OPEN TC11 Switch Semiconductor Test Specification

Version 1.0

Author & Company	OPEN Alliance TC11 Members
Title	Switch Semiconductor Test Specification
Version	1.0
Date	December 13, 2018
Status	Final
Restriction Level	Public

This document defines and specifies test cases for verification of basic Ethernet switch semiconductor mechanisms that are required for typical Automotive Ethernet use cases.

Version Control of Document

Version	Author	Description:	Date
00d01	F. Nikolaus	Very early first draft. Created from test specification commited by Ruetz and included Ixia test cases as well as test cases from C&S.	27.10.2016
00d02	F. Nikolaus	Added new test cases for Filtering	10.11.2016
00d03	J. Angstenberger M. Heinzinger	Adding some new QoS test cases, adopted the feedback from IXIA for Time Sync and split the TSN Chapter into Time Synchronization and QOS	14.11.2016
00d04	M. Heinzinger	Added new test cases for QOS, minor editorial and technical corrections	20.01.2017
00d05	M. Gosh	Incorporated Feedback to VLAN test cases	23.03.2017
00d06	F. Nikolaus	- Reworked test specificartion after feedback was incorporated. - Added VLAN test cases VLAN_074, VLAN_075 and VLAN_076. - Assigned test case ID to each test case.	20.04.2017
00d07	F. Nikolaus	- Updated Disclaimer. - Removed QinQ test cases. - Updated sections GEN, ADDR, VLAN, TIME, QOS, CONF, FILT; DIAG, INTF repective review findings. - Removed INTF_003 as no external requirement for this test exists.	16.11.2017
00d08	F. Nikolaus	- Removed test cases VLAN_036, VLAN_037 (dublicates) - Added Appendix B for Standard Configuration - Added test cases VLAN_078, VLAN_079 - minor changes in the general part	07.12.2017
00d09	F. Nikolaus	- Added test case VLAN_080	15.02.2018
00d10	F. Nikolaus	- Added test cases GEN_019, GEN_020, DIAG_004, DIAG_005, DIAG_006, DIAG_007	15.03.2018

00d11	F. Nikolaus	- Added test cases DIAG_008 – DIAG_012, GEN_021, GEN_022, ADDR_017 - Modified test case TIME_001	22.03.2018
00d12	F. Nikolaus	- Removed reduntant test case GEN_009 (dublicate to ADDR_010) - Minor changes to test cases: DIAG_004, DIAG_005, DIAG_006, DIAG_007, DIAG_010 - Added reference to requirement GEN-002 in test cases QOS_005, QOS_006 and QOS_007	22.03.2018
00d13	TC11 Testing Subgroup	- Incorporated test case feedback to all sections according to agreed resolution. - Updated chapter 1.4 Abbreviations and definitions Modified reference in 1.5 Definition of Test Scopes - Added chapter 2.1 Test case classification - Moved chapter 2.3.1.2 Simulated topologies to 3.4 Test Setup VLAN - Moved chapter 2.3.1.3 Required topology related configuration to 4.2.1 4 Topology related configuration - Moved chapter 2.3.1.4 Parameters to 4.2.1 4 Parameters	07.06.2018
00d14	F. Nikolaus	- Updated test setups figures - Added Abstract on cover page - minor bugfixes	20.06.2018
V1.0RC	F. Nikolaus	- Minor changes - Added Keysight contact details	21.06.2018
V1.0	M. Heinzinger, F. Nikolaus	- Revised test procedures for test cases GEN_017 and GEN_018 - Removed several test cases due to duplicates and the non-Automotive use case IVL - Various additional editorial changes according to review comment resolution for V1.0RC - Editorial changes based on feedback from Sumitomo - Additional editorial changes	01.10.2018

OPEN Alliance: Public OPEN Specification

Copyright Notice and Disclaimer

Contents

1 Introduction

1.1 Overview

This Switch Semiconductor Test Specification is designed to determine if a product conforms to specifications defined in OPEN Specifications or related requirements. This specification is a collection of all test cases which are recommended to be considered for automotive use and should be referred by car manufacturers within their quality control processes.
Successful execution and passing all relevant tests gives Switch Semiconductors a minimum approval that the device's basic implementations are done correctly.
Tests are organized and identified with distinct IDs that relate to their scopes, and a unique enumeration. For every scope introduction chapters explain common requirements on the Device under Test, the Test Setup and parameters used by the following tests.

1.2 Feedback

Any feedback for correcting, improving or adding new content is welcome. We encourage bringing forward this feedback in the regular meetings of the OPEN Alliance TC11. In case you are not an OPEN Alliance member you can relay questions or feedback through the following contacts:

Company	Email address
C&S group	eth-testing@cs-group.de
IHR	info@ihr.de
Keysight	utpal-kanti.lodh@keysight.com
RUETZ System Solutions	info@ruetz-system-solutions.com
TUEV NORD	electronics@tuev-nord.de

1.3 References

[1] OPEN Alliance Requirements for Ethernet Switch Semiconductors V1.0, 28.09.2016

1.4 Abbreviations and definitions

Abbreviation	Glossary term	Glossary definition
ARL	Address Resolution Logic/ Address Resolution Lookup	
CRC	Cyclic Redundancy Check	
DUT	Device under test	Combination of PHY, PHY configuration and filter that is being tested.
FCS	Frame Check Sequence	
IPv4	Internet Protocol version 4	
ISO	International Organization for Standardization	International standard-setting body composed of representatives from various

Abbreviation	Glossary term	Glossary definition
		national standard organizations.
IVL	Independent VLAN Learning	
MAC	Media Access Control	Abbreviation for the sub layer of the data link layer (layer 2) of the OSI model or for the physical device that implements the Media Access Control functions.
MDI	Media dependent interface	
MDIO	Management Data Input/Output	
MIB	Management Information Base	
MTU	Maximum Transmission Unit	
OSI	Open Systems Interconnection model	Conceptual model that characterizes and standardizes the communication functions of a telecommunication or computing system without regard to its underlying internal structure and technology
PCP	Priority Code Point	
PHY	Physical Layer	Refers to the device that implements layer 1 of the OSI model with respect to Ethernet.
PTP	Precision Time Protocol	
PVID	Port Virtual LAN ID	
QoS	Quality of Service	
SFD	Start Frame Delimiter	
SPI	Serial Pheripheral Interface	
SVL	Shared VLAN Learning	
TCP	Transmission Control Protocol	
TPID	Tag Protocol Identifier	
UDP	User Datagram Protocol	
VID	VLAN ID	

Abbreviation	Glossary term	Glossary definition
VLAN	Virtual Local Area Network	
WFQ	Weighted-Fair-Queuing	
WRR	Weighted Round Robin	

Table 1: Abbreviations and definitions

1.5 Definition of Test Scopes

The complete test scope is derived from the requirement specification [1]. Also the test groups of all specified test cases are aligned with the chapters defined in [1].

2 Test Cases

2.1 Test case classification

Table 2 lists all classifier used in this specification to indicate if a test case is required for a specific DUT.

Classifier	Glossary term
MUST	Test case is mandatory for all DUTs.
MAY	Test covers an optional feature. Means the test case is conditionally mandatory for all DUTs that support the respective feature.

Table 2: Used test case classifier

2.2 General

2.2.1 Operation and Forwarding

2.2.1.1 Operate_as_Store_and_Forward_Switch

Test ID:	GEN_001
Synopsis:	Check if switch operates as a store and forward switch. Sending frames with valid and invalid CRC to see if invalid frames are dropped and verifying that the first bit is not forwarded before the last bit has entered the switch.
Ext Req ID:	GEN-005
Reference:	NONE
Classifier:	MUST
Test Setup:	Switching
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B)
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. Capture and monitor traffic on all DUT ports 2. From the test station, send 100 untagged frames with invalid FCS and a frame size of 64 bytes 3. From the test station, send 100 untagged frames with invalid FCS and a frame size of 1518 bytes 4. From the test station, send 100 tagged frames with invalid FCS and a frame size of 64 bytes 5. From the test station, send 100 tagged frames with invalid FCS and a frame size of 1522 bytes 6. Check if any frame has been forwarded to any port
Pass criteria:	6. No frame has been forwarded to any port
Notes:	NONE

2.2.1.2 Non-blocking_architecture

Test ID:	GEN_002
Synopsis:	The test shall ensure that the switch uses a non-blocking architecture, i.e. the switch is capable of processing and forwarding all incoming data under full communication load (i.e. full-duplex communication on all ports simultaneously). Therefor full load traffic is generated on every port to see if the switch is able to perform without loss.
Ext Req ID:	GEN-003 GEN-004
Reference:	NONE
Classifier:	MUST
Test Setup:	Switching
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B)
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. Monitor traffic on all DUT ports 2. From the test station continuously send tagged frames with a size of 64 bytes to all DUT ports at 100% line rate; the destination MAC addresses shall be unicast addresses that are learned on the other DUT ports and they shall alternate in a round robin type fashion from frame to frame as described in IETF RFC 2889 5.1.3. 3. Wait 10 seconds 4. Stop traffic 5. Check if all frames have been forwarded correctly 6. From the test station continuously send tagged frames with a size of 1522 bytes to all DUT ports at 100% line rate; the destination MAC addresses shall be unicast addresses that are learned on the other DUT ports and they shall alternate in a round robin type fashion from frame to frame as described in IETF RFC 2889 section 5.1.3. 7. Wait 10 seconds 8. Stop traffic 9. Check if all frames have been forwarded correctly
Pass criteria:	5. All frames have been forwarded correctly 9. All frames have been forwarded correctly
Notes:	NONE

2.2.1.3 MAC_to_MAC_delay

Test ID:	GEN_003
Synopsis:	Check if the MAC to MAC delay meets the specified value. Sending a frame from one port to another and measuring the LIFO delay between both ports' MIIs.
Ext Req ID:	GEN-015
Reference:	IETF RFC 1242, section 3.8
Classifier:	MAY
Test Setup:	Configuration (including port probing on MII for time measurements)
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B)
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured 3. The MII of each of the switch ports must be accessible
Test procedure:	1. From the test station, send one frame from port A to port B 2. Determine the time when the last bit of the frame can be seen on port A's MII 3. Determine the time when the first bit of the frame can be seen on port B's MII 4. Calculate the difference of both measured times
Pass criteria:	4. The difference meets the specified value of the MAC to MAC delay as provided by the manufacturer
Notes:	The test should only be required for DUTs with MII access to each of the switch ports. The arrival time of the frame's last bit can be determined by measuring the first bit's arrival and adding the number of bit times according to the size of the frame sent in step 1.

2.2.2 Start Up Performance

2.2.2.1 Boot_time_with_PHYs

Test ID:	GEN_004
Synopsis:	Check if the startup of the switch with internal PHYs takes no more than 140 ms. Continuously send frames with always same source and destination address on DUT port y and then power on the DUT. Capture time of power-on and time when first frame is getting routed like specified/configured in the switch. The period of time from power-on to forwarding the first frame is the boot time with PHYs.
Ext Req ID:	GEN-006
Reference:	NONE
Classifier:	MAY
Test Setup:	Configuration (including port probing on Ethernet port for time measurements)
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B)
Prerequisites:	1. Link up and stable between test station and DUT ports
Test procedure:	1. Power off DUT 2. From the test station, continuously send frames to one egress port 3. Power on DUT and take timestamp t_{On} 4. Wait until first frame is forwarded and captured by test station. Take timestamp tRX 5. Calculate $\Delta t = t_{RX} - t_{On}$
Pass criteria:	5. $\Delta t \leq 140ms$
Notes:	Applicable for all ports that provide access to internal Ethernet port interfaces

2.2.2.2 Boot_time_without_PHYs

Test ID:	GEN_005
Synopsis:	Check if the startup of the switch without PHYs takes no more than 50 ms. Continuously send frames with always same source and destination address on DUT port y (port with accessible MII) and then power on the DUT. Capture time of power-on and time when first frame is getting routed like specified/configured in the switch. The period of time from power-on to forwarding the first frame is the boot time with PHYs.
Ext Req ID:	GEN-007
Reference:	NONE
Classifier:	MAY
Test Setup:	Configuration (including port probing on MII for time measurements)
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B)
Prerequisites:	1. Power off 2. The MII of each of the switch ports must be accessible
Test procedure:	1. From the test station, continuously send frames to one egress port 2. Power on the DUT 3. Receive all traffic from the egress port 4. Measure the time Δt between power-on and the first bit of the first received frame on the destination port
Pass criteria:	4. The calculated time does not exceed 50 ms
Notes:	Applicable for all ports that provide access to MAC interfaces

2.2.3 IEEE 802.1X Port-Based Security

2.2.3.1 8021X_Block_Frames_with_unknown_source_MAC_address

Test ID:	GEN_006
Synopsis:	Test is intended to check, if the required function is implemented to block traffic with unknown source MAC address
Ext Req ID:	GEN-009
Reference:	IEEE802.1X-2010
Classifier:	MUST
Test Setup:	Switching
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B)
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. Send frames from test station to configured DUT ingress port 2. Check, if frames are being forwarded to other DUT egress ports 3. Configure the respective DUT ingress port to block frames with unknown source MAC address 4. Send frames with unknown source MAC address from test station to configured DUT ingress port 5. Check, if frames are being forwarded to DUT egress ports
Pass criteria:	2. Frames are being forwarded 5. Frames are being blocked (no frames are being forwarded)
Notes:	NONE

2.2.3.2 8021X_Forward_Frames_With_Unknown_Source_Address_To_Host

Test ID:	GEN_008
Synopsis:	Test is intended to check, if the required function is implemented to forward traffic with unknown MAC source addresss to the designated host port
Ext Req ID:	GEN-009
Reference:	IEEE 802.1X
Classifier:	MUST
Test Setup:	Switching
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B)
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. Send frames from test station to configured DUT ingress port 2. Check, if frames are being forwarded to DUT egress ports 3. Configure the respective DUT ingress port to forward frames with unknown source address to host controller 4. Send frames with unknown source addresses from test station to configured DUT ingress port 5. Check, if frames are being forwarded to DUT host controller port
Pass criteria:	2. Frames are being forwarded 5. Frames are being forwarded to host controller only
Notes:	NONE

2.2.4 IEEE 802.1AE MACsec support

2.2.4.1 8021AE_MACsec_frames_forwarded_to_host_controller_only

Test ID:	GEN_010
Synopsis:	Test is intended to check, if the required function is implemented to forward MACsec enctrypted frames to the host controller
Ext Req ID:	GEN-016
Reference:	IEEE 802.1AE-2006
Classifier:	MAY
Test Setup:	Switching
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Configuration for MACsec support
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. Capture traffic on all DUT ports, including the host controller port 2. From the test station, send MACsec encrypted frames to port A addressed to port B 3. Check, if frames are being forwarded to DUT host controller port 4. Check, if frames are being forwarded to any other DUT port
Pass criteria:	3. Frames are being forwarded to the host controller port 4. No frames are being forwarded to any other DUT port
Notes:	NONE

2.2.4.2 8021AE_MACsec_frames_forwarded_from_host_controller_to_correct_egress_port

Test ID:	GEN_011
Synopsis:	Test is intended to check, if the required function is implemented to forward MACsec frames from the host controller to the correct egress port.
Ext Req ID:	GEN-016
Reference:	IEEE 802.1AE-2006
Classifier:	MAY
Test Setup:	Switching
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Configuration for MACsec support
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. Capture traffic on all DUT ports 2. From the test station, send MACsec encrypted frames to the DUT host controller port addressed to port B 3. Check, if frames are being forwarded to port B 4. Check, if frames are being forwarded to any other DUT port
Pass criteria:	3. Frames are being forwarded to port B 4. No frames are being forwarded to any other DUT port
Notes:	NONE

2.2.5 Port Mirroring

2.2.5.1 Ingress_Port_Mirroring

Test ID:	GEN_012A
Synopsis:	Check if switch has Ingress Port Mirroring implemented. Sending frames on a regular port and check if frames are getting copied on a mirror port
Ext Req ID:	GEN-013
Reference:	-
Classifier:	MUST
Test Setup:	Switching
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Respective test port M of the switch configured to mirror all traffic entering at port A - The switch is configured to filter the mirrored traffic depending on source and destination MAC addresses and VLAN membership. 16 rules shall be supported.
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. Start capturing all traffic from port M 2. From the test station send traffic to port A and to another port B. The test traffic shall include frames with source and destination MAC addresses and VLAN tags both according and not according to the filter rules 3. Observe if traffic sent to port A is received from port M and if filtering rules are met 4. Observe if traffic sent to port B is received from port M. 5. Reconfigure the switch to mirror multiple ports to the mirror port and repeat the test steps 2-4
Pass criteria:	3. Traffic sent to port A is received at port M according to the filtering rules 4. No traffic sent to port B is received at port M
Notes:	NONE

2.2.5.2 Egress_Port_Mirroring

Test ID:	GEN_012B
Synopsis:	Check if switch has Egress Port Mirroring implemented. Sending frames such that they get forwarded on a regular port that is configured for Egress Mirroring; check if the forwarded frames are getting copied on the mirror port while the frames not forwarded to the Egress are not getting copied on the mirror port.
Ext Req ID:	GEN-013
Reference:	-
Classifier:	MUST
Test Setup:	Switching
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Respective test port M of the switch configured to mirror all traffic forwarded through port A - The switch is configured to filter the mirrored traffic depending on source and destination MAC addresses and VLAN membership. 16 rules shall be supported.
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. From the test station send broadcast traffic to a port B. The test traffic shall include frames with source and destination MAC addresses and VLAN tags both according and not according to the filter rules. 2. Receive all traffic from port A and port M 3. Observe if traffic received from port A is also received from port M and if filtering rules are met 4. Observe if there is traffic received from port M that has not been forwarded to port A, too. 5. Reconfigure the switch to mirror multiple ports to the mirror port and repeat the test steps 2-4
Pass criteria:	3. Traffic received from port A is also received at port M according to the filtering rules 4. All traffic received from port M is also received from port A
Notes:	NONE

2.2.6 Port_Disabling

Test ID:	GEN_013
Synopsis:	Check if switch has Port Disabling implemented. Sending frames on a disabled port and check if frames are getting dropped and if MAC address are learnt; also sending frames on an enabled port and check if frames are forwarded to the disabled port.
Ext Req ID:	GEN-014
Reference:	-
Classifier:	MUST
Test Setup:	Switching
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Respective test port D of the switch disabled
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. Observe if link of port D is still up when the port is disabled 2. Receive and monitor all traffic from port D and another port A 3. From the test station send broadcast traffic to port A 4. Observe if test station receives any traffic from port D 5. From the test station send broadcast traffic to port D 6. Observe if test station receives any traffic from port A 7. Through any vendor specified means, enable port D 8. From the test station send traffic to port A with the source MAC address used in step 5 as destination MAC address 9. Observe if test station receives the traffic exclusively from port D
Pass criteria:	1. Link is up 4. Test station does not receive any traffic from port D 6. Test station does not receive any traffic from port A 9. Test station receives traffic from port D and also from every other port
Notes:	NONE

2.2.7 Handling of Jumbo Frames

2.2.7.1 Support_Jumbo_Frames_untagged

Test ID:	GEN_014A
Synopsis:	Check if switch is able to handle jumbo frames
Ext Req ID:	GEN-017
Reference:	NONE
Classifier:	MAY
Test Setup:	Switching
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Support of Jumbo Frames enabled
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured 3. The manufacturer must provide the maximum supported payload size
Test procedure:	1. Send untagged frames with payload size = maximum supported payload size at line-rate 2. Check if all frames are forwarded correctly
Pass criteria:	2. All frames are forwarded correctly
Notes:	This test is optional. If the DUT supports Jumbo frames, then the manufacturer should provide the maximum supported payload size.

2.2.7.2 Support_Jumbo_Frames_single_tagged

Test ID:	GEN_014B
Synopsis:	Check if switch is able to handle jumbo frames
Ext Req ID:	GEN-017
Reference:	NONE
Classifier:	MAY
Test Setup:	Switching
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Support of Jumbo Frames enabled
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured 3. The manufacturer must provide the maximum supported payload size
Test procedure:	1. Send single-tagged frames with payload size = maximum supported payload size at line-rate 2. Check if all frames are forwarded correctly
Pass criteria:	2. All frames are forwarded correctly
Notes:	This test is optional. If the DUT supports Jumbo frames, then the manufacturer should provide the maximum supported payload size.

2.2.7.3 Support_Jumbo_Frames_double_tagged

Test ID:	GEN_014C
Synopsis:	Check if switch is able to handle jumbo frames
Ext Req ID:	GEN-017
Reference:	NONE
Classifier:	MAY
Test Setup:	Switching
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Support of Jumbo Frames enabled
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured 3. The manufacturer must provide the maximum supported payload size
Test procedure:	1. Send double-tagged frames with payload size = maximum supported payload size at line-rate 2. Check if all frames are forwarded correctly
Pass criteria:	2. All frames are forwarded correctly
Notes:	This test is optional. If the DUT supports Jumbo frames, then the manufacturer should provide the maximum supported payload size.

2.2.7.4 Disable_Jumbo_Frames

Test ID:	GEN_015
Synopsis:	Check if switch can be configured to disable jumbo frame handling
Ext Req ID:	GEN-018
Reference:	NONE
Classifier:	MUST
Test Setup:	Switching
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Support of Jumbo Frames disabled or Switch does not support Jumbo Frames at all
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. Send untagged frames with a payload size of more than 1500 Byte at full bus load 2. Check if any frame is forwarded 3. Send single-tagged frames with a payload size of more than 1500 Byte at full bus load 4. Check if any frame is forwarded 5. Send untagged frames with a payload size of more than 1500 Byte at full bus load 6. Check if any frame is forwarded
Pass criteria:	2. No frame is observed to be forwarded 4. No frame is observed to be forwarded 6. No frame is observed to be forwarded
Notes:	The possibility to enable Jumbo Frames is an optional requirement. However, switches that offer this feature must be configurable such that Jumbo Frames are dropped; additionally, switches that do not offer this feature must drop Jumbo Frames. Thus, this is a mandatory test for both kinds of switches. If the DUT supports Jumbo frames, then the manufacturer should provide the maximum supported payload size.

2.2.8 Read_Out_Device_ID

Test ID:	GEN_016
Synopsis:	Check if Device ID and revision of the chip is accessible via SPI/MDIO
Ext Req ID:	GEN-019
Reference:	NONE
Classifier:	MUST
Test Setup:	Switching
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B)
Prerequisites:	1. Switch configured 2. The manufacturer must provide the Device ID and the revision of the DUT
Test procedure:	1. Follow the manufacturer's instructions to read out the Device ID and the revision of the DUT via SPI/MDIO 2. Compare the Device ID and the revision of the DUT with the information provided by the manufacturer
Pass criteria:	2. The retrieved Device ID and revision match the information provided by the manufacturer
Notes:	NONE

2.2.9 Frame_buffer_size

Test ID:	GEN_017
Synopsis:	Check if the size of the frame buffer corresponds to the information provided by the manufacturer
Ext Req ID:	GEN-011
Reference:	NONE
Classifier:	MUST
Test Setup:	Switching
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - The switch is configured to use the Strict Priority - Configure the queue size for the highest traffic class to one frame - Configure the queue size for the lowest traffic class to n_{max} - 1 frame, where n_{max} is the maximum available frame buffer size according to the customer information - Configure the queue sizes for the remaining traffic classes to zero
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Manufacturer must provide the maximum available frame buffer size n_{max} 3. Switch configured
Test procedure:	1. From the test station, send full load traffic with VLAN priority 7 and with one supported frame size to port B and addressed to port C 2. Wait 1 second 3. From the test station, send full load traffic with VLAN priority 0 and with one supported frame size to port A and addressed to port C 4. Wait 2 seconds 5. Stop all traffic from port A to assure that no new frames enter the buffer through port B 6. Wait 1 second 7. Stop all traffic from port B 8. Wait until no more traffic is received from port B 9. Determine the total number n_{prio0} of frames that have been sent to port B in step 3 which have been successfully forwarded to port C
Pass criteria:	9. $n_{prio0} = n_{max} - 1$
Notes:	This test, as it is specified here, assumes that the queue size is specified as a number of frames. However, as the unit of the queue size (e.g. in frames, in bytes, etc.) is not clearly specified in a TC11 requirement, it might be necessary to further refine the test

	method by iterating through several different frame sizes.

2.2.10 Limited_queue_size

Test ID:	GEN_018
Synopsis:	Check if the size of each queue can be limited individually
Ext Req ID:	GEN-012
Reference:	NONE
Classifier:	MUST
Test Setup:	Switching
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - The switch is configured to use the Strict Priority Algorithm at egress of ports B and C - Configure the queue size for each traffic class to $n_{max} * \frac{9+priority}{100}$, where n_{max} is the maximum available frame buffer size according to the customer information
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Manufacturer must provide the maximum available frame buffer size n_{max} 3. Switch configured
Test procedure:	1. From the test station, send full load traffic with VLAN priority 7 and with one supported frame size to port B and addressed to port C 2. Wait 1 second 3. From the test station, send full load traffic with VLAN priority 0 and with one supported frame size to port A and addressed to port C 4. Wait 2 seconds 5. Stop all traffic from port A to assure that no new frames enter the buffer through port B 6. Wait 1 second 7. Stop all traffic from port B 8. Wait until no more traffic is received from port B 9. Determine the total number n_{lower_prio} of frames that have been sent to port B in step 3 which have been successfully forwarded to port C 10. Repeat steps 1-9 for the VLAN priorities 1-6 each instead of 0 in step 4.
Pass criteria:	9. $n_{lower\_prio} = n_{max} * \frac{9+priority}{100}$
Notes:	As the size of the highest priorized queue (here: priority 7) cannot be checked against a higher priority, the size of this queue is not exactly testable with this test method. However, this method and test case GEN_017 complement one another for verification

	of the queue size for priority 7. This test, as it is specified here, assumes that the queue size is specified as a number of frames. However, as the unit of the queue size (e.g. in frames, in bytes, etc.) is not clearly specified in a TC11 requirement, it might be necessary to further refine the test method by iterating through several different frame sizes.

2.2.11 Negative_Address_Learning_for_Multicast_Frames

Test ID:	GEN_019
Synopsis:	Check if switch is learning MAC address when using frames with valid unregistered MAC Multicast addresses as source addresses.
Ext Req ID:	GEN-001
Reference:	NONE
Classifier:	MUST
Test Setup:	Switching
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Switch is configured to support at least one multicast address that is forwarded to at least one other port than port A.
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured 3. ARL table NOT learned
Test procedure:	1. Through any vendor specified means, have the DUT delete its Address Table entries 2. Capture and monitor traffic on every port 3. From the test station, send tagged and untagged frames to one DUT port A with valid unregistered MAC Multicast source addresses 4. From the test station, send tagged and untagged frames to each of the remaining DUT ports, each frame using one of the MAC Multicast source addresses from step 3 as the destination MAC address. 5. At every DUT port, check if the frames have been forwarded 6. Through any vendor specified means, read the learned MAC address table 7. Repeat test steps 1 to 7 for every DUT port as port A
Pass criteria:	5. Every frame is seen on every other port (flooded) or not seen on any port at all 6. The MAC Multicast used are not learned to the Address Table
Notes:	NONE

2.2.12 Port Filtering and Bridge Relaying Rate

Test ID:	GEN_020
Synopsis:	Check if the Port Filtering Rate and Bridge Relaying Rate match the values guaranteed by the manufacturer.
Ext Req ID:	GEN-001
Reference:	IEEE 802.1D-2004
Classifier:	MUST
Test Setup:	Switching
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B)
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured 3. Manufacturer must provide guaranteed Port Filtering Rate and guaranteed Bridge Relaying Rate of the switch.
Test procedure:	1. From the test station send tagged Unicast frames with a size of 64 bytes and with incrementing source MAC addresses to two switch ports A and B at 100% line rate, all frames addressed to and oversubscribing port C. 2. At port C, measure the rate of the forwarded traffic. 3. Stop traffic at port B. 4. At port C, measure the rate of the forwarded traffic. 5. Stop all traffic.
Pass criteria:	2. The measured rate matches the manufacturer's specification of the Bridge Relaying Rate. 4. The measured rate matches the manufacturer's specification of the Port Filtering Rate.
Notes:	The Port Filtering Rate can only be tested if it is smaller than the Bridge Relaying Rate.

2.2.13 Block untagged frames with invalid length in the length/type field

Test ID:	GEN_021
Synopsis:	Check if switch blocks untagged frames with a frame length that is inconsistent with the length value specified in the length/type field.
Ext Req ID:	GEN-001
Reference:	IEEE 802.3-2015 IEEE 802.1D-2004
Classifier:	MAY
Test Setup:	Switching
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B)
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. From the test station send untagged frames with a length of 146 bytes and a value of 0x0080 in the length/type field to a DUT port A. 2. Check, if frames are being forwarded to other DUT egress ports 3. From the test station send untagged frames with a length of 147 bytes and a value of 0x0080 in the length/type field to a DUT port A. 4. Check, if frames are being forwarded to other DUT egress ports 5. From the test station send untagged frames with a length of 145 bytes, a value of 0x0080 in the length/type field and a source MAC address that has not yet been learned to the ARL table to a DUT port A. 6. Check, if frames are being forwarded to other DUT egress ports 7. From the test station send frames with the source MAC address used in step 5 as the destination MAC address to a DUT port B. 8. Check, if frames are being forwarded to other DUT egress ports
Pass criteria:	2. All frames are forwarded 4. No frames are forwarded 6. No frames are forwarded 8. All frames are flooded to all other DUT egress ports
Notes:	NONE

2.2.14 Block tagged frames with invalid length in the length/type field

Test ID:	GEN_022
Synopsis:	Check if switch blocks tagged frames with a frame length that is inconsistent with the length value specified in the length/type field.
Ext Req ID:	GEN-001
Reference:	IEEE 802.3-2015 IEEE 802.1D-2004
Classifier:	MAY
Test Setup:	Switching
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B)
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. From the test station send tagged frames with a length of 150 bytes and a value of 0x0080 in the length/type field to a DUT port A. 2. Check, if frames are being forwarded to other DUT egress ports 3. From the test station send tagged frames with a length of 151 bytes and a value of 0x0080 in the length/type field to a DUT port A. 4. Check, if frames are being forwarded to other DUT egress ports 5. From the test station send tagged frames with a length of 149 bytes, a value of 0x0080 in the length/type field and a source MAC address that has not yet been learned to the ARL table to a DUT port A. 6. Check, if frames are being forwarded to other DUT egress ports 7. From the test station send frames with the source MAC address used in step 5 as the destination MAC address to a DUT port B. 8. Check, if frames are being forwarded to other DUT egress ports
Pass criteria:	2. All frames are forwarded 4. No frames are forwarded 6. No frames are forwarded 8. All frames are flooded to all other DUT egress ports
Notes:	NONE

2.3 Address Resolution

2.3.1 Address_Learning_with_untagged_frames

Test ID:	ADDR_001
Synopsis:	Check if switch is capable of MAC address learning using untagged frames with unique source MAC addresses.
Ext Req ID:	ADDR-001 ADDR-003
Reference:	NONE
Classifier:	MUST
Test Setup:	Switching
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - The switch shall be configured to forward untagged frames - If the switch supports choosing between SVL (Shared VLAN Learning) and IVL (Independent VLAN Learning), SVL shall be selected.
Prerequisites:	1. If the switch supports hash based address learning, then the vendor/manufacturer shall provide a list with 256 MAC addresses that lead to the same hash value for the hash polynomial used for the ARL table. 2. Link up and stable between test station and DUT ports 3. Switch configured 4. ARL table NOT learned
Test procedure:	1. Through any vendor specified means, have the DUT delete its Address Table entries 2. Capture and monitor traffic on every port 3. From the test station, send 256 untagged frames to one DUT port A, each frame with a different, valid source MAC address and all MAC addresses resulting in the same hash value 4. From the test station, send 256 untagged frames to each of the remaining DUT ports, each frame using one of the source MAC addresses from step 3 as the destination MAC address. 5. At every DUT port, check if the frames have been forwarded 6. From the test station, send 256 tagged frames to each of the remaining DUT ports, each frame using one of the source MAC addresses from step 3 as the destination MAC address and a valid VLAN tag according to the VLAN configuration for port A. 7. At every DUT port, check if the frames have been forwarded 8. Repeat test steps 1 to 7 for every DUT port as port A
Pass criteria:	5. At port A, all 256 frames per each other port are seen 5. At the remaining ports, no frame is seen 7. At port A, all 256 frames per each other port are seen 7. At the remaining ports, no frame is seen

Notes:	NONE

2.3.2 Address_Learning_with_tagged_frames

Test ID:	ADDR_002
Synopsis:	Check if switch is capable of MAC address learning using tagged frames with unique source MAC addresses.
Ext Req ID:	ADDR-001 ADDR-003
Reference:	NONE
Classifier:	MUST
Test Setup:	Switching
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - The switch shall be configured to forward untagged frames - If the switch supports choosing between SVL (Shared VLAN Learning) and IVL (Independent VLAN Learning), SVL shall be selected.
Prerequisites:	1. If the switch supports hash based address learning, then the vendor/manufacturer shall provide a list with 256 MAC addresses that lead to the same hash value for the hash polynomial used for the ARL table. 2. Link up and stable between test station and DUT ports 3. Switch configured 4. ARL table NOT learned
Test procedure:	1. Through any vendor specified means, have the DUT delete its Address Table entries 2. Capture and monitor traffic on every port 3. From the test station, send 256 tagged frames to one DUT port A, each frame with a different, valid source MAC address and a valid VLAN tag according to the VLAN configuration for port A. 4. From the test station, send 256 untagged frames to each of the remaining DUT ports, each frame using one of the source MAC addresses from step 1 as the destination MAC address. 5. At every DUT port, check if the frames have been forwarded 6. From the test station, send 256 tagged frames to each of the remaining DUT ports, each frame using one of the source MAC addresses from step 1 as the destination MAC address and the same VLAN tag used as in step 3. 7. At every DUT port, check if the frames have been forwarded 8. From the test station, send 256 tagged frames to each of the remaining DUT ports, each frame using one of the source MAC addresses from step 1 as the destination MAC address and a valid VLAN tag according to the VLAN configuration of port A, but different to that VLAN tag used in step 3. 9. At every DUT port, check if the frames have been forwarded 10. Repeat test steps 1 to 9 for every DUT port as port A
Pass	5. At port A, all 256 frames per each other port are seen 5. At the remaining ports, no frame is seen

criteria:	7. At port A, all 256 frames per each other port are seen 7. At the remaining ports, no frame is seen 9. At port A, all 256 frames per each other port are seen 9. At the remaining ports, no frame is seen
Notes:	-

2.3.3 Address_Learning_read_ARL_table

Test ID:	ADDR_003
Synopsis:	Check if switch supports reading the learned ARL table.
Ext Req ID:	ADDR-004
Reference:	-
Classifier:	MUST
Test Setup:	Switching
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Ageing should be deactivated or the ageing time should be set to a high enough value so that manually reading the address table is feasible before the timer runs out.
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured 3. ARL table NOT learned
Test procedure:	1. Through any vendor specified means have the DUT delete its Address Table entries 2. From the test station, send at least 2 untagged and at least 2 tagged frames to each of the DUT ports, each frame with a different, valid source MAC address and each of the tagged frames with a different valid VLAN tag according to the VLAN configuration of the corresponding port 3. Through any vendor specified means, read the learned MAC address table
Pass criteria:	3. The read table correctly lists the MAC addresses and the corresponding ports as learned in step 2.
Notes:	-

2.3.4 Address_Learning_write_ARL_table

Test ID:	ADDR_004
Synopsis:	Check if switch supports writing to the learned MAC table.
Ext Req ID:	ADDR-003 ADDR-004 GEN-010
Reference:	-
Classifier:	MUST
Test Setup:	Switching
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Switch is configured to support at least two multicast addresses, each forwarding to at least two, but fewer ports than the maximum number of DUT ports
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. Through any vendor specified means cause the DUT to delete its Address Table entries 2. Through any vendor specified means, write to the learned MAC address table. The written address table should consist of 256 entries. Furthermore, the written MAC address table should contain both unicast and multicast entries. For every DUT port, there should be at least one unicast and one multicast entry addressing to it. 3. Through any vendor specified means, read the learned MAC address table 4. From the test station, send untagged frames to every DUT port, each frame using one of the MAC addresses written to the MAC address table in step 2 as the destination MAC address. For every written entry the corresponding MAC address should be used at least once. 5. At every DUT port, check if the frames have been forwarded correctly 6. From the test station, send tagged frames to each of the remaining DUT ports, each frame using one of the MAC addresses written to the MAC address table in step 2 as the destination MAC address and a valid VLAN tag according to the VLAN configuration for the port corresponding to the destination address. For every written entry the corresponding MAC address should be used at least once. 7. At every DUT port, check if the frames have been forwarded correctly
Pass criteria:	3. The read table correctly lists the MAC addresses and the corresponding ports as written in step 2 5. All frames have been forwarded to the ports according to the MAC address table written in step 2 5. No frame has been forwarded to any port not according to the MAC address table written in step 2

	7. All frames have been forwarded to the ports according to the MAC address table written in step 2 7. No frame has been forwarded to any port not according to the MAC address table written in step 2
Notes:	-

2.3.5 Address_Learning_ageing

Test ID:	ADDR_005
Synopsis:	Check if switch enables de-/activation of ageing in the MAC address table individually for every entry.
Ext Req ID:	ADDR-005 GEN-010
Reference:	-
Classifier:	MUST
Test Setup:	Switching
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Configure the DUT to flood frames with unknown destination MAC address
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. Capture and monitor traffic on every port 2. From the test station, start continuous transmission of frames to port A with always the same source MAC address; the frame rate should be high enough that the time between frames is always below the configured ageing time (plus buffer), but it should not exceed 50% of the port's maximum load. 3. From the test station, start continuous transmission of frames to port A with always the same source MAC address different to that used in step 2; the frame rate should be high enough that the time between frames is always below the configured ageing time (plus buffer), but it should not exceed the port's remaining bandwidth, i.e. the maximum load minus the frame rate chosen in step 2 (minus an additional buffer). 4. Through any vendor specified means, read the learned MAC address table and identify the entries learned in step 2 and step 3 5. Through any vendor specified means, activate ageing for the entry corresponding to step 2 6. Through any vendor specified means, deactivate ageing for the entry corresponding to step 3 7. Cease the traffic initiated in steps 2 and 3 8. Wait at least as long as the ageing time 9. From the test station, send frames with the MAC addresses used in step 2 as destination addresses to any port B other than port A. 10. Examine to which ports the frames from step 9 are forwarded 11. From the test station, send frames with the MAC addresses used in step 3 as destination addresses to any port B other than port A. 12. Examine to which ports the frames from step 9 are forwarded 13. Repeat steps 1 to 10 for every DUT port as port A
Pass	10. All frames from step 9 are seen on every port other than port B 12. Any of the frames with the MAC address used in step 3 are not seen on a port

criteria:	other than A
Notes:	-

2.3.6 Address_Learning_ageing_time

Test ID:	ADDR_006
Synopsis:	Check if the ageing time in the MAC address table can be adjusted.
Ext Req ID:	ADDR-006
Reference:	-
Classifier:	MUST
Test Setup:	Switching
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Configure the DUT to flood frames with unknown destination MAC address - Configure the DUT to enable ageing for every new entry in the MAC address table
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. Capture and monitor traffic on every port 2. Through any vendor specified means, set the ageing time of the MAC address table to a new value 3. From the test station, send a frame to port A with a valid source MAC address 4. Wait for 90-95% of the ageing time 5. From the test station, send frames with the MAC address used in step 3 as destination address to any port B other than port A 6. Examine to which ports the frames sent in step 5 are forwarded 7. From the test station, send a frame to port A with a valid source MAC address different from the MAC address used in step 3 8. Wait for 105-110% of the ageing time 9. From the test station, send frames with the MAC address used in step 7 as destination address to any port B other than port A 10. Examine to which ports the frames sent in step 9 are forwarded 11. Repeat steps 1 to 10 for at least three significantly different values of the ageing time
Pass criteria:	6. The frames are seen on port A 6. The frames are not seen on any port other than port A 10. All frames are seen on every port except on port B
Notes:	-

2.3.7 Address_Learning_disable_learning_on_specific_port

Test ID:	ADDR_007
Synopsis:	Check if MAC address learning can be disabled for every port individually.
Ext Req ID:	ADDR-007
Reference:	-
Classifier:	MUST
Test Setup:	Switching
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - The switch shall be configured to enable MAC address learning for every port - The switch shall be configured to flood frames with an unknown destination MAC address
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured 3. ARL table NOT learned
Test procedure:	1. Through any vendor specified means, have the DUT delete its Address Table entries 2. Capture and monitor traffic on every port 3. From the test station, send a frame to one DUT port A with a valid source MAC address. 4. From the test station, send a frame to a DUT port B other than port A, using the source MAC addresses from step 1 as the destination MAC address. 5. At every DUT port, check if the frame has been forwarded 6. Through any vendor specified means, disable MAC address learning for port A 7. Through any vendor specified means, have the DUT delete its Address Table entries 8. From the test station, send a frame to one DUT port A with a valid source MAC address. 9. From the test station, send a frame to a DUT port other than port A, using the source MAC addresses from step 1 as the destination MAC address. 10. At every DUT port, check if the frame has been forwarded 11. Repeat test steps 1 to 10 for every DUT port as port A
Pass criteria:	5. The frame has been forwarded to port A 5. The frame has not been forwarded to any port other than port A 10. The frame has been forwarded to every port other than port B
Notes:	-

2.3.8 Address_Learning_behaviour_upon_unknown_destination_address

Test ID:	ADDR_008
Synopsis:	Check if switch allows configuration of the behavior upon receiving frames with unknown destination MAC addresses.
Ext Req ID:	ADDR-008
Reference:	-
Classifier:	MUST
Test Setup:	Switching
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B)
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured 3. ARL table NOT learned
Test procedure:	1. Through any vendor specified means, have the DUT delete its Address Table entries 2. Capture and monitor traffic on every port 3. Through any vendor specified means, configure the DUT to flood frames with unknown destination MAC address to every port 4. From the test station, send a frame to a DUT port A, using any valid, unicast MAC address as the destination MAC address. The destination MAC address must not be the same as the source MAC address. 5. At every DUT port, check if the frame has been forwarded 6. Through any vendor specified means, have the DUT delete its Address Table entries 7. Through any vendor specified means, configure the DUT to discard frames with unknown destination MAC address 8. From the test station, send a frame to DUT port A, using any valid, unicast MAC address as the destination MAC address. The destination MAC address must not be the same as the source MAC address. 9. At every DUT port, check if the frame has been forwarded 10. Through any vendor specified means, have the DUT delete its Address Table entries 11. Through any vendor specified means, configure the DUT to forward frames with unknown destination MAC address to a specific port B other than port A 12. From the test station, send a frame to DUT port A, using any valid, unicast MAC address as the destination MAC address. The destination MAC address must not be the same as the source MAC address. 13. At every DUT port, check if the frame has been forwarded 14. Repeat test steps 1 to 11 for every DUT port as port A
Pass	5. The frame has been forwarded to every port except port A

criteria:	9. The frame has not been forwarded to any port 13. The frame has been forwarded to port B 13. The frame has not been forwarded to any port other than port B
Notes:	-

2.3.9 Address_Learning_behaviour_upon_MAAP_destination_address

Test ID:	ADDR_009
Synopsis:	Check if switch allows configuration of the behavior upon receiving frames with MAAP addresses as destination MAC addresses.
Ext Req ID:	ADDR-009
Reference:	-
Classifier:	MUST
Test Setup:	Switching
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B)
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured 3. ARL table NOT learned
Test procedure:	1. Capture and monitor traffic on every port 2. Through any vendor specified means, configure the DUT to flood frames with MAAP addresses as destination MAC address to every port 3. From the test station, send MAAP frames to a DUT port A. Among these frames, there shall be at least one frame for each of the two MAAP address ranges (91:E0:F0:00:00:00–91:E0:F0:00:FD:FF) and (91:E0:F0:00:FE:00-91:E0:F0:00:FE:FF) 4. At every DUT port, check if the frame has been forwarded 5. Through any vendor specified means, configure the DUT to discard frames with MAAP addresses as destination MAC address 6. From the test station, send MAAP frames to DUT port A. Among these frames, there shall be at least one frame for each of the two MAAP address ranges (91:E0:F0:00:00:00–91:E0:F0:00:FD:FF) and (91:E0:F0:00:FE:00-91:E0:F0:00:FE:FF) 7. At every DUT port, check if the frame has been forwarded 8. Through any vendor specified means, configure the DUT to forward frames with MAAP addresses as destination MAC address to a specific port B other than port A 9. From the test station, send MAAP frames to DUT port A. Among these frames, there shall be at least one frame for each of the two MAAP address ranges (91:E0:F0:00:00:00–91:E0:F0:00:FD:FF) and (91:E0:F0:00:FE:00-91:E0:F0:00:FE:FF) 10. At every DUT port, check if the frame has been forwarded 11. Repeat test steps 1 to 11 for every DUT port as port A
Pass criteria:	4. The frame has been forwarded to every port except port A 7. The frame has not been forwarded to any port 10. The frame has been forwarded to port B

	10. The frame has not been forwarded to any port other than port B
Notes:	-

2.3.10 Address_Learning_behaviour_upon_01_80_C2_destination_address

Test ID:	ADDR_010
Synopsis:	Check if switch allows configuration of the behavior upon receiving frames with (01:80:C2) addresses as destination MAC addresses.
Ext Req ID:	GEN-009 ADDR-010
Reference:	-
Classifier:	MUST
Test Setup:	Switching
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B)
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured 3. ARL table NOT learned
Test procedure:	1. Capture and monitor traffic on every port 2. Through any vendor specified means, configure the DUT to flood frames with (01:80:C2) addresses as destination MAC address to every port 3. From the test station, send frames with (01:80:C2) addresses as destination MAC addresses to a DUT port A. 4. At every DUT port, check if the frame has been forwarded 5. Through any vendor specified means, configure the DUT to discard frames with (01:80:C2) addresses as destination MAC address 6. From the test station, send frames with (01:80:C2) addresses as destination MAC addresses to a DUT port A. 7. At every DUT port, check if the frame has been forwarded 8. Through any vendor specified means, configure the DUT to forward frames with (01:80:C2) addresses as destination MAC address to a specific port B other than port A 9. From the test station, send frames with (01:80:C2) addresses as destination MAC addresses to a DUT port A. 10. At every DUT port, check if the frame has been forwarded 11. Repeat test steps 1 to 11 for every DUT port as port A
Pass criteria:	4. The frame has been forwarded to every port except port A 7. The frame has not been forwarded to any port 10. The frame has been forwarded to port B 10. The frame has not been forwarded to any port other than port B
Notes:	-

2.3.11 Address_Learning_ARL_table_overflow_status_info

Test ID:	ADDR_011
Synopsis:	Check if switch provides status information to indicate an overflow in the address tables with the corresponding dropped MAC address.
Ext Req ID:	ADDR-011
Reference:	-
Classifier:	MUST
Test Setup:	Switching
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B)
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured 3. ARL table NOT learned
Test procedure:	1. Through any vendor specified means, have the DUT delete its Address Table entries 2. Capture and monitor traffic on every port 3. From the test station, send N frames to the DUT, each frame to any single port and with a different, valid source MAC address. N shall be 1 larger than the MAC address table's maximum number of entries. The MAC address of the last sent frame shall be noted for later use. 4. Through any vendor specified means, check if the DUT reports an overflow in the address table and if it reports the dropped MAC address properly
Pass criteria:	4. The DUT reports an overflow and the dropped MAC address is reported to be the same as noted in step 3
Notes:	-

2.3.12 Address_Learning_forward_to_specific_port

Test ID:	ADDR_012
Synopsis:	Check if switch can be configured to forward all incoming frames of selected ports to a specific port.
Ext Req ID:	ADDR-012
Reference:	-
Classifier:	MUST
Test Setup:	Switching
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B)
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. Through any vendor specified means, configure the DUT to forward all incoming frames of one DUT port A to another DUT port B. 2. Capture and monitor traffic on every port 3. From the test station, send frames to every DUT port except port A, each frame with a different, valid source MAC address, at least one frame to each port. Note which MAC addresses are sent to which port for later usage 4. From the test station, send frames to DUT port A, each frame using one of the source MAC addresses from step 3 as the destination MAC address. 5. At every DUT port, check if the frames have been forwarded
Pass criteria:	5. Every frame has been forwarded to port B 5. No frame has been forwarded to any port other than port B
Notes:	-

2.3.13 Address_Learning_one_shot_mode

Test ID:	ADDR_013
Synopsis:	Check if switch can be configured for address learning in a one-shot-mode.
Ext Req ID:	ADDR-013 GEN-010
Reference:	-
Classifier:	MUST
Test Setup:	Switching
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B)
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. Capture and monitor traffic on every port 2. Through any vendor specified means, configure the switch to disable one-shot address learning 3. From the test station, send a frame to one DUT port A with a valid source MAC address 4. From the test station, send a frame to another DUT port B with the same source MAC address as in step 3 5. From the test station, send frames to a third DUT port C, each frame using the source MAC addresses from step 3 and 4 as the destination MAC address. 6. At DUT ports A and B, check if the frames have been forwarded 7. Through any vendor specified means, configure the switch to enable one-shot address learning 8. From the test station, send a frame to one DUT port A with a valid source MAC address 9. From the test station, send a frame to another DUT port B with the same source MAC address as in step 8 10. From the test station, send frames to a third DUT port C, each frame using the source MAC addresses from step 8 and 9 as the destination MAC address. 11. At DUT ports A and B, check if the frames have been forwarded
Pass criteria:	6. All frames have been forwarded to port B 6. No frame has been forwarded to port A 11. All frames have been forwarded to port A 11. No frame has been forwarded to port B
Notes:	-

2.3.14 Address_Learning_limited_number_of_learnt_addresses_per_port

Test ID:	ADDR_014
Synopsis:	Check if switch can be configured to limit the number of MAC addresses learned on a port by a configuration parameter.
Ext Req ID:	ADDR-014
Reference:	-
Classifier:	MUST
Test Setup:	Switching
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B)
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured 3. ARL table NOT learned
Test procedure:	1. Through any vendor specified means, have the DUT delete its Address Table entries 2. Capture and monitor traffic on every port 3. Through any vendor specified means, configure the DUT to limit the number of MAC addresses learned on a port A to a number N smaller than 256. 4. From the test station, send 256 frames to DUT port A, each frame with a different, valid source MAC address. 5. From the test station, send 256 frames to another DUT port B, each frame using one of the source MAC addresses from step 4 as the destination MAC address. 6. At every DUT port, check if the frames have been forwarded 7. Through any vendor specified means, have the DUT delete its Address Table entries 8. From the test station, send 256 frames to DUT port B, each frame with one of the source MAC addresses used in step 4. 9. From the test station, send 256 frames to a DUT port C other than port B, each frame using one of the source MAC addresses from step 8 as the destination MAC address. 10. At every DUT port, check if the frames have been forwarded
Pass criteria:	6. At port A, all 256 frames are seen 6. At the remaining ports, the first N frames are not seen 6. At the remaining ports, the last (256-N) frames are seen 10. At port B, all 256 frames are seen 10. At the remaining ports, no frame is seen
Notes:	DUT port C in test step 9 can be the same as DUT port A in test step 3.

2.3.15 Address_Learning_1024_addresses_without_hash_conflict_with_untagged_frames

Test ID:	ADDR_015
Synopsis:	Check if the switch's ARL table can learn up to 1024 addresses using untagged frames.
Ext Req ID:	ADDR-001 ADDR-002
Reference:	-
Classifier:	MUST
Test Setup:	Switching
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - The switch shall be configured to forward untagged frames - If the switch supports choosing between SVL (Shared VLAN Learning) and IVL (Independent VLAN Learning), SVL shall be selected.
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured 3. ARL table NOT learned 4. The vendor shall provide a list of 1024 valid MAC addresses that can be learnt without address conflict or alternatively sufficient information that allows generating such a list (e.g. the polynomial for hash value determination).
Test procedure:	1. Through any vendor specified means, have the DUT delete its Address Table entries 2. Capture and monitor traffic on every port 3. From the test station, send 1024 untagged frames to one DUT port A, each frame with a different, valid source MAC address from the list mentioned in Prerequisite 4. 4. From the test station, send 1024 untagged frames to each of the remaining DUT ports, each frame addressed to a different MAC address from the list mentioned in Prerequisite 4 as the destination MAC address. 5. At every DUT port, check if the frames have been forwarded 6. From the test station, send 1024 tagged frames to each of the remaining DUT ports, each frame addressed to a different MAC address from the list mentioned in Prerequisite 4 as the destination MAC address and using a valid VLAN tag according to the VLAN configuration for port A. 7. At every DUT port, check if the frames have been forwarded 8. Repeat test steps 1 to 7 for every DUT port as port A
Pass criteria:	5. At port A, all 1024 frames per each other port are seen 5. At the remaining ports, no frame is seen 7. At port A, all 1024 frames per each other port are seen 7. At the remaining ports, no frame is seen
Notes:	In most common hash functions using polynomials, an address range starting with xx:xx:xx:xx:00:00 and incrementing by 1 can be used for testing without hash conflicts.

2.3.16 Address_Learning_1024_addresses_without_hash_conflict_with_tagged_frames

Test ID:	ADDR_016
Synopsis:	Check if the switch's ARL table can learn up to 1024 addresses using tagged frames.
Ext Req ID:	ADDR-001 ADDR-002
Reference:	-
Classifier:	MUST
Test Setup:	Switching
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - The switch shall be configured to forward untagged frames - If the switch supports choosing between SVL (Shared VLAN Learning) and IVL (Independent VLAN Learning), SVL shall be selected.
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured 3. ARL table NOT learned 4. The vendor shall provide a list of 1024 valid MAC addresses that can be learnt without address conflict or alternatively sufficient information that allows generating such a list (e.g. the polynomial for hash value determination).
Test procedure:	1. Through any vendor specified means, have the DUT delete its Address Table entries 2. Capture and monitor traffic on every port 3. From the test station, send 1024 tagged frames to one DUT port A, each frame with a different, valid source MAC address from the list mentioned in Prerequisite 4 and a valid VLAN tag according to the VLAN configuration for port A. 4. From the test station, send 1024 untagged frames to each of the remaining DUT ports, each frame addressed to a different MAC address from the list mentioned in Prerequisite 4 as the destination MAC address. 5. At every DUT port, check if the frames have been forwarded 6. From the test station, send 1024 tagged frames to each of the remaining DUT ports, each frame addressed to a different MAC address from the list mentioned in Prerequisite 4 as the destination MAC address and using the same VLAN tag as used in step 3. 7. At every DUT port, check if the frames have been forwarded 8. From the test station, send 1024 tagged frames to each of the remaining DUT ports, each frame addressed to a different MAC address from the list mentioned in Prerequisite 4 as the destination MAC address and using a valid VLAN tag according to the VLAN configuration of port A, but different to that VLAN tag used in step 3. 9. At every DUT port, check if the frames have been forwarded 10. Repeat test steps 1 to 9 for every DUT port as port A

Pass criteria:	5. At port A, all 1024 frames per each other port are seen 5. At the remaining ports, no frame is seen 7. At port A, all 1024 frames per each other port are seen 7. At the remaining ports, no frame is seen 9. At port A, all 1024 frames per each other port are seen 9. At the remaining ports, no frame is seen
Notes:	-

2.3.17 Address_Learning_behaviour_upon_user_defined_destination_addresses_range

Test ID:	ADDR_017
Synopsis:	Check if switch allows configuration of the behavior upon receiving frames with a user defined address range as destination MAC addresses.
Ext Req ID:	ADDR-009
Reference:	-
Classifier:	MUST
Test Setup:	Switching
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B)
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured 3. ARL table NOT learned
Test procedure:	1. Capture and monitor traffic on every port. 2. Through any vendor specified means, configure the DUT to flood frames with destination addresses from the ranges of (00:FF:FF:FF:00:00-01:00:00:00:FF:FF) to every port. 3. From the test station, send frames with all destination addresses from the range of (00:FF:FF:FF:00:00-01:00:00:00:FF:FF) to a DUT port A. 4. At every DUT port, check if the frame has been forwarded. 5. Through any vendor specified means, configure the DUT to discard frames with destination addresses from the range of (00:FF:FF:FF:00:00-01:00:00:00:FF:FF). 6. From the test station, send frames with destination addresses from the range of (00:FF:FF:FF:00:00-01:00:00:00:FF:FF) to a DUT port A. 7. At every DUT port, check if the frame has been forwarded 8. Through any vendor specified means, configure the DUT to forward frames with destination addresses from the range of (00:FF:FF:FF:00:00-01:00:00:00:FF:FF) to a specific port B other than port A. 9. From the test station, send frames with destination addresses from the range of (00:FF:FF:FF:00:00-01:00:00:00:FF:FF) to a DUT port A. 10. At every DUT port, check if the frame has been forwarded
Pass criteria:	4. The frames have been forwarded to every port except port A 7. The frames have not been forwarded to any port 10. The frames have been forwarded to port B 10. The frames have not been forwarded to any port other than port B

Notes:	-

2.4 Virtual LAN (VLAN)

2.4.1 IEEE 802.1Q - VLAN

2.4.1.1 General

The scope of this chapter is to specify test cases for bridges from the following standards:

- IEEE Std 802.1Q-2005

2.4.1.2 Setup/Verification Tests

Setup/Verification Tests #1

Test ID	VLAN_Setup_001
Synopsys	Tagging a frame with a VLAN tag: a) Allows a VLAN Identifier (VID) to be conveyed, facilitating consistent VLAN classification of the frame throughout the network and enabling segregation of frames assigned to different VLANs; (NOTE: This test adds tag header)
Ext Req ID	VLAN-001
Reference	IEEE Std 802.1Q-2005 S9.1 P74 Purpose of Tagging
Classifier	MUST
Test setup	SETUP 1
DUT Configuration	VLAN Configuration 6 (see Appendix B)
Prerequisites	NONE
Test Procedure	1. TEST STATION: Send untagged Data Frame to <DIface-1>, containing: - Destination MAC Address field set to <unusedMACAddr-1> - Source MAC Address field set to <unusedMACAddr-0> 2. TEST STATION: Listen (for up to<ParamListenTime> seconds) on <DIface-0> 3. DUT: Forward VLAN-tagged Data Frame 4. TEST STATION: Verify that the received VLAN-tagged Data Frame contains: - Tag Header, contains: - VLAN Identifier field set to <VID1>
Pass Criteria	3. DUT: Forward VLAN-tagged Data Frame 4. TEST STATION: Verify that the received VLAN-tagged Data Frame contains:

	- Tag Header, contains: - VLAN Identifier field set to <VID1>
Notes	NONE

Setup/Verification Tests #2

Test ID	VLAN_Setup_002
Synopsys	Tagging a frame with a VLAN tag: a) Allows a VLAN Identifier (VID) to be conveyed, facilitating consistent VLAN classification of the frame throughout the network and enabling segregation of frames assigned to different VLANs; (NOTE: This test removes tag header)
Ext Req ID	VLAN-001
Reference	IEEE Std 802.1Q-2005 S9.1 P74 Purpose of Tagging
Classifier	MUST
Test setup	SETUP 1
DUT Configuration	VLAN Configuration 6 (see Appendix B)
Prerequisites	NONE
Test Procedure	1. TEST STATION: Send VLAN-tagged Data Frame to <DIface-0>, containing: - Destination MAC Address field set to <unusedMACAddr-1> - Source MAC Address field set to <unusedMACAddr-0> - Tag Header, containing: - VLAN Identifier field set to <VID1> 2. TEST STATION: Listen (for up to<ParamListenTime> seconds) on <DIface-1> 3. DUT: Forward untagged Data Frame
Pass Criteria	3. DUT: Forward untagged Data Frame
Notes	NONE

2.4.1.3 *Preservation of the MAC service*

Preservation of the MAC service #1

Test ID	VLAN_001
Synopsys	Frames transmitted between end stations carry the MAC Addresses of the peer-end stations in their destination and source address fields, not an address of a Bridge.
Ext Req ID	VLAN-001
Reference	IEEE Std 802.1Q-2005 S6.2 P16 Preservation of the MAC service
Classifier	MUST
Test setup	SETUP 1
DUT Configuration	VLAN Configuration 5 (see Appendix B)
Prerequisites	NONE
Test Procedure	1. TEST STATION: Send Untagged Data Frame to <DIface-0> containing: - Source address of TIface-0 - Destination address of TIface-1 2. TEST STATION: Listen (for up to<ParamListenTime> seconds> on <DIface-1> 3. DUT: Forward Untagged Data Frame 4. TEST STATION: Verify that the Source and Destination Address in the received untagged packet is that of TIface-0 and TIface-1 respectively
Pass Criteria	3. DUT: Forward Untagged Data Frame 4. TEST STATION: Verify that the Source and Destination Address in the received untagged packet is that of TIface-0 and TIface-1 respectively
Notes	NONE

Preservation of the MAC service #2

Test ID	VLAN_002
Synopsys	Frames transmitted between end stations carry the MAC Addresses of the peer-end stations in their destination and source address fields, not an address of a Bridge.
Ext Req ID	VLAN-001
Reference	IEEE Std 802.1Q-2005 S6.2 P16 Preservation of the MAC service
Classifier	MUST
Test setup	SETUP 1
DUT Configuration	VLAN Configuration 5 (see Appendix B)
Prerequisites	NONE
Test Procedure	1. TEST STATION: Send Untagged Data Frame to <DIface-0> containing: - Source address of TIface-0 - Any Destination address other than that of TIface-1 2. TEST STATION: Listen (for up to<ParamListenTime> seconds> on <DIface-1> 3. DUT: Do not forward Untagged Data Frame
Pass Criteria	3. DUT: Do not forward Untagged Data Frame
Notes	NONE

2.4.1.4 *Support of the EISS*

Support of the EISS #1

Test ID	VLAN_003
Synopsys	An Acceptable Frame Types parameter with at least one of the following values: 1) Admit Only VLAN-tagged frames; 2) Admit Only Untagged and Priority-tagged frames; 3) Admit All frames.
Ext Req ID	VLAN-001
Reference	IEEE Std 802.1Q-2005 S6.7 P26 Support of the EISS
Classifier	MUST
Test setup	SETUP 1
DUT Configuration	VLAN Configuration 6 (see Appendix B)
Prerequisites	NONE
Test Procedure	1. DUT CONFIGURE: Externally configure the value of "Acceptable Frame Types" parameter as "Admit only VLAN-tagged Frames" on <DIface-0> 2. TEST STATION: Send <TYPE> Data Frame to <DIface-0>, containing: - Destination MAC Address field set to <unusedMACAddr-1> - Source MAC Address field set to <unusedMACAddr-0> 3. TEST STATION: Listen (for up to<ParamListenTime> seconds) on <DIface-1> 4. DUT: Do not forward 5. <CASE>: <TYPE> = untagged 6. <CASE>: <TYPE> = priority-tagged
Pass Criteria	4. DUT: Do not forward
Notes	NONE

Support of the EISS #2

Test ID	VLAN_004
Synopsys	An Acceptable Frame Types parameter with at least one of the following values: 1) Admit Only VLAN-tagged frames; 2) Admit Only Untagged and Priority-tagged frames; 3) Admit All frames.
Ext Req ID	VLAN-001
Reference	IEEE Std 802.1Q-2005 S6.7 P26 Support of the EISS
Classifier	MUST
Test setup	SETUP 1
DUT Configuration	VLAN Configuration 4 (see Appendix B)
Prerequisites	NONE
Test Procedure	1. DUT CONFIGURE: Externally configure the value of "Acceptable Frame Types" parameter as "Admit All Frames" on <DIface-1> 2. TEST STATION: Send <TYPE> Data Frame to <DIface-1>, containing: - Destination MAC Address field set to <unusedMACAddr-1> - Source MAC Address field set to <unusedMACAddr-0> 3. TEST STATION: Listen (for up to<ParamListenTime> seconds) on <DIface-0> 4. DUT: Forward VLAN-tagged Data Frame 5. TEST STATION: Verify that the received VLAN-tagged Data Frame contains: - Tag Header, contains: - VID field set to <VID1> 6. <CASE>: <TYPE> = untagged 7. <CASE>: <TYPE> = priority-tagged
Pass Criteria	4. DUT: Forward VLAN-tagged Data Frame 5. TEST STATION: Verify that the received VLAN-tagged Data Frame contains: - Tag Header, contains: - VID field set to <VID1>
Notes	NONE

Support of the EISS #3

Test ID	VLAN_005
Synopsys	The PVID and VID Set shall contain valid VID values (Table 9-2)
Ext Req ID	VLAN-001
Reference	IEEE Std 802.1Q-2005 S6.7 P26 Support of the EISS
Classifier	MUST
Test setup	SETUP 1
DUT Configuration	VLAN Configuration 6 (See Appendix B)
Prerequisites	NONE
Test Procedure	1. TEST STATION: Send tagged date Frame to <DIface-1>, containing: - Destination MAC Address field set to <unusedMACAddr-0> - Source MAC Address field set to <unusedMACAddr-1> - VLAN Id. set to <4095>. 2. TEST STATION: Listen (for up to<ParamListenTime> seconds) on <DIface-0> 3. DUT: Do not forward the VLAN-tagged Data Frame, containing: - Tag Header, containing: - VLAN Identifier field set to <4095>
Pass Criteria	3. DUT: Do not forward the VLAN-tagged Data Frame, containing: - Tag Header, containing: - VLAN Identifier field set to <4095>
Notes	NONE

Support of the EISS #4

Test ID	VLAN_006
Synopsys	The PVID and VID Set shall contain valid VID values (Table 9-2)
Ext Req ID	VLAN-001
Reference	IEEE Std 802.1Q-2005 S6.7 P26 Support of the EISS
Classifier	MUST
Test setup	SETUP 1
DUT Configuration	VLAN Configuration 6 (See Appendix B)
Prerequisites	NONE
Test Procedure	1. DUT CONFIGURE: Externally configure the PVID of <DIface-1> to <VID1> 2. TEST STATION: Send <TYPE> Data Frame to <DIface-1>, containing: - Destination MAC Address field set to <unusedMACAddr-0> - Source MAC Address field set to <unusedMACAddr-1> 3. TEST STATION: Listen (for up to<ParamListenTime> seconds) on <DIface-0> 4. DUT: Forward VLAN-tagged Data Frame 5. TEST STATION: Verify that the received VLAN-tagged frame contains: - Tag Header, contains: - VLAN Identifier field set to <VID1>, not <nullVID> 6. <CASE>: <TYPE> = untagged 7. <CASE>: <TYPE> = priority-tagged
Pass Criteria	4. DUT: Forward VLAN-tagged Data Frame 5. TEST STATION: Verify that the received VLAN-tagged frame contains: - Tag Header, contains: - VLAN Identifier field set to <VID1>, not <nullVID>
Notes	NONE

Support of the EISS #5

Test ID	VLAN_007
Synopsys	If they have not been explicitly configured, the PVID shall assume the value of the default PVID defined in Table 9-2 and the VID Set shall be empty
Ext Req ID	VLAN-001
Reference	IEEE Std 802.1Q-2005 S6.7 P26 Support of the EISS
Classifier	MUST
Test setup	SETUP 1
DUT Configuration	VLAN Configuration 6 (See Appendix B)
Prerequisites	NONE
Test Procedure	1. TEST STATION: Send <TYPE> Data Frame to <DIface-1>, containing: - Destination MAC Address field set to <unusedMACAddr-1> - Source MAC Address field set to <unusedMACAddr-0> 2. TEST STATION: Listen (for up to<ParamListenTime> seconds) on <DIface-0> 3. DUT: Forward VLAN-tagged Data Frame 4. TEST STATION: Verify that the received VLAN-tagged frame contains: - Tag Header, contains: - VLAN Identifier field set to <VID1>5. <CASE>: <TYPE> = untagged 6. <CASE>: <TYPE> = priority-tagged
Pass Criteria	3. DUT: Forward VLAN-tagged Data Frame 4. TEST STATION: Verify that the received VLAN-tagged frame contains: - Tag Header, contains: - VLAN Identifier field set to 1
Notes	NONE

Support of the EISS #6

Test ID	VLAN_008
Synopsys	If they have not been explicitly configured, the PVID shall assume the value of the default PVID defined in Table 9-2 and the VID Set shall be empty
Ext Req ID	VLAN-001
Reference	IEEE Std 802.1Q-2005 S6.7 P26 Support of the EISS
Classifier	MUST
Test setup	SETUP 1
DUT Configuration	VLAN Configuration 6 (See Appendix B)
Prerequisites	NONE
Test Procedure	1. DUT CONFIGURE: Externally configure the PVID of <DIface-1> to <VID1> 2. TEST STATION: Send <TYPE> Data Frame to <DIface-1>, containing: - Destination MAC Address field set to <unusedMACAddr-1> - Source MAC Address field set to <unusedMACAddr-0> 3. TEST STATION: Listen (for up to<ParamListenTime> seconds) on <DIface-0> 4. DUT: Forward VLAN-tagged Data Frame 5. TEST STATION: Verify that the received VLAN-tagged Data Frame contains: - Tag Header, contains: - VLAN Identifier field set to <VID1> 6. <CASE>: <TYPE> = untagged 7. <CASE>: <TYPE> = priority-tagged
Pass Criteria	4. DUT: Forward VLAN-tagged Data Frame 5. TEST STATION: Verify that the received VLAN-tagged Data Frame contains: - Tag Header, contains: - VLAN Identifier field set to <VID1>
Notes	NONE

2.4.1.5 Data indications

Data indications #1

Test ID	VLAN_009
Synopsys	The value of the vlan_identifier parameter is as follows: d) The value of the PVID for the Port, if the frame is untagged or Priority-tagged and port-and-protocol VLAN classification is not implemented;
Ext Req ID	VLAN-001
Reference	IEEE Std 802.1Q-2005 S6.7.1 P27 Data indications
Classifier	MAY
Test setup	SETUP 1
DUT Configuration	VLAN Configuration 4 (See Appendix B)
Prerequisites	NONE
Test Procedure	1. DUT CONFIGURE: Externally configure the PVID of <DIface-1> to <VID1> 2. TEST STATION: Send <TYPE> Data Frame to <DIface-1>, containing: - Destination MAC Address field set to <unusedMACAddr-1> - Source MAC Address field set to <unusedMACAddr-0> 3. TEST STATION: Listen (for up to<ParamListenTime> seconds) on <DIface-0> 4. DUT: DUT associate the frames with the PVID <VID1> 5. DUT: Forward VLAN-tagged Data Frame 6. TEST STATION: Verify that the received VLAN-tagged Data Frame contains: - Tag Header, contains: - VLAN Identifier field set to <VID1> 7. <CASE>: <TYPE> = untagged 8. <CASE>: <TYPE> = priority-tagged
Pass Criteria	4. DUT: DUT associate the frames with the PVID <VID1> 5. DUT: Forward VLAN-tagged Data Frame 6. TEST STATION: Verify that the received VLAN-tagged Data Frame contains: - Tag Header, contains: - VLAN Identifier field set to <VID1>

Notes	NONE

Data indications #2

Test ID	VLAN_010
Synopsys	The value of the vlan_identifier parameter is as follows: d) The value of the PVID for the Port, if the frame is untagged or Priority-tagged and port-and-protocol VLAN classification is not implemented;
Ext Req ID	VLAN-001
Reference	IEEE Std 802.1Q-2005 S6.7.1 P27 Data indications
Classifier	MAY
Test setup	SETUP 1
DUT Configuration	VLAN Configuration 4 (See Appendix B)
Prerequisites	NONE
Test Procedure	1. DUT CONFIGURE: Externally Create Static VLAN Registration Entry for <VID2> with Port-Map as Registration Fixed and Tagged for all DUT Ports 2. DUT CONFIGURE: Externally configure the PVID of <DIface-1> to <VID1> 3. TEST STATION: Send VLAN-tagged Data Frame to <DIface-1>, containing: - Destination MAC Address field set to <unusedMACAddr-1> - Source MAC Address field set to <unusedMACAddr-0> - Tag Header, containing: - VLAN Identifier field set to <VID2> 4. TEST STATION: Listen (for up to<ParamListenTime> seconds) on <DIface-0> 5. DUT: DUT will not associate the VLAN-tagged frame with PVID <VID1> 6. DUT: Forward VLAN-tagged Data Frame 7. TEST STATION: Verify that the received VLAN-tagged Data Frame contains: - Tag Header, contains: - VLAN Identifier field set to <VID2>
Pass Criteria	5. DUT: DUT will not associate the VLAN-tagged frame with PVID <VID1> 6. DUT: Forward VLAN-tagged Data Frame 7. TEST STATION: Verify that the received VLAN-tagged Data Frame contains: - Tag Header, contains:

	- VLAN Identifier field set to <VID2>
Notes	NONE

Data indications #3

Test ID	VLAN_011
Synopsys	The value of the vlan_identifier parameter is as follows: c) The value contained in the VID field, if the frame is VLAN-tagged;
Ext Req ID	VLAN-001
Reference	IEEE Std 802.1Q-2005 S6.7.1 P27 Data indications
Classifier	MUST
Test setup	SETUP 1
DUT Configuration	VLAN Configuration 3 (See Appendix B)
Prerequisites	NONE
Test Procedure	1. TEST STATION: Send VLAN-tagged Data Frame to <DIface-0>, containing: - Destination MAC Address field set to <unusedMACAddr-1> - Source MAC Address field set to <unusedMACAddr-0> - Tag Header, containing: - VLAN Identifier field set to <VID1> 2. TEST STATION: Listen (for up to<ParamListenTime> seconds) on <DIface-1> 3. DUT: Forward VLAN-tagged Data Frame 4. TEST STATION: Verify that the received VLAN-tagged Data Frame contains: - Tag Header, contains: - VLAN Identifier field set to <VID1>
Pass Criteria	3. DUT: Forward VLAN-tagged Data Frame 4. TEST STATION: Verify that the received VLAN-tagged Data Frame contains: - Tag Header, contains: - VLAN Identifier field set to <VID1>
Notes	NONE

Data indications #5

Test ID	VLAN_012
Synopsys	The received frame is discarded if: b) The initial octets of the mac_service_data_unit do not contain... 3) The VID value is in the range 001-FFE, and the Acceptable Frame Types are Admit Only Untagged and Priority-tagged frames.
Ext Req ID	VLAN-001
Reference	IEEE Std 802.1Q-2005 S6.7.1 P27 Data indications
Classifier	MUST
Test setup	SETUP 1
DUT Configuration	VLAN Configuration 3 (See Appendix B)
Prerequisites	NONE
Test Procedure	1. DUT CONFIGURE: Externally configure the value of "Acceptable Frame Types" parameter as "Admit only Untagged and Priority-tagged Frames" on <DIface-1> 2. TEST STATION: Send <TYPE> Data Frame to <DIface-1>, containing: - Destination MAC Address field set to <unusedMACAddr-1> - Source MAC Address field set to <unusedMACAddr-0> 3. TEST STATION: Listen (for up to<ParamListenTime> seconds) on <DIface-0> 4. DUT: DUT will forward the frame as the Acceptable Frame Types parameter of <DIface-1> is set to "Admit only Untagged and Priority-tagged frames" 5. DUT: Forward the data frame 6. <CASE>: <TYPE> = untagged 7. <CASE>: <TYPE> = priority-tagged
Pass Criteria	4. DUT: DUT will forward the frame as the Acceptable Frame Types parameter of <DIface-1> is set to "Admit only Untagged and Priority-tagged frames" 5. DUT: Forward the data frame
Notes	NONE

Data indications #6

Test ID	VLAN_013
Synopsys	The received frame is discarded if: b) The initial octets of the mac_service_data_unit do not contain... 3) The VID value is in the range 001-FFE, and the Acceptable Frame Types are Admit Only Untagged and Priority-tagged frames.
Ext Req ID	VLAN-001
Reference	IEEE Std 802.1Q-2005 S6.7.1 P27 Data indications
Classifier	MUST
Test setup	SETUP 1
DUT Configuration	VLAN Configuration 3 (See Appendix B)
Prerequisites	NONE
Test Procedure	1. DUT CONFIGURE: Externally configure the value of "Acceptable Frame Types" parameter as "Admit only Untagged and Priority-tagged Frames" on <DIface-1> 2. TEST STATION: Send vlan-tagged Data Frame to <DIface-1>, containing: - Destination MAC Address field set to <unusedMACAddr-1> - Source MAC Address field set to <unusedMACAddr-0> 3. TEST STATION: Listen (for up to<ParamListenTime> seconds) on <DIface-0> 4. DUT: DUT will discard the frame as the Acceptable Frame Types parameter of <DIface-1> is set to "Admit only Untagged and Priority-tagged frames" 5. DUT: Discard the data frame
Pass Criteria	4. DUT: DUT will discard the frame as the Acceptable Frame Types parameter of <DIface-1> is set to "Admit only Untagged and Priority-tagged frames" 5. DUT: Discard the data frame
Notes	NONE

2.4.1.6 *Protocol VLAN classification*

Protocol VLAN classification #1

Test ID	VLAN_016
Synopsys	Each instance of the tagging and detagging functions that supports the EISS (6.7), and implements the optional port-and-protocol-based VLAN classification, shall implement a VID Set, each member of which associates values of a Protocol Group Identifier (6.8.2) with a VID. Each Untagged and Priority-tagged frame received is assigned a vlan_identifier equal to the VID Set value for the receiving Port and the Protocol Group Identifier selected by matching the received frame with a Protocol Template.
Ext Req ID	VLAN-001
Reference	IEEE Std 802.1Q-2005 S6.8 P29 Protocol VLAN classification
Classifier	MAY
Test setup	SETUP 1
DUT Configuration	VLAN Configuration 4 (See Appendix B)
Prerequisites	1. The DUT supports Port-and-Protocol-based VLAN classification
Test Procedure	1. DUT CONFIGURE: Externally Create Static VLAN Registration Entry for VLAN Identifier <VID2> with Port-Map as Registration Fixed and Tagged for all DUT Ports 2. DUT CONFIGURE: Externally configure the value of "Acceptable Frame Types" parameter as "Admit only VLAN-tagged frames" on <DIface-1> 3. TEST STATION: Send VLAN-tagged Data Frame to <DIface-1>, containing: - Destination MAC Address field set to <unusedMACAddr-1> - Source MAC Address field set to <unusedMACAddr-0> - Tag Header, containing: - VLAN Identifier field set to <VID2> 4. TEST STATION: Listen (for up to<ParamListenTime> seconds) on <DIface-0> 5. DUT: DUT will not discard the frame as the Acceptable Frame Types parameter of <DIface-1> is set to "Admit Only VLAN-tagged frames" 6. DUT: Forward VLAN-tagged Data Frame
Pass Criteria	5. DUT: DUT will not discard the frame as the Acceptable Frame Types parameter of <DIface-1> is set to "Admit Only VLAN-tagged frames" 6. DUT: Forward VLAN-tagged Data Frame

Notes	NONE

Protocol VLAN classification #2

Test ID	VLAN_017
Synopsys	Each instance of the tagging and detagging functions that supports the EISS (6.7), and implements the optional port-and-protocol-based VLAN classification, shall implement a VID Set, each member of which associates values of a Protocol Group Identifier (6.8.2) with a VID. Each Untagged and Priority-tagged frame received is assigned a vlan_identifier equal to the VID Set value for the receiving Port and the Protocol Group Identifier selected by matching the received frame with a Protocol Template.
Ext Req ID	VLAN-001
Reference	IEEE Std 802.1Q-2005 S6.8 P29 Protocol VLAN classification
Classifier	MAY
Test setup	SETUP 1
DUT Configuration	VLAN Configuration 4 (See Appendix B)
Prerequisites	1. The DUT supports Port-and-Protocol-based VLAN classification
Test Procedure	1. DUT CONFIGURE: Externally configure the PVID of <DIface-0> to <UnusedVID-0> 2. DUT CONFIGURE: Externally configure the PVID of <DIface-1> to <UnusedVID-1> 3. DUT CONFIGURE: Externally configure the protocol version of <DIface-0> to IP after assigning IP protocol with VLAN Id <UnusedVID-2> 4. TEST STATION: Send untagged Data Frame to <DIface-0>, containing: - Destination MAC Address field set to <unusedMACAddr-1> - Source MAC Address field set to <unusedMACAddr-0> - Ethernet Type field set to IP 5. TEST STATION: Listen (for up to<ParamListenTime> seconds) on <DIface-0> 6. DUT: Forward VLAN-tagged Data Frame 7. TEST STATION: Verify that the received VLAN-tagged Data Frame contains: - Tag Header, contains: - VLAN Identifier field set to <UnusedVID-2>
Pass Criteria	6. DUT: Forward VLAN-tagged Data Frame 7. TEST STATION: Verify that the received VLAN-tagged Data Frame contains: - Tag Header, contains: - VLAN Identifier field set to <UnusedVID-2>
Notes	NONE

Protocol VLAN classification #3

Test ID	VLAN_018
Synopsys	The value of the vlan_identifier parameter is as follows: e) As determined by port-and-protocol-based VLAN classification (6.8) if that capability is implemented and the frame is untagged or Priority-tagged. (Note: Testing for Frame type = LLC_Other)
Ext Req ID	VLAN-001
Reference	IEEE Std 802.1Q-2005 S6.7.1 P27 Data Indication
Classifier	MAY
Test setup	SETUP 1
DUT Configuration	VLAN Configuration 4 (See Appendix B)
Prerequisites	1. The DUT supports Port-and-Protocol-based VLAN classification
Test Procedure	1. DUT CONFIGURE: Externally configure the PVID of <DIface-0> to <UnusedVID-0> 2. DUT CONFIGURE: Externally configure the PVID of <DIface-1> to <UnusedVID-1> 3. DUT CONFIGURE: Externally configure the protocol version of <DIface-0> to IP after assigning IP protocol with VLAN Id <UnusedVID-2> 4. TEST STATION: Send untagged Data Frame to <DIface-1>, containing: - Destination MAC Address field set to <unusedMACAddr-1> - Source MAC Address field set to <unusedMACAddr-0> - Ethernet Type field set to LLC_Other (0xFEFE) 5. TEST STATION: Listen (for up to<ParamListenTime> seconds) on <DIface-0> 6. DUT: Forward VLAN-tagged Data Frame 7. TEST STATION: Verify that the received VLAN-tagged Data Frame contains: - Tag Header, contains: - VLAN Identifier field set to <UnusedVID-0>
Pass Criteria	6. DUT: Forward VLAN-tagged Data Frame 7. TEST STATION: Verify that the received VLAN-tagged Data Frame contains: - Tag Header, contains: - VLAN Identifier field set to <UnusedVID-0>
Notes	NONE

2.4.1.7 Ingress, Forwarding, and Egress Rules

Ingress, Forwarding, and Egress Rules #1

Test ID	VLAN_019
Synopsys	Frames that carry control information ... are not forwarded Permanently configured static entries in the filtering database (8.2, 8.3, and 8.13) ensure that such frames are discarded by the Forwarding Process (8.6). (Note : In this test we send standard RST BPDU to carry control information)
Ext Req ID	VLAN-001
Reference	IEEE Std 802.1Q-2005 S7.5 P29 Ingress Forwarding and Egress Rules
Classifier	MUST
Test setup	SETUP 1
DUT Configuration	VLAN Configuration 5 (See Appendix B)
Prerequisites	NONE
Test Procedure	1. DUT CONFIGURE: Externally configure Bridge Hello Time protocol parameter of DUT to <hugeHelloTime> 2. TEST STATION: Wait for (2 * <configBridgeForwardDelay>) seconds for DUT to stabilize 3. TEST STATION: Listen (for up to2 * <hugeHelloTime> seconds) on <DIface-1> 4. DUT: Send <TYPE-PDU> 5. TEST STATION: Send <TYPE-PDU> to <DIface-0> - Root Identifier field set to <worseBridgeID> - Bridge Identifier field set to <worseBridgeID> 6. TEST STATION: Listen (for up to<ParamListenTime> seconds) on <DIface-1> 7. DUT: Do not forward <TYPE-PDU> containing: - Bridge Identifier field set to <worseBridgeID> 8. <CASE>: <TYPE-PDU> = CONFIG BPDU <PROTOCOLVERSION> = <STPMode> or, <TYPE-PDU> = RST BPDU <PROTOCOLVERSION> = <RSTPMode>
Pass Criteria	4. DUT: Send <TYPE-PDU> 7. DUT: Do not forward <TYPE-PDU> containing: - Bridge Identifier field set to <worseBridgeID>

Notes	NONE

2.4.1.8 *Traffic Segregation*

Traffic Segregation #1

Test ID	VLAN_020
Synopsys	A Bridge can filter frames to confine them to LANs that belong to the VLAN to which they are assigned and, thus, define the VLAN's maximum extent (7.3). The functions that support the use and maintenance of information for this purpose are: a) Configuration of a PVID for each Port,to associate a VID with untagged and priority-tagged received frames
Ext Req ID	VLAN-001
Reference	IEEE Std 802.1Q-2005 S8.1.4 P39 Traffic Segregation
Classifier	MUST
Test setup	SETUP 1
DUT Configuration	VLAN Configuration 4 (See Appendix B)
Prerequisites	NONE
Test Procedure	1. TEST STATION: Send <TYPE> Data Frame to <DIface-1>, containing: - Destination MAC Address field set to <unusedMACAddr-1> - Source MAC Address field set to <unusedMACAddr-0> 2. TEST STATION: Listen (for up to<ParamListenTime> seconds) on <DIface-0> 3. DUT: Forward the VLAN-tagged Data Frame 4. TEST STATION: Verify that the received VLAN-tagged Data Frame contains: - Tag Header, contains: - VID field set to <VID1> 5. <CASE>: <TYPE> = untagged 6. <CASE>: <TYPE> = priority-tagged
Pass Criteria	3. DUT: Forward the VLAN-tagged Data Frame 4. TEST STATION: Verify that the received VLAN-tagged Data Frame contains: - Tag Header, contains: - VID field set to <VID1>
Notes	NONE

2.4.1.9 *Bridge Port Transmit and Receive*

Bridge Port Transmit and Receive #1

Test ID	VLAN_022
Synopsys	The Bridge Port Transmit and Receive process supports the attachment of the Bridge Port to a network. As illustrated in Figure 8-8.
Ext Req ID	VLAN-001
Reference	IEEE Std 802.1Q-2005 S8.5 P45 Bridge Port Transmit and Receive
Classifier	MUST
Test setup	SETUP 1
DUT Configuration	VLAN Configuration 2 (See Appendix B)
Prerequisites	NONE
Test Procedure	1. TEST STATION: Send VLAN-tagged Data Frame to <DIface-A> containing: - Destination MAC Address field set to Port MAC Address of <DIface-A> - Source MAC Address field set to <unusedMACAddr-0> - Tag Header, containing - VLAN Identifier field set to <VID1> 2. TEST STATION: Listen (for up to<ParamListenTime> seconds) on <DIface-B> and <DIface-C> 3. DUT: Forward VLAN-tagged Data Frame through both the interfaces 4. TEST STATION: Verify that the received VLAN-tagged frame contains: - Tag Header, contains: - VLAN Identifier field set to <VID1> 5. <CASE>: <DIface-A> = <DIface-0>, <DIface-B> = <DIface-1>, <DIface-C> = <DIface-2> 6. <CASE>: <DIface-A> = <DIface-1>, <DIface-B> = <DIface-2>, <DIface-C> = <DIface-0> 7. <CASE>: <DIface-A> = <DIface-2>, <DIface-B> = <DIface-0>, <DIface-C> = <DIface-1>
Pass Criteria	3. DUT: Forward VLAN-tagged Data Frame through both the interfaces 4. TEST STATION: Verify that the received VLAN-tagged frame contains:

	- Tag Header, contains: - VLAN Identifier field set to <VID1>
Notes	NONE

2.4.1.10 The Forwarding Process

The Forwarding Process #1

Test ID	VLAN_023
Synopsys	Each frame submitted to the MAC Relay Entity shall be forwarded subject to the constituent functions of the Forwarding Process (Figure 8-9). (NOTE: Acceptible Frame Types = "Admit All Frames", Enable Ingress Filtering = TRUE and Port is in Member Set)
Ext Req ID	VLAN-001
Reference	IEEE Std 802.1Q-2005 S8.6 P47 The Forwarding Process
Classifier	MUST
Test setup	SETUP 1
DUT Configuration	VLAN Configuration 4 (See Appendix B)
Prerequisites	NONE
Test Procedure	1. DUT CONFIGURE: Externally configure the PVID of <DIface-1> to <VID1> 2. DUT CONFIGURE: Externally configure the value of "Acceptable Frame Types" parameter as "Admit All Frames" on <DIface-1> 3. DUT CONFIGURE: Externally configure "Enable Ingress Filtering" parameter to TRUE on <DIface-1> 4. TEST STATION: Send untagged Data Frame to <DIface-1>, containing: - Destination MAC Address field set to <unusedMACAddr-1> - Source MAC Address field set to <unusedMACAddr-0> 5. TEST STATION: Listen (for up to<ParamListenTime> seconds) on <DIface-0> 6. DUT: Forward VLAN-tagged Data Frame 7. TEST STATION: Send untagged Data Frame to <DIface-1>, containing: - Destination MAC Address field set to <unusedMACAddr-0> - Source MAC Address field set to <unusedMACAddr-2> 8. TEST STATION: Listen (for up to<ParamListenTime> seconds) on <DIface-0> 9. DUT: Do not forward
Pass Criteria	6. DUT: Forward VLAN-tagged Data Frame 9. DUT: Do not forward
Notes	NONE

The Forwarding Process #4

Test ID	VLAN_024
Synopsys	Each frame submitted to the MAC Relay Entity shall be forwarded subject to the constituent functions of the Forwarding Process (Figure 8-9). NOTE: Acceptible Frame Types = "Admit Only VLAN-tagged Frames", Enable Ingress Filtering = FALSE and Port is in Member Set
Ext Req ID	VLAN-001
Reference	IEEE Std 802.1Q-2005 S8.6 P47 The Forwarding Process
Classifier	MUST
Test setup	SETUP 1
DUT Configuration	VLAN Configuration 3 (See Appendix B)
Prerequisites	NONE
Test Procedure	1. DUT CONFIGURE: Externally configure the value of "Acceptable Frame Types" parameter as "Admit Only VLAN-tagged Frames" on <DIface-0> 2. DUT CONFIGURE: Externally configure "Enable Ingress Filtering" parameter to FALSE on <DIface-0> 3. DUT CONFIGURE: Externally configure to create VLAN ID <unusedVID-0> 4. DUT CONFIGURE: Externally configure a Static VLAN Registration Entry for VID <unusedVID-0> with Port-Map as "Registration Fixed" on <DIface-0> and <DIface-1> and "tagged" 5. TEST STATION: Send VLAN-tagged Data Frame to <DIface-0>, containing: - Destination MAC Address field set to <unusedMACAddr-1> - Source MAC Address field set to <unusedMACAddr-0> - Tag Header, containing: - VLAN Identifier field set to <unusedVID-0> 6. TEST STATION: Listen (for up to<ParamListenTime> seconds) on <DIface-1> 7. DUT: Forward VLAN-tagged Data Frame, containing: - VLAN Identifier field set to <unusedVID-0> 8. TEST STATION: Send VLAN-tagged Data Frame to <DIface-0>, containing: - Destination MAC Address field set to <unusedMACAddr-0> - Source MAC Address field set to <unusedMACAddr-2> - Tag Header, containing: - VLAN Identifier field set to <unusedVID-0> 9. TEST STATION: Listen (for up to<ParamListenTime> seconds) on <DIface-1> 10. DUT: Do not forward the data frame

Pass Criteria	7. DUT: Forward VLAN-tagged Data Frame, containing: - VLAN Identifier field set to <unusedVID-0> 10. DUT: Do not forward the data frame
Notes	NONE

2.4.1.11 *Active SETUP enforcement*

Active topology enforcement #3

Test ID	VLAN_027
Synopsys	The Forwarding Process allocates each received frame to a spanning tree. If the reception Port State for that spanning tree is Forwarding or Learning, the source address and VID are submitted to the Learning Process. If the reception Port State is Forwarding, each Bridge Port, other than the reception Port, with a Port State of Forwarding for that tree is identified as a potential transmission Port.
Ext Req ID	VLAN-001
Reference	IEEE Std 802.1Q-2005 S8.6.1 P47 Active topology enforcement
Classifier	MUST
Test setup	SETUP 1
DUT Configuration	VLAN Configuration 3 (See Appendix B)
Prerequisites	NONE
Test Procedure	1. TEST STATION: Send VLAN-tagged Data Frame to <DIface-0>, containing: - Destination MAC Address field set to <unusedMACAddr-1> - Source MAC Address field set to <unusedMACAddr-0> - Tag Header, containing: - VLAN Identifier field set to <VID1> 2. TEST STATION: Listen (for up to<ParamListenTime> seconds> on <DIface-0> and <DIface-1> 3. DUT: DUT will not consider the <DIface-0> as transmission port 4. DUT: Forward VLAN-tagged Data Frame through <DIface-1> 5. TEST STATION: Verify that the received VLAN-tagged Data Frame contains: - Tag Header, contains: - VLAN Identifier field set to <VID1>
Pass Criteria	3. DUT: DUT will not consider the <DIface-0> as transmission port 4. DUT: Forward VLAN-tagged Data Frame through <DIface-1> 5. TEST STATION: Verify that the received VLAN-tagged Data Frame contains: - Tag Header, contains: - VLAN Identifier field set to <VID1>
Notes	NONE

2.4.1.12 Ingress

Ingress #6

Test ID	VLAN_028
Synopsys	Each Port may support an Enable Ingress Filtering parameter. A frame received on a Port that is not in the member set (8.8.9) associated with the VID shall be discarded if this parameter is set.
Ext Req ID	VLAN-001
Reference	IEEE Std 802.1Q-2005 S8.6.2 P48 Ingress
Classifier	MAY
Test setup	SETUP 1
DUT Configuration	VLAN Configuration 3 (See Appendix B)
Prerequisites	NONE
Test Procedure	1. TEST STATION: Send VLAN-tagged Data Frame to <DIface-0>, containing: - Destination MAC Address field set to <unusedMACAddr-0> - Source MAC Address field set to <unusedMACAddr-1> - Tag Header, containing: - VLAN Identifier field set to <unusedVID-0> 2. TEST STATION: Listen (for up to<ParamListenTime> seconds> on <DIface-1> 3. DUT: Do not forward
Pass Criteria	3. DUT: Do not forward
Notes	NONE

2.4.1.13 The Learning Process

The Learning Process #4

Test ID	VLAN_030
Synopsys	It shall create or update a Dynamic Filtering Entry (8.8.3) that specifies the reception Port for the frame's source address and VID, if and only if the source address is an Individual Address, i.e., is not a Group Address, the resulting number of entries would not exceed the capacity of the Filtering Database [NOTE: This test can be carried out if DUT flushes the first in Filtering Database entry to make room for the new ones when Filtering Database is full]
Ext Req ID	VLAN-001
Reference	IEEE Std 802.1Q-2005 S8.7 P51 The Learning Process
Classifier	MAY
Test setup	SETUP 1
DUT Configuration	VLAN Configuration 2 (See Appendix B)
Prerequisites	NONE
Test Procedure	1. TEST STATION: Send VLAN-tagged Data Frame to <DIface-0>, containing: - Destination MAC Address field set to <unusedMACAddr-n> - Source MAC Address field set to <unusedMACAddr-(n+1)> - Tag Header, containing: - VLAN Identifier field set to <VID1> 2. TEST STATION: Repeate the above step up to<ParamFilteringDatabaseSize> times with the value of n = 0, 2, 4 ..... (<ParamFilteringDatabaseSize - 1> * 2) 3. TEST STATION: Send VLAN-tagged Data Frame to <DIface-0>, containing: - Destination MAC Address field set to <unusedMACAddr-n> - Source MAC Address field set to <unusedMACAddr-(n+1)> - Tag Header, containing: - VLAN Identifier field set to <VID1> where n = 2 * <ParamFilteringDatabaseSize> 4. DUT: Flush the first entry in the Filtering Database to make a room for the new entry. 5. TEST STATION: Wait for <ParamProcessTime> seconds for DUT to update Filtering Database 6. TEST STATION: Send VLAN-tagged Data Frame to <DIface-1>, containing: - Destination MAC Address field set to <unusedMACAddr-1> - Source MAC Address field set to <unusedMACAddr-n>

	- Tag Header, containing: - VLAN Identifier field set to <VID1> where n = (2 * <ParamFilteringDatabaseSize>) + 2 7. TEST STATION: Listen (for up to<ParamListenTime> seconds) on <DIface-0> and <DIface-2> 8. DUT: DUT forward the VLAN-tagged data frame through both the interfaces containing: - VLAN Identifier field set to <VID1>
Pass Criteria	4. DUT: Flush the first entry in the Filtering Database to make a room for the new entry. 8. DUT: DUT forward the VLAN-tagged data frame through both the interfaces containing: - VLAN Identifier field set to <VID1>
Notes	NONE

2.4.1.14 *Default filtering utility criteria*

Default filtering utility criteria #2

Test ID	VLAN_031
Synopsys	NOTE: If the member set for a given VID is empty, that VLAN is not currently active, and the Bridge will filter all frames destined for that VLAN, regardless of their destination address. Note: This testcase tests whether DUT discards packets with VID that is not in the Member Set
Ext Req ID	VLAN-001
Reference	IEEE Std 802.1Q-2005 S8.7.1 P51 Default filtering utility criteria
Classifier	MUST
Test setup	SETUP 1
DUT Configuration	VLAN Configuration 3 (See Appendix B)
Prerequisites	NONE
Test Procedure	1. TEST STATION: Send VLAN-Tagged Data Frame to <DIface-1>, containing: - Destination MAC Address field set to <unusedMACAddr-1> - Source MAC Address field set to <unusedMACAddr-0> - VLAN Identifier field is set to <VID2> 2. TEST STATION: Listen (for up to<ParamListenTime> seconds) on <DIface-1> 3. DUT: Do Not Forward the data frame
Pass Criteria	3. DUT: Do Not Forward the data frame
Notes	NONE

2.4.1.15 *Static VLAN Registration Entries*

Static VLAN Registration Entries #1

Test ID	VLAN_041
Synopsys	A Static VLAN Registration Entry specifies a) The VID of the VLAN to which the static filtering information applies; b) A Port Map, consisting of a control element ... 1) The Registrar Administrative Control values for the ... i) Registration Fixed; or 2) Whether frames are to be VLAN-tagged or untagged when transmitted
Ext Req ID	VLAN-001
Reference	IEEE Std 802.1Q-2005 S8.8.2 P55 Static VLAN Registration Entries
Classifier	MUST
Test setup	SETUP 1
DUT Configuration	VLAN Configuration 7 (See Appendix B)
Prerequisites	NONE
Test Procedure	1. DUT CONFIGURE: Externally configure to create VLAN ID <unusedVID-0> 2. DUT CONFIGURE: Externally configure a Static VLAN Registration entry for VLAN ID <unusedVID-0> on <DIface-0> and <DIface-1> with Port-Map as "Registration Fixed" and "VLAN-tagged". 3. TEST STATION: Send VLAN-tagged Data Frame to <DIface-0>, containing: - Destination MAC Address field set to <unusedMACAddr-0> - Source MAC Address field set to <unusedMACAddr-1> - Tag Header, containing: - VLAN Identifier field set to <unusedVID-0> 4. TEST STATION: Listen (for up to<ParamListenTime> seconds) on <DIface-1> and <DIface-2> 5. DUT: Forward VLAN-tagged Data Frame only through <DIface-1> 6. TEST STATION: Verify that the received VLAN-tagged Data Frame contains: - Tag Header, contains: - VLAN Identifier field set to <unusedVID-0>
Pass Criteria	5. DUT: Forward VLAN-tagged Data Frame only through <DIface-1> 6. TEST STATION: Verify that the received VLAN-tagged Data Frame contains: - Tag Header, contains: - VLAN Identifier field set to <unusedVID-0>
Notes	NONE

Static VLAN Registration Entries #2

Test ID	VLAN_042
Synopsys	A Static VLAN Registration Entry specifies a) The VID of the VLAN to which the static filtering information applies; b) A Port Map, consisting of a control element ... 1) The Registrar Administrative Control values for the ... ii) Registration Forbidden; 2) Whether frames are to be VLAN-tagged or untagged when transmitted
Ext Req ID	VLAN-001
Reference	IEEE Std 802.1Q-2005 S8.8.2 P55 Static VLAN Registration Entries
Classifier	MUST
Test setup	SETUP 1
DUT Configuration	VLAN Configuration 7 (See Appendix B)
Prerequisites	NONE
Test Procedure	1. DUT CONFIGURE: Externally configure to create VLAN ID <unusedVID-0> 2. DUT CONFIGURE: Externally configure a Static VLAN Registration entry for VLAN ID <unusedVID-0> on <DIface-1> with Port-Map as "Registration Forbidden" and "VLAN-tagged" 3. TEST STATION: Send VLAN-tagged Data Frame to <DIface-0>, containing: - Destination MAC Address field set to <unusedMACAddr-0> - Source MAC Address field set to <unusedMACAddr-1> - Tag Header, containing: - VLAN Identifier field set to <unusedVID-0> 4. TEST STATION: Listen (for up to<ParamListenTime> seconds) on <DIface-1> 5. DUT: Do not forward on <DIface-1>
Pass Criteria	5. DUT: Do not forward on <DIface-1>
Notes	NONE

Static VLAN Registration Entries #3

Test ID	VLAN_043
Synopsys	A Static VLAN Registration Entry specifies a) The VID of the VLAN to which the static filtering information applies; b) A Port Map, consisting of a control element ... 1) The Registrar Administrative Control values for the ... iii) Normal Registration. 2) Whether frames are to be VLAN-tagged or untagged when transmitted
Ext Req ID	VLAN-001
Reference	IEEE Std 802.1Q-2005 S8.8.2 P55 Static VLAN Registration Entries
Classifier	MUST
Test setup	SETUP 1
DUT Configuration	VLAN Configuration 7 (See Appendix B)
Prerequisites	NONE
Test Procedure	1. DUT CONFIGURE: Externally configure to create VLAN ID <unusedVID-0> 2. DUT CONFIGURE: Externally configure a Static VLAN Registration entry for VLAN ID <unusedVID-0> on <DIface-0>, <DIface-1> and <DIface-2> with Port-Map as "Normal Registration" and "VLAN-tagged" 3. TEST STATION: Send VLAN-tagged Data Frame to <DIface-2>, containing: - Destination MAC Address field set to <unusedMACAddr-0> - Source MAC Address field set to <unusedMACAddr-1> - Tag Header, containing: - VLAN Identifier field set to <unusedVID-0> 4. TEST STATION: Wait (for up to<ParamProcessTime> seconds) (DUT will update Filtering Database by adding a new entry) 5. TEST STATION: Send VLAN-tagged Data Frame to <DIface-0>, containing: - Destination MAC Address field set to <unusedMACAddr-1> - Source MAC Address field set to <unusedMACAddr-2> - Tag Header, containing: - VLAN Identifier field set to <unusedVID-0> 6. TEST STATION: Listen (for up to<ParamListenTime> seconds) on <DIface-2> and <DIface-1> 7. DUT: Forward VLAN-tagged Data Frame only through <DIface-2> 8. TEST STATION: Verify that the received VLAN-tagged Data Frame contains: - Tag Header, contains: - VLAN Identifier field set to <unusedVID-0>

Pass Criteria	7. DUT: Forward VLAN-tagged Data Frame only through <DIface-2> 8. TEST STATION: Verify that the received VLAN-tagged Data Frame contains: - Tag Header, contains: - VLAN Identifier field set to <unusedVID-0>
Notes	NONE

Static VLAN Registration Entries #4

Test ID	VLAN_044
Synopsys	A Static VLAN Registration Entry specifies a) The VID of the VLAN to which the static filtering information applies; b) A Port Map, consisting of a control element ... 1) The Registrar Administrative Control values for the ... i) Registration Fixed; or 2) Whether frames are to be VLAN-tagged or untagged when transmitted (Note : This test is for untagged frame)
Ext Req ID	VLAN-001
Reference	IEEE Std 802.1Q-2005 S8.8.2 P55 Static VLAN Registration Entries
Classifier	MUST
Test setup	SETUP 1
DUT Configuration	VLAN Configuration 7 (See Appendix B)
Prerequisites	NONE
Test Procedure	1. DUT CONFIGURE: Externally configure to create VLAN ID <unusedVID-0> 2. DUT CONFIGURE: Externally configure a Static VLAN Registration entry for VLAN ID <unusedVID-0> on <DIface-0> and <DIface-1> with Port-Map as "Registration Fixed" and "untagged" 3. TEST STATION: Send VLAN-tagged Data Frame to <DIface-0>, containing: - Destination MAC Address field set to <unusedMACAddr-0> - Source MAC Address field set to <unusedMACAddr-1> - Tag Header, containing: - VLAN Identifier field set to <unusedVID-0> 4. TEST STATION: Listen (for up to<ParamListenTime> seconds) on <DIface-1> and <DIface-2> 5. DUT: Forward untagged Data Frame only through <DIface-1>
Pass Criteria	5. DUT: Forward untagged Data Frame only through <DIface-1>
Notes	NONE

Static VLAN Registration Entries #5

Test ID	VLAN_045
Synopsys	A Static VLAN Registration Entry specifies a) The VID of the VLAN to which the static filtering information applies; b) A Port Map, consisting of a control element ... 1) The Registrar Administrative Control values for the ... ii) Registration Forbidden; 2) Whether frames are to be VLAN-tagged or untagged when transmitted (Note : This test is for untagged frame)
Ext Req ID	VLAN-001
Reference	IEEE Std 802.1Q-2005 S8.8.2 P55 Static VLAN Registration Entries
Classifier	MUST
Test setup	SETUP 1
DUT Configuration	VLAN Configuration 7 (See Appendix B)
Prerequisites	NONE
Test Procedure	1. DUT CONFIGURE: Externally configure to create VLAN ID <unusedVID-0> 2. DUT CONFIGURE: Externally configure a Static VLAN Registration entry for VLAN ID <unusedVID-0> on <DIface-1> with Port-Map as "Registration Forbidden" and "untagged" 3. TEST STATION: Send VLAN-tagged Data Frame to <DIface-0>, containing: - Destination MAC Address field set to <unusedMACAddr-0> - Source MAC Address field set to <unusedMACAddr-1> - Tag Header, containing: - VLAN Identifier field set to <unusedVID-0> 4. TEST STATION: Listen (for up to<ParamListenTime> seconds) on <DIface-1> 5. DUT: Do not forward on <DIface-1>
Pass Criteria	5. DUT: Do not forward on <DIface-1>
Notes	NONE

Static VLAN Registration Entries #6

Test ID	VLAN_046
Synopsys	A Static VLAN Registration Entry specifies a) The VID of the VLAN to which the static filtering information applies; b) A Port Map, consisting of a control element ... 1) The Registrar Administrative Control values for the ... iii) Normal Registration. 2) Whether frames are to be VLAN-tagged or untagged when transmitted (Note : This test is for untagged frame)
Ext Req ID	VLAN-001
Reference	IEEE Std 802.1Q-2005 S8.8.2 P55 Static VLAN Registration Entries
Classifier	MUST
Test setup	SETUP 1
DUT Configuration	VLAN Configuration 7 (See Appendix B)
Prerequisites	NONE
Test Procedure	1. DUT CONFIGURE: Externally configure to create VLAN ID <unusedVID-0> 2. DUT CONFIGURE: Externally configure a Static VLAN Registration entry for VLAN ID <unusedVID-0> on <DIface-0>, <DIface-1> and <DIface-2> with Port-Map as "Normal Registration" and "untagged" 3. TEST STATION: Send VLAN-tagged Data Frame to <DIface-2>, containing: - Destination MAC Address field set to <unusedMACAddr-0> - Source MAC Address field set to <unusedMACAddr-1> - Tag Header, containing: - VLAN Identifier field set to <unusedVID-0> 4. TEST STATION: Wait (for up to<ParamProcessTime> seconds) (DUT will update Filtering Database by adding a new entry) 5. TEST STATION: Send VLAN-tagged Data Frame to <DIface-0>, containing: - Destination MAC Address field set to <unusedMACAddr-1> - Source MAC Address field set to <unusedMACAddr-2> - Tag Header, containing: - VLAN Identifier field set to <unusedVID-0> 6. TEST STATION: Listen (for up to<ParamListenTime> seconds) on <DIface-2> and <DIface-1> 7. DUT: Forward untagged Data Frame only through <DIface-2>
Pass Criteria	7. DUT: Forward untagged Data Frame only through <DIface-2>
Notes	NONE

Static VLAN Registration Entries #7

Test ID	VLAN_047
Synopsys	NOTE-In other words, it shall be possible to configure any VLAN as untagged on egress, but it is an implementation option as to whether only a single untagged VLAN per Port on egress is supported, or whether multiple untagged VLANs per Port on egress are supported. (This test is for multiple untagged VLANs per Port.)
Ext Req ID	VLAN-001
Reference	IEEE Std 802.1Q-2005 S8.8.2 P55 Static VLAN Registration Entries
Classifier	MAY
Test setup	SETUP 1
DUT Configuration	VLAN Configuration 7 (See Appendix B)
Prerequisites	NONE
Test Procedure	1. DUT CONFIGURE: Externally configure to create VLAN ID <unusedVID-0> 2. DUT CONFIGURE: Externally configure to create VLAN ID <unusedVID-1> 3. DUT CONFIGURE: Externally configure Static VLAN Registration entry for VLAN ID <unusedVID-0> on <DIface-1> with Port-Map as "Registration Fixed" and "untagged" 4. DUT CONFIGURE: Externally configure Static VLAN Registration entry for VLAN ID <unusedVID-1> on <DIface-1> with Port-Map as "Registration Fixed" and "untagged" 5. TEST STATION: Send VLAN-tagged Data Frame to <DIface-0>, containing: - Destination MAC Address field set to <unusedMACAddr-0> - Source MAC Address field set to <unusedMACAddr-1> - Tag Header, containing: - VLAN Identifier field set to <unusedVID-0> 6. TEST STATION: Listen (for up to<ParamListenTime> seconds) on <DIface-1> 7. DUT: Forward untagged Data Frame 8. TEST STATION: Send VLAN-tagged Data Frame to <DIface-0>, containing: - Destination MAC Address field set to <unusedMACAddr-2> - Source MAC Address field set to <unusedMACAddr-3> - Tag Header, containing: - VLAN Identifier field set to <unusedVID-1> 9. TEST STATION: Listen (for up to<ParamListenTime> seconds) on <DIface-1> 10. DUT: Forward untagged Data Frame
Pass Criteria	7. DUT: Forward untagged Data Frame

	10. DUT: Forward untagged Data Frame
Notes	NONE

2.4.1.16 *Default Group Filtering behavior*

Default Group Filtering behavior #1

Test ID	VLAN_057
Synopsys	In Bridges that support only Basic Filtering Services, the default Group Filtering behavior is Forward All Groups for all Ports of the Bridge, for all VLANs.
Ext Req ID	VLAN-001
Reference	IEEE Std 802.1Q-2005 S8.8.6 P58
Classifier	MUST
Test setup	SETUP 1
DUT Configuration	VLAN Configuration 7 (See Appendix B)
Prerequisites	NONE
Test Procedure	1. TEST STATION: Send VLAN-tagged Data Frame to <DIface-0>, containing: - Destination MAC Address field set to <unusedGroupAddr-0> - Source MAC Address field set to <unusedMACAddr-1> - Tag Header, containing: - VLAN Identifier field set to <VID1> 2. TEST STATION: Listen (for up to<ParamListenTime> seconds) on <DIface-1> and <DIface-2> 3. DUT: Forward VLAN-tagged Data Frame through both the interfaces 4. TEST STATION: Verify that the received VLAN-tagged Data Frame contains: - Tag Header, contains: - VLAN Identifier field set to <VID1> 5. TEST STATION: Send VLAN-tagged Data Frame to <DIface-0>, containing: - Destination MAC Address field set to <unusedGroupAddr-0> - Source MAC Address field set to <unusedMACAddr-1> - Tag Header, containing: - VLAN Identifier field set to <VID2> 6. TEST STATION: Listen (for up to<ParamListenTime> seconds) on <DIface-1> and <DIface-2> 7. DUT: Forward VLAN-tagged Data Frame through both the interfaces 8. TEST STATION: Verify that the received VLAN-tagged Data Frame contains: - Tag Header, contains: - VLAN Identifier field set to <VID2>

Pass Criteria	3. DUT: Forward VLAN-tagged Data Frame through both the interfaces 4. TEST STATION: Verify that the received VLAN-tagged Data Frame contains: - Tag Header, contains: - VLAN Identifier field set to <VID1> 7. DUT: Forward VLAN-tagged Data Frame through both the interfaces 8. TEST STATION: Verify that the received VLAN-tagged Data Frame contains: - Tag Header, contains: - VLAN Identifier field set to <VID2>
Notes	NONE

2.4.1.17 *Allocation of VIDs to FIDs*

Allocation of VIDs to FIDs #6

Test ID	VLAN_062
Synopsys	A VLAN Bridge shall support the ability to allocate at least one VID to each FID, and may support the ability to allocate more than one VID to each FID. (Note : To test that DUT may support allocation of more than one VID to each FID)
Ext Req ID	VLAN-001
Reference	IEEE Std 802.1Q-2005 S8.8.7 P59 Allocation of VIDs to FIDs
Classifier	MAY
Test setup	SETUP 1
DUT Configuration	VLAN Configuration 7 (See Appendix B)
Prerequisites	NONE
Test Procedure	1. DUT CONFIGURE: Externally configure VLAN ID <VID1> to FID 1 2. DUT CONFIGURE: Externally configure VLAN ID <VID2> to FID 1 3. TEST STATION: Send VLAN-tagged Data Frame to <DIface-0>, containing: - Destination MAC Address field set to <unusedMACAddr-0> - Source MAC Address field set to <unusedMACAddr-1> - Tag Header, containing: - VLAN Identifier field set to <VID1> 4. TEST STATION: Listen (for up to<ParamListenTime> seconds) on <DIface-1> and <DIface-2> 5. DUT: Forward VLAN-tagged Data Frame through both the interfaces 6. TEST STATION: Send VLAN-tagged Data Frame to <DIface-1>, containing: - Destination MAC Address field set to <unusedMACAddr-1> - Source MAC Address field set to <unusedMACAddr-2> - Tag Header, containing: - VLAN Identifier field set to <VID2> 7. TEST STATION: Listen (for up to<ParamListenTime> seconds) on <DIface-0> and <DIface-2> 8. DUT: Forward VLAN-tagged Data Frame only through <DIface-0>
Pass Criteria	5. DUT: Forward VLAN-tagged Data Frame through both the interfaces 8. DUT: Forward VLAN-tagged Data Frame only through <DIface-0>
Notes	NONE

2.4.1.18 *Determination of the member set for a VLAN*

Determination of the member set for a VLAN #13

Test ID	VLAN_067
Synopsys	If a Static VLAN Registration Entry for a VID and port specifies Registration Fixed, then the port belongs to the member set of the VID. (NOTE: 1st Row, 1st Col of the table 8-7)
Ext Req ID	VLAN-001
Reference	IEEE Std 802.1Q-2005 S8.8.9 Table 8-7 P64
Classifier	MUST
Test setup	SETUP 1
DUT Configuration	VLAN Configuration 3 (See Appendix B)
Prerequisites	NONE
Test Procedure	1. DUT CONFIGURE: Externally configure to create VLAN ID <unusedVID-0> 2. DUT CONFIGURE: Externally configure Static VLAN Registration Entries of VLAN ID <unusedVID-0> with Registration Fixed on <DIface-0> and <DIface-1> 3. TEST STATION: Send VLAN-tagged Data Frame to <DIface-0>, containing: - Destination MAC Address field set to <unusedMACAddr-0> - Source MAC Address field set to <unusedMACAddr-1> - Tag Header, containing: - VLAN Identifier field set to <unusedVID-0> 4. TEST STATION: Listen (for up to<ParamListenTime> seconds) on <DIface-1> 5. DUT: Forward VLAN-tagged Data Frame 6. TEST STATION: Verify that the received VLAN-tagged Data Frame contains: - Tag Header, contains: - VID field set to <unusedVID-0>
Pass Criteria	5. DUT: Forward VLAN-tagged Data Frame 6. TEST STATION: Verify that the received VLAN-tagged Data Frame contains: - Tag Header, contains: - VID field set to <unusedVID-0>
Notes	NONE

2.4.1.19 *Permanent Database*

Permanent Database #1

Test ID	VLAN_068
Synopsys	The Permanent Database provides fixed storage for a number of Static Filtering Entries and Static VLAN Registration Entries... Entries may be added to and removed from the Permanent Database under explicit management control, using the management functionality defined in Clause 12. (Modify the Static VLAN Registration Entry for default VLAN)
Ext Req ID	VLAN-001
Reference	IEEE Std 802.1Q-2005 S8.8.10 P64 Permanent Database
Classifier	MAY
Test setup	SETUP 1
DUT Configuration	VLAN Configuration 5 (See Appendix B)
Prerequisites	NONE
Test Procedure	1. DUT CONFIGURE: Externally configure to modify Static VLAN Registration Entry for default VLAN ID 1 to be tagged on <DIface-1> 2. TEST STATION: Send untagged Data Frame to <DIface-0>, containing: - Destination MAC Address field set to <unusedMACAddr-0> - Source MAC Address field set to <unusedMACAddr-1> 3. TEST STATION: Listen (for up to<ParamListenTime> seconds) on <DIface-1> 4. DUT: Forward Data Frame as VLAN-tagged frame containing - Tag Header, containing: - VLAN Identifier field set to 1
Pass Criteria	4. DUT: Forward Data Frame as VLAN-tagged frame containing - Tag Header, containing: - VLAN Identifier field set to 1
Notes	NONE

Permanent Database #2

Test ID	VLAN_069
Synopsys	The Permanent Database provides fixed storage for a number of Static Filtering Entries and Static VLAN Registration Entries... Entries may be added to and removed from the Permanent Database under explicit management control, using the management functionality defined in Clause 12. (Delete the Static VLAN Registration Entry for default VLAN)
Ext Req ID	VLAN-001
Reference	IEEE Std 802.1Q-2005 S8.8.10 P64 Permanent Database
Classifier	MAY
Test setup	SETUP 1
DUT Configuration	VLAN Configuration 5 (See Appendix B)
Prerequisites	NONE
Test Procedure	1. DUT CONFIGURE: Externally configure to delete a Static VLAN Registration Entry for default VLAN 1 on <DIface-1> 2. TEST STATION: Send untagged Data Frame to <DIface-0>, containing: - Destination MAC Address field set to <unusedMACAddr-0> - Source MAC Address field set to <unusedMACAddr-1> 3. TEST STATION: Listen (for up to<ParamListenTime> seconds) on <DIface-1> 4. DUT: Do not forward Data Frame
Pass Criteria	4. DUT: Do not forward Data Frame
Notes	NONE

2.4.1.20 *Use of the PVID and VID Set*

Use of the PVID and VID Set #1

Test ID	VLAN_073
Synopsys	The initial state of the Permanent Database contains a Static VLAN Registration Entry for the VLAN corresponding to the Default PVID (Table 9-2). The Port Map in this entry specifies Registration Fixed and forwarding untagged for all Ports of the Bridge.
Ext Req ID	VLAN-001
Reference	IEEE Std 802.1Q-2005 S11.2.1.3 P85
Classifier	MUST
Test setup	SETUP 1
DUT Configuration	VLAN Configuration 5 (See Appendix B)
Prerequisites	NONE
Test Procedure	1. DUT CONFIGURE: Flush the Address Table 2. TEST STATION: Wait for (3 * <configBridgeForwardDelay>) seconds for DUT to stabilize 3. TEST STATION: Send untagged Data Frame to <DIface-0>, containing: - Destination MAC Address field set to <unusedMACAddr-0> - Source MAC Address field set to <unusedMACAddr-1> 4. TEST STATION: Listen (for up to<ParamListenTime> seconds) on <DIface-1> 5. DUT: Forward untagged Data Frame
Pass Criteria	5. DUT: Forward untagged Data Frame

2.4.2 Default VLAN ID at ingress port

Test ID:	VLAN_074
Synopsis:	This test checks if the switch is able to overwrite the VID field at the ingress of a port with a Default VID. The Test station sends tagged and untagged traffic to a port that is configured to overwrite the VID field at ingress. At egress of the destination port, the forwarded frames indicate if the VID has successfully been overwritten.
Ext Req ID:	VLAN-003
Reference:	IEEE 802.1Q
Classifier:	MUST
Test Setup:	Shaping
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Configure the switch to set the VID field to 4 for all frames entering ingress port A.
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured 3. ARL table learned and valid
Test procedure:	1. From the test station, start sending tagged frames with the VID field set to 2 to one DUT port A 2. Wait 1 second 3. At the egress port C, check if all frames sent from port A are forwarded with the VID field set to 4 and no frames with another VID in between 4. Stop all traffic 5. Repeat the steps 1-4, now using untagged frames in step 1.
Pass criteria:	3. At the egress port C, check if all frames sent from port A are forwarded with the VID field set to 4 and no frames with another VID in between
Notes:	NONE

2.4.3 Freely configure outer TPID EtherType

Test ID:	VLAN_075
Synopsis:	This test checks if the switch is able to freely configure the outer TPID EtherType field. Frames with a specific outer TPID other than 0x88A8 shall be treated as double tagged frames. The Test station sends double tagged traffic to a port. The frames shall be forwarded to the destination port to be checked by the Test station.
Ext Req ID:	VLAN-006
Reference:	IEEE 802.1Q
Classifier:	MUST
Test Setup:	Shaping
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Configure the switch to treat frames with a specific outer TPID other than 0x88A8 as double tagged frames
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured 3. ARL table learned and valid
Test procedure:	1. From the test station, start sending double tagged frames with the outer TPID field set to a value other than 0x88A8 to one DUT port A 2. Wait 1 second 3. At the egress port C, check if all frames sent from port A are forwarded 4. Stop all traffic
Pass criteria:	3. At the egress port C, check if all frames sent from port A are forwarded
Notes:	NONE

2.4.4 Dropping double-tagged frames

Test ID:	VLAN_076
Synopsis:	This test checks if the switch supports Double-Tagging (Q-in-Q) according to IEEE 802.1Q [4]. The Test station sends double tagged traffic to a port A and a port B. At egress of the destination port C, all frames from port A are forwarded and none of the frames sent from port B are forwarded.
Ext Req ID:	VLAN-007
Reference:	IEEE 802.1Q
Classifier:	MUST
Test Setup:	Shaping (see Appendix B)
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Configure the switch to support Double-Tagging (Q-in-Q) according to IEEE 802.1Q [4]. - Configure the switch to drop double tagged frames on port B but not on port A
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured 3. ARL table learned and valid
Test procedure:	1. From the test station, start sending double tagged frames with the outer TPID set to 0x88A8 to one DUT port A and DUT port B 2. Wait 1 second 3. At the egress port C, check if all frames sent from port A are forwarded and none of the frames sent from port B are forwarded 4. Stop all traffic 5. Repeat the steps 1-4, now using untagged frames in step 1.
Pass criteria:	3. At the egress port C, check if all frames sent from port A are forwarded and none of the frames sent from port B are forwarded
Notes:	NONE

2.4.5 Switching_VLAN_support_untagging

Test ID:	VLAN_077
Synopsis:	Check if switch can be configured to support untagging of tagged frames for every port individually. Sending a tagged frame on every ingress port of the DUT and check if the frame is getting untagged correctly like configured
Ext Req ID:	VLAN-004
Reference:	NONE
Classifier:	MUST
Test Setup:	Switching (see Appendix A)
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Configure switch to forward tagged frames with any VID x (except 0 and 4095) without untagging on egress port A and with untagging on egress port B.
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured 3. ARL table learned and valid
Test procedure:	1. Send tagged frame from test station with VID x to DUT ingress port C 2. Capture and monitor traffic from DUT egress port A and egress port B
Pass criteria:	2. On port A, the frame is observed and it is still tagged with VID x 2. On port B, the frame is observed and it is untagged
Notes:	NONE

2.4.6 VID_based_VLAN_retagging_at_egress

Test ID:	VLAN_078
Synopsis:	Check if switch can be configured to support at least 16 individual retagging rules at egress, based on the VID and applicable to an arbitrary subset of all ports.
Ext Req ID:	VLAN-008
Reference:	NONE
Classifier:	MUST
Test Setup:	Switching
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Configure switch to use 16 different rules for performing VID based retagging on egress. Each of these 16 rules should involve different VIDs. Among the 16 rules, there should be at least two different subsets of egress ports at which the retagging should be performed, and each subset should consist of more than one port, but less than the total number of ports of the DUT.
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured 3. ARL table learned and valid
Test procedure:	1. Capture and monitor traffic from all DUT egress ports. 2. Send tagged Broadcast frames from test station with a valid VID that is not mentioned in the first configured retagging rule. 3. Check if the frames are forwarded from every DUT port without being retagged. 4. Send tagged Broadcast frames from test station with a valid VID that is mentioned in the first configured retagging rule. 5. Check if the frames are forwarded and retagged correctly. 6. Repeat steps 2 to 5 for each of the 16 retagging rules.
Pass criteria:	3. All frames are forwarded to all ports without being retagged. 5. All frames are forwarded to all ports. 5. At all ports in the retagging rule's port subset, the frames are retagged and carry the correct VID according to the retagging rule. 5. At all ports that are not in the retagging rule's port subset, the frames still carry the same VID as sent in step 4.
Notes:	NONE

2.4.7 Suppress_VLAN_hopping

Test ID:	VLAN_079
Synopsis:	Check if switch suppresses or can be configured to suppress traffic with multiple 802.1Q customer tags (TPID 0x8100) with changing VLANs (VLAN hopping).
Ext Req ID:	VLAN-009
Reference:	NONE
Classifier:	MUST
Test Setup:	Switching (see Appendix A)
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - If necessary, configure the switch to suppress traffic with multiple 802.1Q customer tags (TPID 0x8100) with changing VLANs (VLAN hopping).
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured 3. ARL table learned and valid
Test procedure:	1. Capture and monitor traffic from all DUT egress ports. 2. Send double tagged Broadcast frames from test station. The outer and inner VLAN tags shall contain the TPID 0x8100 and both tags shall contain valid, but different VIDs. 3. Check if the frames are received from any DUT port.
Pass criteria:	3. No frame is received from any DUT port.
Notes:	NONE

2.4.8 Shared VLAN learning

Test ID:	VLAN_080
Synopsis:	Check if the switch is configured to use shared VLAN learning (SVL)
Ext Req ID:	ADDR-002
Reference:	IEEE_8021Q-2014
Classifier:	MUST
Test Setup:	Switching
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Configure the switch to use shared VLAN learning
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured 3. ARL table NOT learned
Test procedure:	1. Enable traffic monitoring on all switch ports 2. Send a tagged frame with <VID2> and the same valid MAC Source Address from Test Station to port B 3. Send a tagged frame with VIDx and the same valid MAC Destination Address from Test Station to port C 4. Wait to check if the frames are being forwarded
Pass criteria:	4. The Frame is forwarded to port B and received at the test station
Notes:	NONE

2.5 Time Synchronization based on Time Sensitive Networking (TSN)

2.5.1 PTP_1_Step_Clock

Test ID:	TIME_001
Synopsis:	Checking 1-step frame forwarding mechanism including correct implementation of residence time measurement. The test station sends Sync frames to the PTP Slave Port and receives frames on all PTP Master Ports of the DUT. The corresponding timestamps of the test station are recorded. The correctionField of the Sync message is checked if the value correlates to the timestamp measurements of the test station.
Ext Req ID:	TIME-001 TIME-002 GEN_001
Reference:	IEEE Std 1588-2008
Classifier:	MUST
Test Setup:	Time Synchronization 1-Step-Clock
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Configuration 1-Step forwarding and modification of Sync frames
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. Send Sync frames to DUT ingress port and capture timestamp from test station 2. Receive Sync frame from DUT egress port and capture timestamp from test station 3. Read correctionField from received Sync frame 4. Verify that the FCS field of the forwarded Sync frame has been recalculated correctly 5. Reconfigure the port roles such that every port is tested at least one time as a PTP Master port and at least one time as PTP Slave port. 6. Repeat steps 1-5 until every port has been tested as PTP Master and Slave at least one time.
Pass criteria:	3. Value from correctionField needs to match the difference between the timestamp in the Sync frame and the timestamp of receiving the packet on the tester, minus cable lengths and tester innacuracies, to within ±80ns error. 4. The FCS field of the forwarded Sync frame is correct
Notes:	NONE

2.5.2 PTP_2_Step_Clock

Test ID:	TIME_002
Synopsis:	Checking 2-step frame forwarding mechanism including correct implementation of residence time measurement. The test station sends Sync and Follow_Up frames to the PTP Slave Port and receives frames on all PTP Master Ports of the DUT. The corresponding timestamps of the test station are recorded. The correctionField of the Follow_Up message is checked for correlation to the timestamp measurements of the test station.
Ext Req ID:	TIME-002 TIME-005
Reference:	IEEE Std 1588-2008 IEEE Std 802.1AS-2011
Classifier:	MUST
Test Setup:	Time Synchronization 2-Step-Clock
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Ports are configured for 2-Step forwarding and modification of Sync and Follow_Up frames - Basic TSN Application on Host Controller that handles 2-step operation for Sync forwarding, supports the timestamp mechanism of the DUT and generates Follow_Up frames with the correctionField containing the residence time
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. Send Sync and Follow_Up frames to DUT ingress port and capture timestamp of Sync frame from test station 2. Receive Sync and Follow_Up frame from DUT egress port and capture timestamp of Sync frame from test station 3. Read correctionField from received Follow_Up frame 4. Reconfigure the port roles such that every port is tested at least one time as a PTP Master port and at least one time as PTP Slave port. 5. Repeat steps 1-4 until every port has been tested as PTP Master and Slave at least one time.
Pass criteria:	3. The value of the correctionField matches the difference between the timestamp in the Sync packet and the timestamp of receiving the packet on the tester, minus cable lengths and tester innacuracies, to within ±80ns error.
Notes:	NONE

2.5.3 PTP_1_Step_Clock_Specific_MAC_Header

Test ID:	TIME_003
Synopsis:	Checking 1-step frame forwarding mechanism with specific MAC-Header. The test station sends Sync frames with specific MAC-Header to the PTP Slave Port and receives frames on all PTP Master Ports of the DUT. The correctionField of the Sync message is checked if the value is getting updated.
Ext Req ID:	TIME-003
Reference:	IEEE Std 1588-2008
Classifier:	MUST
Test Setup:	Time Synchronization 1-Step-Clock, Time Synchronization 2-Step-Clock
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Configuration 1-Step forwarding and modification of Sync frames - Configuration for non-standard MAC address and VLAN ID of Sync frames
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. Send Sync frames with specific MAC address and VLAN ID to DUT with the value of correctionField set to 0 2. Check if these frames are forwarded to configured port and that the value of correctionField is changed 3. Repeat step 1 and 2 with two step Sync and Follow_Up frames and check if the value of correctionField of Follow_Up is changed
Pass criteria:	2. Value of Sync's correctionField is changed 3. Value of Follow_Up's correctionField is changed
Notes:	NONE

2.5.4 PTP_1_and_2_Step_Clock_simultaneously

Test ID:	TIME_004
Synopsis:	Checking 1-step and 2-step frame forwarding mechanism including correct implementation of residence time measurements in parallel. The test station sends Sync frames to the related 1-step PTP Slave Port and receives frames on all other related 1-step PTP Master Ports of the DUT. In parallel, the test station sends Sync and Follow_Up frames to the related 2-step PTP Slave Port and receives frames on all other related 2-step PTP Master Ports of the DUT. The corresponding timestamps of the test station are recorded. The correctionFields of the Sync resp. Follow_Up messages are checked for correlation to the timestamp measurements of the test station.
Ext Req ID:	TIME-004
Reference:	IEEE Std 1588-2008 IEEE Std 802.1AS-2011
Classifier:	MUST
Test Setup:	Time Synchronization 1-Step and 2-Step-Clock
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Selected ports are configured for 1-Step forwarding and modification of Sync frames - Selected ports are configured for 2-Step forwarding and modification of Sync and Follow_Up frames - Basic TSN Application for 2-step operation on Host Controller that handles Sync forwarding, supports the timestamp mechanism of the DUT and generates Follow_Up frames with the correctionField containing the residence time
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. Send 1588 Sync frames within one time domain and 802.1AS Sync and Follow_Up frames in another time domain to related ingress ports and start capture 2. Receive 1588 Sync and respectively 802.1AS Sync and Follow_Up frames respectively from egress port and capture receive time of Sync frames 3. Read correctionField from received 1588 Sync frames and 802.1AS Follow_Up frames respectively
Pass criteria:	3. The value of the correctionField matches the difference between the timestamp in the Sync packet and the timestamp of receiving the packet on the tester, minus cable lengths and tester innacuracies, to within ±80ns error.
Notes:	

2.6 Quality of Service (QoS)

2.6.1 Support_of_Priority_Based_Quality_Of_Service

Test ID:	QOS_001
Synopsis:	Check if switch supports priority based Quality of Service by using all 8 possible values of the PCP field. The Strict Priority Algorithm is utilized as forwarding selection mechanism in order to verify that forwarding is based on the PCP priorities.
Ext Req ID:	QOS-001, QOS-002, QOS-003, QOS-004
Reference:	IEEE 802.1Q
Classifier:	MUST
Test Setup:	Shaping
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Switch configured to use the Strict Priority Algorithm
Prerequisites:	1. Link up and stable between test station and DUT ports
Test procedure:	1. From the test station, start sending tagged frames with a constant PCP value with 100% load to one DUT port A by either using static MAC addresses from the Standard Configuration that have been configured on port C, or unlearned & unconfigured MAC addresses as destination addresse 2. Wait 1 seconds 3. From the test station, start sending tagged frames with a constant, but different PCP value than in step 1 with 100% load to another DUT port B 4. Wait 5 seconds 5. At the egress port C, check if all frames with the higher PCP value are forwarded 6. Stop all traffic 7. Repeat the steps 1-6 for every combination of different PCP values on both ports 8. Repeat the steps 1-7 for every port as the egress port C 9. Repeat the steps 1-8 for priority-tagged frames
Pass criteria:	5. All frames with the higher PCP value are forwarded with no lower prioritized frames in between.
Notes:	It is not necessary to iterate through every combination of ingress ports A and B; however, the ports A and B should be chosen such that they operate at the same bandwidth as port C.

2.6.2 Support_of_WRR

Test ID:	QOS_002
Synopsis:	The test shall ensure that the switch is able to forward VLAN and Priority tagged packets using Weighted Round Robin. The test station sends traffic with 100% load to two different ports, each port with a different PCP value and frame size. On the egress port, the traffic shall be forwarded according to the WRR settings.
Ext Req ID:	QOS-005
Reference:	NONE
Classifier:	MUST (if Switch does not support Weighted Fair Queueing)
Test Setup:	Shaping
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Configure the switch to use Weighted Round Robin (WRR) on each port - Configure the weights of the queues for PCP 3 to be 2 - Configure the weights of the queues for PCP 5 to be 3
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. From the test station, start sending tagged frames with a frame size of 64 Byte and with PCP 3 with 100% load to one DUT port A 2. From the test station, start sending tagged frames with PCP 5 with a frame size of 1522 and with 100% load to another DUT port B 3. At the egress port C, record the numbers $N_{Port\ A}$ and $N_{Port\ B}$ of forwarded frames sent from Port A and from Port B for an observation window of at least 10 seconds and with a number of frames that is a multiple of 5.
Pass criteria:	3. $2 \cdot N_{Port\ B} = 3 \cdot N_{Port\ A}$
Notes:	The Switch has to support at least one variant of WRR or WFQ for each egress Port. This test relies on the assumption that the weighting behavior is always the same for every WRR round.

2.6.3 Mapping_Priority_Information_Based_On_802.1Q

Test ID:	QOS_003
Synopsis:	This test checks if the switch is able to overwrite the PCP field at the ingress of a port with a new value depending on the PCP of the incoming frame. The test station sends tagged traffic with 100% load to a port that is configured to overwrite the PCP field at ingress. To another port, the test station sends other tagged traffic. At egress of the destination port, the forwarded frames of the traffic indicate if the PCP has successfully been overwritten before entering the switch fabric.
Ext Req ID:	QOS-007
Reference:	IEEE 802.1Q
Classifier:	MUST
Test Setup:	Shaping
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Configure the switch to use the Strict Priority Algorithm on every egress port. - Configure the switch to change the PCP field from 2 to 4 at ingress of port A - Configure the switch to tag untagged frames at ingress port A, setting the PCP field to 4 (= Default priority).
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. From the test station, start sending tagged frames with the PCP field set to 2 with 100% load to one DUT port A 2. Wait 1 second 3. From the test station, start sending tagged frames with the PCP field set to 3 with 100% load to another DUT port B 4. Wait 5 seconds 5. At the egress port C, check if all frames sent from port A are forwarded with the PCP field set to 4 6. Stop all traffic 7. Repeat the steps 1-6, now using untagged frames in step 1. 8. From the test station, start sending tagged frames with the PCP field set to 1 with 100% load to one DUT port A 9. At the egress port C, check if any frame sent from port A is forwarded with the PCP still set to 1.
Pass criteria:	5. All frames sent from port A are forwarded with none of the frames sent from port B in between, and all of them have a tag with the PCP field set to 4. 9. All frames are forwarded with the PCP field still set to 1.
Notes:	NONE

2.6.4 Overwrite_Priority_Of_Frame_at_Ingress_Port

Test ID:	QOS_004
Synopsis:	This test checks if the switch is able to overwrite the PCP field at the ingress of a port with a new value independent of the PCP of the incoming frame. The test station sends tagged traffic with 100% load to a port that is configured to overwrite the PCP field at ingress. To another port, the test station sends other tagged traffic. At egress of the destination port, the forwarded frames of the traffic indicate if the PCP has successfully been overwritten before entering the switch fabric.
Ext Req ID:	QOS-008
Reference:	IEEE 802.1Q
Classifier:	MUST
Test Setup:	Shaping
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Configure the switch to use the Strict Priority Algorithm on every egress port. - Configure the switch to set the PCP field to 4 for all frames entering ingress port A
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. From the test station, start sending tagged frames with the PCP field set to 2 with 100% load to one DUT port A 2. Wait 1 second 3. From the test station, start sending tagged frames with the PCP field set to 3 with 100% load to another DUT port B 4. Wait 5 seconds 5. At the egress port C, check if all frames sent from port A are forwarded with the PCP field set to 4 6. Stop all traffic 7. Repeat the steps 1-6, now using untagged frames in step 1.
Pass criteria:	5. All frames sent from port A are forwarded with none of the frames sent from port B in between, and all of them now have a tag with the PCP field set to 4.
Notes:	NONE

2.6.5 Freely_Mappable_Priorities_To_Internal_Queues_1

Test ID:	QOS_005
Synopsis:	This test checks if the switch is able to freely map incoming priorities to internal queues. The test station sends tagged traffic with 100% load to a port. To another port, the test station sends other tagged traffic. At egress of the destination port, the forwarded frames of the traffic indicate if the PCP has successfully been mapped to internal queues.
Ext Req ID:	QOS-009 GEN-002
Reference:	IEEE 802.1Q
Classifier:	MUST
Test Setup:	Shaping
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Configure the switch to use the Strict Priority Algorithm on every egress port. - Configure the switch to map frames with the PCP field set to 2 into a queue of the highest priority. Frames with other PCP fields should be mapped to queues with priorities according to their PCP fields regularly. - Configure the switch to map untagged frames into a queue of a higher priority than frames with the PCP field set to 3.
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. From the test station, start sending tagged frames with the PCP field set to 2 with 100% load to one DUT port A 2. Wait 1 second 3. From the test station, start sending tagged frames with the PCP field set to 3 with 100% load to another DUT port B 4. Wait 5 seconds 5. At the egress port C, check if all frames sent from port A are forwarded 6. Stop all traffic 7. From the test station, start sending tagged frames with the PCP field set to 3 with 100% load to one DUT port B 8. Wait 1 second 9. From the test station, start sending tagged frames with the PCP field set to 1 with 100% load to another DUT port A 10. At the egress port C, check if all frames sent from port B are forwarded 11. Stop all traffic
Pass criteria:	5. All frames sent from port A are forwarded with none of the frames sent from port B in between. 10. All frames sent from port B are forwarded with none of the frames sent from port A in between.

Notes:	NONE

2.6.6 Freely_Mappable_Priorities_To_Internal_Queues_2

Test ID:	QOS_006
Synopsis:	This test checks if the switch is able to freely map incoming priorities to internal queues. The test station sends tagged traffic with 100% load to a port. To another port, the test station sends other tagged traffic. At egress of the destination port, the forwarded frames of the traffic indicate if the PCP has successfully been mapped to internal queues.
Ext Req ID:	QOS-009 GEN-002
Reference:	IEEE 802.1Q
Classifier:	MUST
Test Setup:	Shaping
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Configure the switch to use the Strict Priority Algorithm on every egress port. - Configure the switch to map frames with the PCP field set to 2 into a queue of the highest priority. Frames with other PCP fields should be mapped to queues with priorities according to their PCP fields regularly. - Configure the switch to map untagged frames into a queue of a higher priority than frames with the PCP field set to 3.
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. From the test station, start sending untagged frames with 100% load to one DUT port A 2. Wait 1 second 3. From the test station, start sending tagged frames with the PCP field set to 3 with 100% load to another DUT port B 4. Wait 5 seconds 5. At the egress port C, check if all frames sent from port A are forwarded 6. Stop all traffic 7. From the test station, start sending tagged frames with the PCP field set to 3 with 100% load to one DUT port B 8. Wait 1 second 9. From the test station, start sending tagged frames with the PCP field set to 1 with 100% load to another DUT port A 10. At the egress port C, check if all frames sent from port B are forwarded 11. Stop all traffic
Pass criteria:	5. All frames sent from port A are forwarded with none of the frames sent from port B in between. 10. All frames sent from port B are forwarded with none of the frames sent from port A in between.

Notes:	NONE

2.6.7 Freely_Mappable_To_Egress_Priority

Test ID:	QOS_007
Synopsis:	This test checks if the switch is able to map its internal queues to PCP values at egress. The test station sends tagged traffic with 100% load to a port that is configured to overwrite the PCP field at ingress. To another port, the test station sends other tagged traffic. At egress of the destination port, the forwarded frames of the traffic indicate if the PCP has successfully been mapped after leaving the switch fabric.
Ext Req ID:	QOS-010 GEN-002
Reference:	IEEE 802.1Q
Classifier:	MUST
Test Setup:	Shaping
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Configure the switch to use the Strict Priority Algorithm on every egress port. - Configure the switch to set the PCP field from the highest prioritized queue (to which ingress frames with the PCP field set to 7 should be mapped) to a value of 2 at egress port C
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. From the test station, start sending tagged frames with the PCP field set to 7 with 100% load to one DUT port A 2. Wait 1 second 3. From the test station, start sending tagged frames with the PCP field set to 4 with 100% load to another DUT port B 4. Wait 5 seconds 5. At the egress port C, check if all frames sent from port A are forwarded with the PCP field set to 2
Pass criteria:	5. All frames sent from port A are forwarded with none of the frames sent from port B in between, and all of them have the PCP field set to 2.
Notes:	NONE

2.6.8 Support_Of_8_Shapers_Per_Egress_Port

Test ID:	QOS_008
Synopsis:	This test checks if the switch can be configured to use 8 different shapers at egress. The switch is configured to use different shaper settings for each queue. The test station sends traffic at full load. At the egress of the destination port, the test checks if the traffic is shaped correctly for every queue.
Ext Req ID:	QOS-011
Reference:	IEEE 802.1Q
Classifier:	MUST
Test Setup:	Switching

DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B)
	- Configure the switch to map each PCP value (0-7) to different queues on ingress
	- Configure the switch to use shapers for every traffic class on egress of a port
	- Configure the egress bandwidth of the shapers to be 10% + (<PCP value>) * 10%, i.e.
	  ○ PCP 0: 10%
	  ○ PCP 1: 20%
	  ○ PCP 2: 30%
	  ○ PCP 3: 40%
	  ○ PCP 4: 50%
	  ○ PCP 5: 60%
	  ○ PCP 6: 70%
	  ○ PCP 7: 80%

Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. From the test station, start sending tagged frames with the PCP field set to 0 with 100% load to one DUT port A 2. Wait 10 seconds 3. At the egress port B, check the ratio of forwarding rate compared to the total sent traffic 4. Stop traffic 5. Repeat steps 1-4 for a different value of the PCP field until all possible PCP values (0-7) have been tested
Pass criteria:	3. At the egress port B, the forwarded traffic is observed to be 10% + (<PCP value> * 10%) of the sent traffic
Notes:	The error tolerance should be below 1000ppm

2.6.9 Support_Of_Leaky_Bucket_Algorithm

Test ID:	QOS_009
Synopsis:	Check if switch supports leaky bucket algorithm. The algorithm used shall be configurable per shaper.
Ext Req ID:	QOS-012
Reference:	NONE
Classifier:	MUST
Test Setup:	Switching
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Configure the switch to map each PCP value (0-7) to different queues on ingress - Configure the switch to use the Leaky Bucket Algorighm for every traffic class on egress of a port - Configure the bucket size to the largest possible size - Configure the leaky bucket output rate of the shapers to be 10% + (<PCP value>) * 10%, i.e. o PCP 0: 10% o PCP 1: 20% o PCP 2: 30% o PCP 3: 40% o PCP 4: 50% o PCP 5: 60% o PCP 6: 70% o PCP 7: 80%
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. From the test station, start sending tagged frames with a frame size of 64Byte and with the PCP field set to 0 with 100% load to one DUT port A 2. Wait 10 seconds 3. At the egress port B, check the ratio of forwarding rate compared to the total sent traffic 4. At the egress port B, check if the forwarded traffic contains bursts. 5. Stop traffic 6. Repeat steps 1-5 for a different value of the PCP field until all possible PCP values (0-7) have been tested
Pass criteria:	3. At the egress port B, the forwarded traffic is observed to be 10% + (<PCP value> * 10%) of the sent traffic. 4. At the egress port B, the forwarded traffic contains bursts, i.e. there are at least two consecutive packets with a gap not bigger than the regular interframe gap.
Notes:	This test is meant to assure that the shaping differs from the Credit-based Shaper.

	One significant difference is that the traffic shaped by the Credit-based shaper does not contain any bursts; however, when using the Leaky Bucket Algorithm for shaping, bursts can still occur.

2.6.10 Credit_Based_Shaper_1

Test ID:	QOS_010
Synopsis:	Check if switch supports credit-based shaper algorithm according to IEEE 802.1Q FQTSS. The algorithm used shall be configurable per shaper.
Ext Req ID:	QOS-013
Reference:	IEEE 802.1Qav
Classifier:	MUST
Test Setup:	Switching
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Configure the switch to map each PCP value (0-7) to different queues on ingress - Configure the switch to use the Credit-based Shaper for every traffic class on egress of a port - Configure the output rate of the Credit-based Shapers to be 10% + (<PCP value>) * 10%, i.e. ○ PCP 0: 10% ○ PCP 1: 20% ○ PCP 2: 30% ○ PCP 3: 40% ○ PCP 4: 50% ○ PCP 5: 60% ○ PCP 6: 70% ○ PCP 7: 80%
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. From the test station, start sending tagged frames with a frame size of 92 Byte and with the PCP field set to 0 with 100% load to one DUT port A 2. Wait 10 seconds 3. At the egress port B, check the ratio of forwarding rate compared to the total sent traffic 4. At the egress port B, check if the forwarded traffic contains bursts. 5. Stop traffic 6. Repeat steps 1-5 for a different value of the PCP field until all possible PCP values (0-7) have been tested
Pass criteria:	3. At the egress port B, the forwarded traffic is observed to be 10% + (<PCP value> * 10%) of the sent traffic. 4. At the egress port B, the forwarded traffic does not contain bursts, i.e. the interval between two consecutive packets is $\frac{9-<PCP>}{<PCP>+1} 800\ bit\ times$
Notes:	

2.6.11 Credit_Based_Shaper_2

Test ID:	QOS_011
Synopsis:	Check if switch supports credit-based shaper algorithm according to IEEE 802.1Q FQTSS. The algorithm used shall be configurable per shaper.
Ext Req ID:	QOS-013
Reference:	IEEE 802.1Qav
Classifier:	MUST
Test Setup:	Shaping
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Configure the switch to map each PCP value (0-7) to different queues on ingress - Configure the switch to use the Credit-based Shaper for the two queues which PCP 2 and PCP 3 are mapped to - Configure the output rate of the Credit-based Shaper for the queue with PCP 3 to 75% - Configure the output rate of the Credit-based Shaper for the queue with PCP 2 to 20%
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. From the test station, start sending tagged frames with the PCP field set to 1 with 100% load to one DUT port A 2. From the test station, start sending tagged frames with the PCP field set to 2 with 100% load to one DUT port B 3. Wait 10 seconds 4. At the egress port D, check the ratio of forwarding rate compared to the total sent traffic for both traffic types 5. Stop traffic 6. From the test station, start sending tagged frames with the PCP field set to 1 with 100% load to one DUT port A 7. From the test station, start sending tagged frames with the PCP field set to 2 with 100% load to one DUT port B 8. From the test station, start sending tagged frames with the PCP field set to 3 with 100% load to one DUT port C 9. Wait 10 seconds 10. At the egress port D, check the ratio of forwarding rate compared to the total sent traffic for both traffic types 11. Stop traffic
Pass criteria:	4. At the egress port D, the forwarded traffic from Port A with PCP 1 is observed to be 80% of the sent traffic. 4. At the egress port D, the forwarded traffic from Port B with PCP 2 is observed to be 20% of the sent traffic. 10. At the egress port D, the forwarded traffic from Port A with PCP 1 is observed

	to be 5% of the sent traffic. 10. At the egress port D, the forwarded traffic from Port B with PCP 2 is observed to be 20% of the sent traffic. 10. At the egress port D, the forwarded traffic from Port C with PCP 3 is observed to be 75% of the sent traffic.
Notes:	NONE

2.6.12 Individual_Deactivation_Of_Shaper

Test ID:	QOS_012
Synopsis:	Check if switch supports deactivation of shapers individually.
Ext Req ID:	QOS-014
Reference:	IEEE 802.1Qav
Classifier:	MUST
Test Setup:	Switching
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Configure the switch to map each PCP value (0-7) to different queues on ingress - Configure the switch to use the Credit-based Shaper for every traffic class on egress of a port - Configure the output rate of the Credit-based Shapers to be 10% + (<PCP value>) * 10%, i.e. o PCP 0: 10% o PCP 1: 20% o PCP 2: 30% o PCP 3: 40% o PCP 4: 50% o PCP 5: 60% o PCP 6: 70% o PCP 7: 80%
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. Through any vendor specified means, deactivate the shapers for PCP 2 and PCP 5. Deactivation of the shapers must be done during runtime. 2. From the test station, start sending tagged frames with the PCP field set to 0 with 100% load to one DUT port A 3. Wait 10 seconds 4. At the egress port B, check the ratio of forwarding rate compared to the total sent traffic 5. Stop traffic Repeat steps 1-4 for a different value of the PCP field until all possible PCP values (0-7) have been tested
Pass criteria:	4. At the egress port B, for all PCP values except PCP 2 and PCP 5 the forwarded traffic is observed to be 10% + (<PCP value> * 10%) of the sent traffic. 4. At the egress port B, for the PCP values 2 and 5 the forwarded traffic is observed to be 100% of the egress line-rate.
Notes:	NONE

2.7 Configuration

2.7.1 Reconfiguration_Without_Interruption

Test ID:	CONF_001
Synopsis:	Check if DUT can be reconfigured during runtime without disabling or blocking the switch (non-stop forwarding). The test station sends line rate traffic to DUT ingress port and monitors traffic at DUT egress ports. The test station changes the configuration of the DUT during runtime. The test station checks, if the traffic at DUT egress ports is getting blocked or interrupted.
Ext Req ID:	CONF-001
Reference:	NONE
Classifier:	MUST
Test Setup:	Configuration
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Access to DUT register of internal Phys
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. Test station sends line rate traffic to DUT ingress port and monitors continuously traffic at DUT egress ports 2. Test Station reconfigures parameters; the new configuration shall differ in the following parameters: one additional static MAC address entry, one additional Filtering rule, one additionally enabled Shaper, one additional VLAN entry, Jumbo frames enabled 3. Check if new reconfiguration has been applied successfully by reading back the reconfigured parameters
Pass criteria:	2. Monitored traffic of DUT egress ports should indicate, that no disabling or blocking of the DUT was observed 3. The reconfigured parameters have been read back successfully
Notes:	NONE

2.7.2 Individual_configuration_per_Port

Test ID:	CONF_002
Synopsis:	Check if switch provides all port-based features to be configurable for each port individually. The test station sends and reads back port based configuration for each port.
Ext Req ID:	CONF-002
Reference:	NONE
Classifier:	MUST
Test Setup:	Configuration
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Access to DUT register
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. Test station configures specific port based features on a single port 2. Read back port based features 3. Repeat steps 1-2 for every integrated PHY port
Pass criteria:	2. Port based features have been configured correctly according to the applied configuration
Notes:	NONE

2.7.3 Starting_in_Dont_Forward_Mode

Test ID:	CONF_003
Synopsis:	Check if DUT supports starting in „Don't Forward" mode before configuration is done. The test station sends line rate traffic to DUT ingress port and monitors traffic at DUT egress ports. The test station checks, if the traffic at DUT egress ports is getting blocked until „Don't Forward" mode is deactivated.
Ext Req ID:	CONF-003
Reference:	NONE
Classifier:	MUST
Test Setup:	Configuration
DUT Configuration:	- Switch powered in „Don't Forward" mode, no configuration is done.
Prerequisites:	1. Link up and stable between test station and DUT ports
Test procedure:	1. Test station sends line rate traffic to DUT ingress port 2. Test station monitors traffic at DUT egress ports 3. Configure the switch with Standard Configuration for Switching and Forwarding 4. Test station monitors traffic at DUT egress ports
Pass criteria:	2. No traffic is received from DUT egress ports 4. All traffic is received from DUT egress ports
Notes:	NONE

2.7.4 Read_Back_Written_Configuration_Information

Test ID:	CONF_004
Synopsis:	Check possibility to read back all configuration information from DUT that can be written. Send configuration information to DUT, read back and evaluate configuration information.
Ext Req ID:	CONF-004
Reference:	NONE
Classifier:	MUST
Test Setup:	Configuration
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Access to DUT register
Prerequisites:	1. Link up and stable between test station and DUT ports
Test procedure:	1. Send significant configuration information to DUT 2. Read back configuration information from 1.
Pass criteria:	2. Written configuration information can be read back and result is plausible
Notes:	NONE

2.7.5 Support_Selective_Lock_Down_Of_Items

Test ID:	CONF_005
Synopsis:	Check possibility if DUT supports selective lock down of configuration items until next cold start. Send configuration items that can be locked to the DUT, lock some of the written configuration items and evaluate which configuration items can be changed after lock.
Ext Req ID:	CONF-005
Reference:	NONE
Classifier:	MUST
Test Setup:	Configuration
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Access to DUT register
Prerequisites:	1. Link up and stable between test station and DUT ports 2. At least two configuration items that can be locked
Test procedure:	1. Send at least two different configuration items that can be locked 2. Send a command to the DUT to lock some of the written configuration items 3. Change all written configuration items 4. Send a command to the DUT to access the register and read out the written configuration items
Pass criteria:	4. Written configuration items can be read back. Changing the written configuration affects only unlocked configuration item, locked configuration items remain unchanged
Notes:	The vendor shall provide a list of configuration items that can be locked

2.8 Filtering of Incoming Frames

2.8.1 Rate_limitation_ingress_VID_based

Test ID:	FILT_001
Synopsis:	Check if switch has VID based ingress rate limitation implemented. Sending VLAN-tagged traffic with 100% load to an ingress port and check if the traffic bandwidth is limited to the configured rate on every egress port like specified/configured
Ext Req ID:	FILT-002
Reference:	NONE
Classifier:	MUST
Test Setup:	Switching (see Appendix A)
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Configure the switch to limit the bandwidth on every ingress port for different VIDs. Each port shall be configured with at least two different VIDs and significantly different values for the limited bandwidth.
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. Send traffic tagged with a VID according to ingress port A's configuration with 100% load to DUT ingress port A 2. Capture and monitor all traffic from DUT egress port B 3. Measure the bandwidth of the received traffic at egress port B 4. Send traffic tagged with another VID according to ingress port A's configuration with 100% load to DUT ingress port A 5. Capture and monitor all traffic from DUT egress port B 6. Measure the bandwidth of the received traffic at egress port B 7. Repeat steps 1-6 for everA ingress port A
Pass criteria:	3. The measured bandwidth matches the configured bandwidth limitation for the VID of step 1at ingress port A. 6. The measured bandwidth matches the configured bandwidth limitation for the VID of step 4 at ingress port A.
Notes:	NONE

2.8.2 Rate_limitation_ingress_priority_based

Test ID:	FILT_002
Synopsis:	Check if switch has priority based ingress rate limitation implemented. Sending VLAN-tagged traffic with 100% load to an ingress port and check if the traffic bandwidth is limited to the configured rate on every egress port like specified/configured
Ext Req ID:	FILT-002
Reference:	NONE
Classifier:	MUST
Test Setup:	Switching (see Appendix A)
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Configure the switch to limit the bandwidth on every ingress port for various VLAN priorities. Each port shall be configured with at least two different priorities and different values for the limited bandwidth.
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. Send traffic tagged with a priority according to ingress port A's configuration with 100% load to DUT ingress port A 2. Capture and monitor all traffic from DUT egress port B 3. Measure the bandwidth of the received traffic at egress port B 4. Send traffic tagged with another priority according to ingress port A's configuration with 100% load to DUT ingress port A. The VID shall be the same as in step 1. 5. Capture and monitor all traffic from DUT egress port B 6. Measure the bandwidth of the received traffic at egress port B 7. Repeat steps 1-6 for every ingress port A
Pass criteria:	3. The measured bandwidth matches the configured bandwidth limitation for the priority of step 1 at ingress port A. 6. The measured bandwidth matches the configured bandwidth limitation for the priority of step 4 at ingress port A.
Notes:	NONE

2.8.3 Broadcast_Storm_Protection

Test ID:	FILT_003
Synopsis:	Check if switch supports Broadcast Storm Protection on each port
Ext Req ID:	FILT-004
Reference:	NONE
Classifier:	MUST
Test Setup:	Switching (see Appendix A)
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B)
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. Through any vendor specified means, enable Broadcast Storm Protection on every port; if the switch supports configuring the ingress rate for Broadcast messages, set this rate to a value significantly below 100% of the maximum load of the port but not 0. 2. Capture and monitor traffic on every port 3. From the test station, send broadcast traffic at line-rate to one DUT port A 4. Check the rate of the forwarded broadcast frames at every DUT port 5. Repeat test steps 3 to 4 for every DUT port as port A 6. If the switch supports configuring the ingress rate for Broadcast messages, repeat test steps 3 to 5 for a different rate than in the first iteration.
Pass criteria:	4. At every port except port A, the rate of the forwarded broadcast frames is significantly below 100%, but not 0 (i.e. not all of the frames are discarded) 4. If the switch supports configuring the ingress rate for Broadcast messages, at every port except port A, the rate of the forwarded broadcast frames matches the value configured in step 1 4. NONE of the broadcast frames is seen at port A
Notes:	NONE

2.8.4 Multicast_Storm_Protection

Test ID:	FILT_004
Synopsis:	Check if switch supports unknown Multicast Storm Protection on each port
Ext Req ID:	FILT-005
Reference:	NONE
Classifier:	MUST
Test Setup:	Switching (see Appendix A)
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - The switch shall be configured to flood frames with unknown multicast destination MAC addresses
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. Through any vendor specified means, enable Unknown Multicast Storm Protection on every port; if the switch supports configuring the ingress rate for unknown multicast messages, set this rate to a value significantly below 100% of the maximum load of the port but not 0. 2. Capture and monitor traffic on every port 3. From the test station, send multicast traffic at line-rate to one DUT port A; the destination MAC address must not be known to the switch 4. Check the rate of the forwarded multicast frames at every DUT port 5. Repeat test steps 3 to 4 for every DUT port as port A 6. If the switch supports configuring the ingress rate for unknown multicast messages, repeat test steps 3 to 5 for a different rate than in the first iteration.
Pass criteria:	4. At every port except port A, the rate of the forwarded unknown multicast frames is significantly below 100%, but not 0 (i.e. not all of the frames are discarded) 4. If the switch supports configuring the ingress rate for unknown multicast messages, at every port except port A, the rate of the forwarded multicast frames matches the value configured in step 1 4. NONE of the multicast frames is seen at port A
Notes:	NONE

2.8.5 General Filtering Requirements

2.8.5.1 8_Policies_Per_Port

Test ID:	FILT_005
Synopsis:	Check if the switch is able to support at least 8 policies per port.
Ext Req ID:	FILT-003
Reference:	IEEE_8021Q-2014
Classifier:	MUST
Test Setup:	Switching (see Appendix A)
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Configure 8 different filtering rules (policies) for each port.
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. Capture traffic on all DUT ports 2. Send traffic from Test Station to each of the configured ports. The traffic applied shall include not only frames affected by all the configured filtering rules, but also traffic not affected by them 3. Wait and check which frames were forwarded by the DUT.
Pass criteria:	3. The captured traffic on the egress ports of the DUT shall correspond with the configured filtering rules on the ingress ports.
Notes:	NONE

2.8.5.2 Policing_Information

Test ID:	FILT_006
Synopsis:	Check if the switch is able to provide status information regarding the configured ingress filters.
Ext Req ID:	FILT-006
Reference:	IEEE_8021Q-2014
Classifier:	MUST
Test Setup:	Switching (see Appendix A)
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Configure a filtering rule in port A to drop all packets with the MAC Destination Address <L2_DestinationAddress_Drop>
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured 3. All DUT counters related with ingress traffic and filters are reset
Test procedure:	1. Enable traffic monitoring on all switch ports 2. Send N frames with MAC Destination Address <L2_DestinationAddress_Drop> from Test Station to port A 3. Wait to check if the frames are being forwarded 4. Read DUT counter indicating number of frames affected by the filtering rules
Pass criteria:	3. All frames are being blocked (no frames were captured on any egress port) 4. The counter of affected frames shall be equal to N
Notes:	NONE

2.8.6 VLAN-Related Filtering Rules

2.8.6.1 Switch_Filtering_Membership_Check_Filtering_01

Test ID:	FILT_007
Synopsis:	Check if the switch is able to forward or drop tagged frames according to the rules configured on any specific port.
Ext Req ID:	FILT-001 FILT-011
Reference:	IEEE_8021Q-2014
Classifier:	MUST
Test Setup:	Switching (see Appendix A)
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Configure the switch to forward frames with VIDx in ports A and B - Configure the switch to drop all frames with VIDy in ports A and B
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. Enable traffic monitoring on all switch ports 2. Send frame tagged with VIDx from Test Station to port A 3. Wait to check if the frame is being forwarded 4. Send frame tagged with VIDy from Test Station to port A 5. Wait to check if the frame is being forwarded
Pass criteria:	3. Frame is forwarded to port B 5. Frame is dropped, nothing is received from port B
Notes:	NONE

2.8.6.2 Switch_Filtering_Membership_Check_Filtering_02

Test ID:	FILT_008
Synopsis:	Check if the switch supports a filtering rule to drop all untagged frames on any specific port.
Ext Req ID:	FILT-001 FILT-011
Reference:	IEEE_8021Q-2014
Classifier:	MUST
Test Setup:	Switching (see Appendix A)
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Configure the switch to forward frames with VIDx in ports A and B - Configure the switch to drop all untagged frames on port A
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. Enable traffic monitoring on all switch ports 2. Send frame tagged with VIDx from Test Station to port A 3. Wait to check if the frame is being forwarded 4. Send untagged frame from Test Station to port A 5. Wait to check if the frame is being forwarded
Pass criteria:	3. Frame is forwarded to port B 5. Frame is dropped, nothing is received from port B
Notes:	NONE

2.8.7 Filtering Rules Based on Fields

2.8.7.1 Filtering_for_L2_Fields_DA

Test ID:	FILT_009
Synopsis:	Check if the switch supports filtering based on L2 fields. In this case the rule for MAC Destination Address is being tested.
Ext Req ID:	FILT-007 FILT-011
Reference:	IEEE_8021Q-2014
Classifier:	MUST
Test Setup:	Switching (see Appendix A)
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Configure a filtering rule in port A to drop all packets with the MAC Destination Address <L2_DestinationAddress_Drop>
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. Enable traffic monitoring on all switch ports 2. Send frame with a valid MAC Destination Address which should not be the one used in the filtering rules, from Test Station to port A 3. Wait to check if the frame is being forwarded 4. Send frame with MAC Destination Address <L2_DestinationAddress_Drop> from Test Station to port A 5. Wait to check if the frame is being forwarded
Pass criteria:	3. Frame is being forwarded 5. Frame is dropped, should not be captured on any port.
Notes:	NONE

2.8.7.2 Filtering_for_L2_Fields_SA

Test ID:	FILT_010
Synopsis:	Check if the switch supports filtering based on L2 fields. In this case the rule for MAC Source Address is being tested.
Ext Req ID:	FILT-007 FILT-011 GEN-010
Reference:	IEEE_8021Q-2014
Classifier:	MUST
Test Setup:	Switching (see Appendix A)
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Configure a filtering rule in port A to drop all packets with the MAC Source Address <L2_SourceAddress_Drop>
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. Enable traffic monitoring on all switch ports 2. Send frame with a valid Source MAC Address which should not be the one used in the filtering rules, from Test Station to port A 3. Wait to check if the frame is being forwarded 4. Send frame with MAC Source Address <L2_SourceAddress_Drop> from Test Station to port A 5. Wait to check if the frame is being forwarded
Pass criteria:	3. Frame is being forwarded 5. Frame is dropped, should not be captured on any port.
Notes:	NONE

2.8.7.3 Filtering_for_L2_Fields_EtherType

Test ID:	FILT_011
Synopsis:	Check if the switch supports filtering based on L2 fields. In this case the rule for Ethernet Type is being tested.
Ext Req ID:	FILT-007 FILT-009 FILT-010 FILT-011 GEN-008
Reference:	IEEE_8021Q-2014
Classifier:	MUST
Test Setup:	Switching (see Appendix A)
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Configure a filtering rule in port A to drop all packets with Ethernet Type equal to <L2_EtherType_Drop>. The value <L2_EtherType_Drop> shall be equal or bigger than 1536
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. Enable traffic monitoring on all switch ports 2. Send the following frames with an Ethernet type different to <L2_EtherType_Drop>, from Test Station to port A a. Untagged (Ethertype !=<L2_EtherType_Drop>) b. Tagged (TPID = 0x8100, Ethertype != <L2_EtherType_Drop>) c. Double Tagged (Outer TPID = 0x9100, Inner TPID = 0x8100, Ethertype != <L2_EtherType_Drop>) 3. Wait to check if the frame is being forwarded 4. Send the following frames with an Ethernet type equal to <L2_EtherType_Drop> from Test Station to port A a. Untagged (Ethertype = <L2_EtherType_Drop>) b. Tagged (TPID = 0x8100, Ethertype = <L2_EtherType_Drop>) c. Double Tagged (Outer TPID = 0x9100, Inner TPID = 0x8100, Ethertype = <L2_EtherType_Drop>) 5. Wait to check if the frame is being forwarded
Pass criteria:	3. All frames are being forwarded 5. All frames are dropped and should not be captured on any port.
Notes:	NONE

2.8.8 Filtering Rules Based on Upper Layer Addresses

2.8.8.1 Filtering_for_L3_Address_UntaggedIPv4

Test ID:	FILT_012
Synopsis:	Check if the switch supports filtering based on L3 addresses. In this case the rule to filter packets based on IPv4 addresses is being tested. The frame used does not contain a VLAN tag. The EtherType value for IPv4 (0x0800) shall be used in the Ethernet frame header.
Ext Req ID:	FILT-008 FILT-011
Reference:	IEEE_8021Q-2014
Classifier:	MUST
Test Setup:	Switching
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Configure a filtering rule in port A to drop all packets with the IPv4 Source Address <L3_IPv4_SourceAddress_Drop> - Configure a filtering rule in port A to drop all packets with the IPv4 Destination Address <L3_IPv4_DestinationAddress_Drop>
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	Given the combinations of source and destination addresses at Layer 3, the following 4 packets will be formed: a. IPv4 Source Address equal to <L3_IPv4_SourceAddress_Drop> IPv4 Destination Address equal to <L3_IPv4_DestinationAddress_Drop> b. IPv4 Source Address equal to <L3_IPv4_SourceAddress_Drop> IPv4 Destination Address different to <L3_IPv4_DestinationAddress_Drop> c. IPv4 Source Address different to <L3_IPv4_SourceAddress_Drop> IPv4 Destination Address equal to <L3_IPv4_DestinationAddress_Drop> d. IPv4 Source Address different to <L3_IPv4_SourceAddress_Drop> IPv4 Destination Address different to <L3_IPv4_DestinationAddress_Drop> 1. Enable traffic monitoring on all switch ports 2. Send one of the IPv4 packets form the list, from Test Station to port A. The frame shall be untagged and the <EtherType> field in Layer 2 shall be equal to 0x0800. 3. Wait to check if the packet is being forwarded 4. Repeat steps 2 and 3 with all the packets in the list
Pass	3. Packet (a) is not forwarded 3. Packet (b) is not forwarded

criteria:	3. Packet (c) is not forwarded 3. Packet (d) is forwarded
Notes:	NONE

2.8.8.2 Filtering_for_L3_Address_EtherTypeIPv4

Test ID:	FILT_013
Synopsis:	Check if the switch supports filtering based on L3 addresses. The switch shall only apply the filter when an IPv4 is detected according to the <EtherType> field on the Ethernet frame header.
Ext Req ID:	FILT-008 FILT-011
Reference:	IEEE_8021Q-2014
Classifier:	MUST
Test Setup:	Switching
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Configure a filtering rule in port A to drop all packets with the IPv4 Destination Address <L3_IPv4_DestinationAddress_Drop>
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. Enable traffic monitoring on all switch ports 2. Send the following IPv4 packets with a destination address equal to <L3_IPv4_DestinationAddress_Drop>, from Test Station to port A. The field <EtherType> in the Ethernet header shall be different to 0x0800 a. Untagged (Ethertype = 0xFFFF) b. Tagged (TPID = 0x8100, Ethertype = 0xFFFF) c. Double Tagged (Outer TPID = 0x9100, Inner TPID = 0x8100, Ethertype = 0xFFFF) 3. Wait to check if the frames are being forwarded 4. Send the following IPv4 packets with a destination address equal to <L3_IPv4_DestinationAddress_Drop>, from Test Station to port A. The field <EtherType> in the Ethernet header shall be equal to 0x0800 a. Untagged (Ethertype = 0x0800) b. Tagged (TPID = 0x8100, Ethertype = 0x0800) c. Double Tagged (Outer TPID = 0x9100, Inner TPID = 0x8100, Ethertype = 0x0800) 5. Wait to check if the frames are being forwarded
Pass criteria:	3. All frames are being forwarded 5. All frames are dropped and should not be captured on any port.
Notes:	NONE

2.8.8.3 Filtering_for_L3_Address_TaggedIPv4

Test ID:	FILT_014
Synopsis:	Check if the switch supports filtering based on L3 addresses. The beginning of the L3 header will be different depending on whether VLAN tags are present or not. The switch shall be able to filter based on IPv4 addresses also when VLAN tags are present on the Ethernet frame header.
Ext Req ID:	FILT-008 FILT-011
Reference:	IEEE_8021Q-2014
Classifier:	MUST
Test Setup:	Switching
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Configure the switch to forward frames with VIDx in ports A and B - Configure a filtering rule in port A to drop all packets with the IPv4 Destination Address <L3_IPv4_DestinationAddress_Drop>
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. Enable traffic monitoring on all switch ports 2. Send tagged frame with VIDx and IPv4 destination address different to <L3_IPv4_DestinationAddress_Drop>, from Test Station to port A 3. Send double tagged frame with VIDx for the outer tag and IPv4 destination address different to <L3_IPv4_DestinationAddress_Drop>, from Test Station to port A 4. Wait to check if both frames are being forwarded 5. Send tagged frame with VIDx and IPv4 destination address equal to <L3_IPv4_DestinationAddress_Drop>, from Test Station to port A 6. Send double tagged frame with VIDx for the outer tag and IPv4 destination address equal to <L3_IPv4_DestinationAddress_Drop>, from Test Station to port A 7. Wait to check if both frames are being dropped
Pass criteria:	4. Frames are being forwarded 7. Frames are dropped, should not be captured on any port.
Notes:	NONE

2.8.8.4 Filtering_for_L4_Address_Ipv4HeaderVariableLength

Test ID:	FILT_015
Synopsis:	Check if the switch supports filtering based on L4 fields. The IPv4 header is of variable size between 20 octets and 60 octets inclusive. In order to parse a layer 4 header and to filter according to its fields, the switch must be able to find the beginning of the L4 header regardless of the L3 header size. IPv4 packets with an UDP payload are sent using different IPv4 header sizes. The switch is configured to filter frames according to the UDP source port.
Ext Req ID:	FILT-008 FILT-011
Reference:	IEEE_8021Q-2014
Classifier:	MUST
Test Setup:	Switching
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Configure a filtering rule in port A to drop all packets with the UDP Source Port <L4_UDP_SourcePort_Drop>
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. Enable traffic monitoring on all switch ports 2. Send an UDP datagram with a valid MAC Destination Address, from Test System to Port A. The UDP source port must be different to <L4_UDP_SourcePort_Drop>. 3. Wait to check if the packet is being forwarded 4. Send an UDP datagram with a valid MAC Destination Address, from Test System to Port A. The UDP source port must be equal to <L4_UDP_SourcePort_Drop>. 5. Wait to check if the packet is being forwarded 6. Repeat steps 1-4 using an IPv4 header with an IHL field bigger than 5. The header option “No Operation” may be used as padding.
Pass criteria:	3. The frame is forwarded 5. The frame is dropped
Notes:	This test case does not contemplate IP fragmentation.

2.8.8.5 Filtering_for_L4_Address_UDPPorts

Test ID:	FILT_016
Synopsis:	Check if the switch supports filtering based on L4 fields. In this case the rules for UDP Source Port and UDP Destination Port are being tested.
Ext Req ID:	FILT-008 FILT-011
Reference:	IEEE_8021Q-2014
Classifier:	MUST
Test Setup:	Switching
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Configure a filtering rule in port A to drop all packets with the UDP Source Port <L4_UDP_SourcePort_Drop> - Configure a filtering rule in port A to drop all packets with the UDP Destination Port <L4_UDP_DestinationPort_Drop>
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. Enable traffic monitoring on all switch ports 2. Send from test system to port A, two UDP datagrams with an UDP destination port different to <L4_UDP_DestinationPort_Drop> and UDP source port as specified below: a. UDP source port different to <L4_UDP_SourcePort_Drop> b. UDP source port equal to <L4_UDP_SourcePort_Drop> 3. Wait to check if the frames are being forwarded 4. Send from test system to port A, two UDP datagrams with an UDP source port different to <L4_UDP_SourcePort_Drop> and UDP destination port as specified below: a. UDP destination port different to <L4_UDP_DestinationPort_Drop> b. UDP destination port equal to <L4_UDP_DestinationPort_Drop> 5. Wait to check if the frames are being forwarded
Pass criteria:	3. Frame 1.a is being forwarded. 3. Frame 1.b is being dropped. 5. Frame 3.a is being forwarded. 5. Frame 3.b is being dropped.
Notes:	This test case does not contemplate IP fragmentation.

2.8.8.6 Filtering_for_L4_Address_TCPPorts

Test ID:	FILT_017
Synopsis:	Check if the switch supports filtering based on L4 fields. In this case the rules for TCP Source Port and TCP Destination Port are being tested.
Ext Req ID:	FILT-008 FILT-011
Reference:	IEEE_8021Q-2014
Classifier:	MUST
Test Setup:	Switching
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Configure a filtering rule in port A to drop all packets with the TCP Source Port <L4_TCP_SourcePort_Drop> - Configure a filtering rule in port A to drop all packets with the TCP Destination Port <L4_TCP_DestinationPort_Drop>
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. Enable traffic monitoring on all switch ports 2. Send from test system to port A, two TCP segments with an TCP destination port different to <L4_TCP_DestinationPort_Drop> and TCP source port as specified below: a. TCP source port different to <L4_TCP_SourcePort_Drop> b. TCP source port equal to <L4_TCP_SourcePort_Drop> 3. Wait to check if the frames are being forwarded 4. Send from test system to port A, two TCP segments with an TCP source port different to <L4_TCP_SourcePort_Drop> and TCP destination port as specified below: a. TCP destination port different to <L4_TCP_DestinationPort_Drop> b. TCP destination port equal to <L4_TCP_DestinationPort_Drop> 5. Wait to check if the frames are being forwarded
Pass criteria:	3. Frame 1.a is being forwarded. 3. Frame 1.b is being dropped. 5. Frame 3.a is being forwarded. 5. Frame 3.b is being dropped.
Notes:	This test case does not contemplate IP fragmentation.

2.9 Diagnostic

2.9.1 Port_Based_Counters

Test ID:	DIAG_001
Synopsis:	Check if switch provides a minimum set of port based counters are available. Send line rate traffic to port and read out the following port based counters: - number of received frames - number of received bytes - number of dropped frames after reception - number of sent frames - (optional) number of unsuccessfully sent frames - number of sent bytes - maximum fill level of the queues since clearing the counter
Ext Req ID:	DIAG-001 DIAG-003
Reference:	NONE
Classifier:	MUST
Test Setup:	Configuration
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Access to DUT register of switch
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. Read and reset counter and status information of the DUT ingress port via atomic instruction 2. Capture and monitor traffic from all DUT egress ports 3. Send line rate traffic to the DUT ingress port for 5ms (The traffic items shall be choosen in a way that each counter to be tested will be incremented at least once) 4. Stop traffic 5. Read and reset counter and status information of the DUT ingress port via atomic instruction 6. Wait 2 seconds 7. Read and reset counter and status information of the DUT ingress port via atomic instruction
Pass criteria:	5. All counters indicate the correct values according to the traffic sent in step 3. 7. All counters indicate 0.
Notes:	NONE

MIB counter support (RFC2819)

2.9.1.1 EtherStats_General

Test ID:	DIAG_004
Synopsis:	Check if the following etherStats counters are supported and the provided values are correct. - etherStatsOctets - etherStatsPkts - etherStatsBroadcastPkts - etherStatsMulticastPkts
Ext Req ID:	DIAG-005
Reference:	IEEE RFC 2819 (May, 2000)
Classifier:	MUST
Test Setup:	Configuration
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B)
Prerequisites:	NONE
Test procedure:	1. Capture and monitor traffic from all DUT ports. 2. Send the following traffic items to the DUT ingress port a) k bad[A] unicast packets b) m bad[A] broadcast packets c) n bad[A] multicast packets d) x good unicast packets e) y good broadcast packets f) z good multicast packets 3. Read the Counters of the DUT ingress port. 4. Check if the counters are available and the values are as expected
Pass criteria:	4. The DUT reports the following statistics and the values are: - etherStatsOctets = (k + m + n + x + y + z) * Framelength[B] - etherStatsPkts = k + m + n + x + y + z - etherStatsBroadcastPkts = y - etherStatsMulticastPkts = z
Notes:	A: Bad Packets have a valid preamble and SFD, but have a bad CRC. B: Framelength excluding framing bits but including FCS octets.

2.9.1.2 EtherStats_CRC

Test ID:	DIAG_005
Synopsis:	Check if the following etherStats counters are supported and the provided values are correct. - etherStatsCRCAlignErrors
Ext Req ID:	DIAG-005
Reference:	IEEE RFC 2819 (May, 2000)
Classifier:	MUST
Test Setup:	Configuration
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B)
Prerequisites:	NONE
Test procedure:	1. Capture and monitor traffic from all DUT ports. 2. Send the following traffic items to the DUT ingress port a) x packets with good FCS b) y packets with bad FCS (integral number of octets) 3. Read the Counters of the DUT ingress port. 4. Check if the counters are available and the values are as expected
Pass criteria:	4. The DUT reports the following statistics and the values are: - etherStatsCRCAlignErrors = y
Notes:	All packets shall have a valid preamble and SFD, as well as a valid length between 64 octets and 1518 octets.

2.9.1.3 EtherStats_ShortPackets

Test ID:	DIAG_006
Synopsis:	Check if the following etherStats counters are supported and the provided values are correct. - etherStatsUndersizePkts - etherStatsFragments
Ext Req ID:	DIAG-005
Reference:	IEEE RFC 2819 (May, 2000)
Classifier:	MUST
Test Setup:	Configuration
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B)
Prerequisites:	NONE
Test procedure:	1. Capture and monitor traffic from all DUT ports. 2. Send the following traffic items to the DUT ingress port a) x short packets with good FCS b) y short packets with bad FCS (integral number of octets) 3. Read the Counters of the DUT ingress port. 4. Check if the counters are available and the values are as expected
Pass criteria:	4. The DUT reports the following statistics and the values are: - etherStatsUndersizePkts = x - etherStatsFragments = y
Notes:	All packets should have a valid preamble and SFD, but a length less than 64 octets.

2.9.1.4 EtherStats_LongPackets

Test ID:	DIAG_007
Synopsis:	Check if the following etherStats counters are supported and the provided values are correct. - etherStatsOversizePkts - etherStatsJabbers
Ext Req ID:	DIAG-005
Reference:	IEEE RFC 2819 (May, 2000)
Classifier:	MUST
Test Setup:	Configuration
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B)
Prerequisites:	NONE
Test procedure:	1. Capture and monitor traffic from all DUT ports. 2. Send the following traffic items to the DUT ingress port a) x long packets with good FCS b) y long packets with bad FCS (integral number of octets) 3. Read the Counters of the DUT ingress port. 4. Check if the counters are available and the values are as expected
Pass criteria:	4. The DUT reports the following statistics and the values are: - etherStatsOversizePkts = x - etherStatsJabbers = y
Notes:	All packets should have a valid preamble and SFD, but a length longer than 1518 octets.

2.9.1.5 EtherStats_Octets

Test ID:	DIAG_008
Synopsis:	Check if the following etherStats counters are supported and the provided values are correct: - *etherStatsPkts64Octets* - *etherStatsPkts65to127Octets* - *etherStatsPkts128to255Octets* - *etherStatsPkts256to511Octets* - *etherStatsPkts512to1023Octets* - *etherStatsPkts1024to1518Octets*
Ext Req ID:	DIAG-005
Reference:	RFC 2819
Classifier:	MUST
Test Setup:	Switching
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B)
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. Start with an Ethernet frame length of s = 64 octets. 2. From the test station send a valid Ethernet frame with length s to switch port A. 3. Check that the MIB counter of port A covering the transmitted frame length is increased by one and the other counters remain unchanged. - *etherStatsPkts64Octets* - *etherStatsPkts65to127Octets* - *etherStatsPkts128to255Octets* - *etherStatsPkts256to511Octets* - *etherStatsPkts512to1023Octets* - *etherStatsPkts1024to1518Octets* 4. From the test station send an Ethernet frame with length s and invalid CRC to switch port A. 5. Check that the MIB counter of port A covering the transmitted frame length is increased by one and the other counters listed in step 3 remain unchanged. 6. Increase Ethernet frame length s by one and continue with step 2 until the frame length exceeds 1518 octets.

	7. From the test station send valid Ethernet frames and Ethernet frames with invalid CRC both with length s = 63 and s = 1519 octets to switch port A. 8. Check that all MIB counters of port A listed in step 3 remain unchanged. 9. Repeat steps 1 to 6 for all ports of the switch.
Pass criteria:	3. Check that the MIB counter of port A covering the transmitted frame length is increased by one and the other counters remain unchanged. 5. Check that the MIB counter of port A covering the transmitted frame length is increased by one and the other counters listed in step 3 remain unchanged. 8. Check that all MIB counters of port A listed in step 3 remain unchanged.
Notes:	The length of an Ethernet frame shall be calculated as the number of octets starting with the destination MAC address up to and including the FCS.

2.9.1.6 EtherStats_Discards

Test ID:	DIAG_009
Synopsis:	Check if the following etherStats counters are supported and the provided values are correct: - *etherStatsDropEvents* - *ifInDiscards*
Ext Req ID:	DIAG-005
Reference:	RFC 2819, RFC 2863
Classifier:	MUST
Test Setup:	Switching
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Switch configured to use the Strict Priority Algorithm
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. From the test station start sending tagged frames with PCP value 7 to switch port A at 100% line rate, with all frames addressed to switch port C. 2. From the test station send n ($n < 2^{32}$) tagged frames with PCP value < 7 to switch port B, with all frames addressed to switch port C. 3. Stop sending traffic to switch port A. 4. Count the number of frames b, forwarded at port C that were received on port B. 5. Check that the MIB counters *ifInDiscards* and *etherStatsDropEvents* of port A both are zero. 6. Check that the MIB counter *ifInDiscards* of port B was increased by n - b. 7. Check that the MIB counter *etherStatsDropEvents* of port B was increased by one. 8. Repeat steps 1 to 7 at least 10 times. 9. Repeat steps 1 to 8 for all ports of the switch.
Pass criteria:	5. Check that the MIB counters *ifInDiscards* and *etherStatsDropEvents* of port A both are zero. 6. Check that the MIB counter *ifInDiscards* of port B was increased by n - b. 7. Check that the MIB counter *etherStatsDropEvents* of port B was increased by one.
Notes:	NONE

2.9.1.7 Unsuccessfully_sent_frames_counter

Test ID:	DIAG_010
Synopsis:	Check if one of the counters for unsuccessfully sent frames is supported and the provided value is correct. - hostOutErrors (RFC2819) - ifOutErrors (RFC2863)
Ext Req ID:	DIAG-005
Reference:	IEEE RFC 2819 (May, 2000) IEEE RFC 2863 (June, 2000)
Classifier:	MUST
Test Setup:	Configuration
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B)
Prerequisites:	NONE
Test procedure:	1. Capture and monitor traffic from all DUT ports. 2. Read the Counters of the DUT port B. 3. Check if the counter for unsuccessfully sent frames is available and note its value. 4. Continuously send traffic to DUT port A. 5. While one frame is being forwarded from a different DUT port B to the test station, break the link between the DUT port B and the test station such that the frame transmission has started, but cannot be finished. 6. Read the Counters of the DUT port B. 7. Check if the counter for unsuccessfully sent frames is available and the value is incremented.
Pass criteria:	3. The DUT reports the counter for unsuccessfully sent frames and its value is x. 7. The DUT reports the counter for unsuccessfully sent frames and its value is x+1.
Notes:	The timing of breaking the link in step 5 is crucial in this test. One method to accomplish this is to send very large frames (e.g. a MAC frames with 1500 bytes payload) at a very high rate (e.g. line rate) and manually break the link at a random point in time. As for any test run there is the (unlikely) possibility that the time of breaking the link falls into the Inter Packet Gap, it is necessary to verify that the last frame received from the DUT port B is incomplete, e.g. by checking if the frame length is significantly smaller than when the frame has been sent in step 4; if this is not the

	case in that particular test run, then the test run must be aborted and restartet.

2.9.2 MIB MTU exceeded discards

Test ID:	DIAG_011
Synopsis:	Check if the following etherStats counters is supported and the provided value is correct: - *dot1dBasePortMtuExceededDiscards*
Ext Req ID:	DIAG-005
Reference:	RFC 4188
Classifier:	MUST
Test Setup:	Switching
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - MTU is configured to a non-standard value (e.g. 1234)
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. Start with an Ethernet frame length of s = 64 octets. 2. From the test station send a valid Ethernet frame with length s to switch port A. 3. Increase Ethernet frame length s by one and continue with step 2 until the frame length exceeds the configured MTU, i.e. the last transmitted frame shall have a length of s = MTU. 4. Check that the MIB counter *dot1dBasePortMtuExceededDiscards* of port A is zero. 5. Increase Ethernet frame length by one (s = MTU + 1). 6. From the test station send a valid Ethernet frame with length s to switch port A. 7. Check that the MIB counter *dot1dBasePortMtuExceededDiscards* of port A is incremented by one. 8. Increase Ethernet frame length s by one and continue with step 6 until the frame length exceeds 2 * MTU. 9. Repeat steps 1 to 8 for all ports of the switch.
Pass criteria:	4. Check that the MIB counter *dot1dBasePortMtuExceededDiscards* of port A is zero. 7. Check that the MIB counter *dot1dBasePortMtuExceededDiscards* of port A is incremented by one.
Notes:	The length of an Ethernet frame shall be calculated as the number of octets starting with the destination MAC address up to and including the FCS.

2.9.3 MIB out counters

Test ID:	DIAG_012
Synopsis:	Check if the following etherStats counters are supported and the provided values are correct: - *ifOutUcastPkts* - *ifOutMulticastPkts* - *ifOutBroadcastPkts* - *ifOutDiscards*
Ext Req ID:	DIAG-005
Reference:	RFC 2863
Classifier:	MUST
Test Setup:	Switching
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Switch is configured to support at least one multicast address
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. From the test station send n_u unicast Ethernet frames to switch port A and m_u unicast Ethernet frames to switch port B, with all frames addressed to switch port C and a transmission rate sufficiently high to oversubscribe port C. 2. Count the number of frames c_u that are forwarded at port C. 3. Check that the MIB counter *ifOutUcastPkts* of port C is equal to $n_u + m_u$ and that the MIB counter *ifOutDiscards* of Port C is equal to $n_u + m_u - c_u$ and that the MIB counters *ifOutMulticastPkts* and *ifOutBroadcastPkts* of port C both are zero. 4. From the test station send n_m multicast Ethernet frames to switch port A and m_m multicast Ethernet frames to switch port B, with all frames addressed to switch port C and a transmission rate sufficiently high to oversubscribe port C. 5. Count the number of frames c_m that are forwarded at port C. 6. Check that the MIB counter *ifOutMulticastPkts* of port C is equal to $n_m + m_m$ and that the MIB counter *ifOutDiscards* of Port C is increased by $n_m + m_m - c_m$ and that the MIB counters *ifOutUcastPkts* and *ifOutBroadcastPkts* of port C both remain unchanged. 7. From the test station send n_b broadcast Ethernet frames to switch port A and m_b broadcast Ethernet frames to switch port B, with a transmission rate sufficiently high to oversubscribe port C. 8. Count the number of frames c_b that are forwarded at port C.

	9. Check that the MIB counter *ifOutBroadcastPkts* of port C is equal to $n_b + m_b$ and that the MIB counter *ifOutDiscards* of Port C is increased by $n_b + m_b - c_b$ and that the MIB counters *ifOutUcastPkts* and *ifOutMulticastPkts* of port C both remain unchanged. 10. Repeat steps 1 to 9 for all ports of the switch.
Pass criteria:	3. Check that the MIB counter *ifOutUcastPkts* of port C is equal to $n_u + m_u$ and that the MIB counter *ifOutDiscards* of Port C is equal to $n_u + m_u - c_u$ and that the MIB counters *ifOutMulticastPkts* and *ifOutBroadcastPkts* of port C both are zero. 6. Check that the MIB counter *ifOutMulticastPkts* of port C is equal to $n_m + m_m$ and that the MIB counter *ifOutDiscards* of Port C is increased by $n_m + m_m - c_m$ and that the MIB counters *ifOutUcastPkts* and *ifOutBroadcastPkts* of port C both remain unchanged. 8. Check that the MIB counter *ifOutBroadcastPkts* of port C is equal to $n_b + m_b$ and that the MIB counter *ifOutDiscards* of Port C is increased by $n_b + m_b - c_b$ and that the MIB counters *ifOutUcastPkts* and *ifOutMulticastPkts* of port C both remain unchanged.
Notes:	NONE

2.10 Interface

2.10.1 100BASE-TX_Auto_MDI-X

Test ID:	INTF_001
Synopsis:	Check if 100BASE-TX port supports Auto MDI-X. Cross RX/TX pairs of 100BASE-TX and check if link can be established
Ext Req ID:	INT-001
Reference:	NONE
Classifier:	MAY
Test Setup:	Configuration
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B)
Prerequisites:	1. Link up and stable between test station and DUT port 2. Switch configured
Test procedure:	1. Read Phy register Link Status 2. Cross TX/RX pairs 3. Read Phy register Link Status
Pass criteria:	1. Link Status should report “Link up”. 3. Link Status should report “Link up”.
Notes:	Applicable only for integrated 100BASE-TX ports

2.10.2 Configuration_Via_SPI

Test ID:	INTF_002
Synopsis:	Check if DUT can be configured via SPI. Send configuration to DUT via SPI interface and check if DUT is being configured
Ext Req ID:	INT-002
Reference:	-
Classifier:	MUST
Test Setup:	Configuration
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B)
Prerequisites:	NONE
Test procedure:	1. Send configuration to DUT via SPI interface 2. Read out significant register via SPI to check, if configuration process was completed successfully
Pass criteria:	2. Register check should show values according to the applied configuration
Notes:	NONE

3 Appendix A – Test Setups

3.1 Test Setup Switching

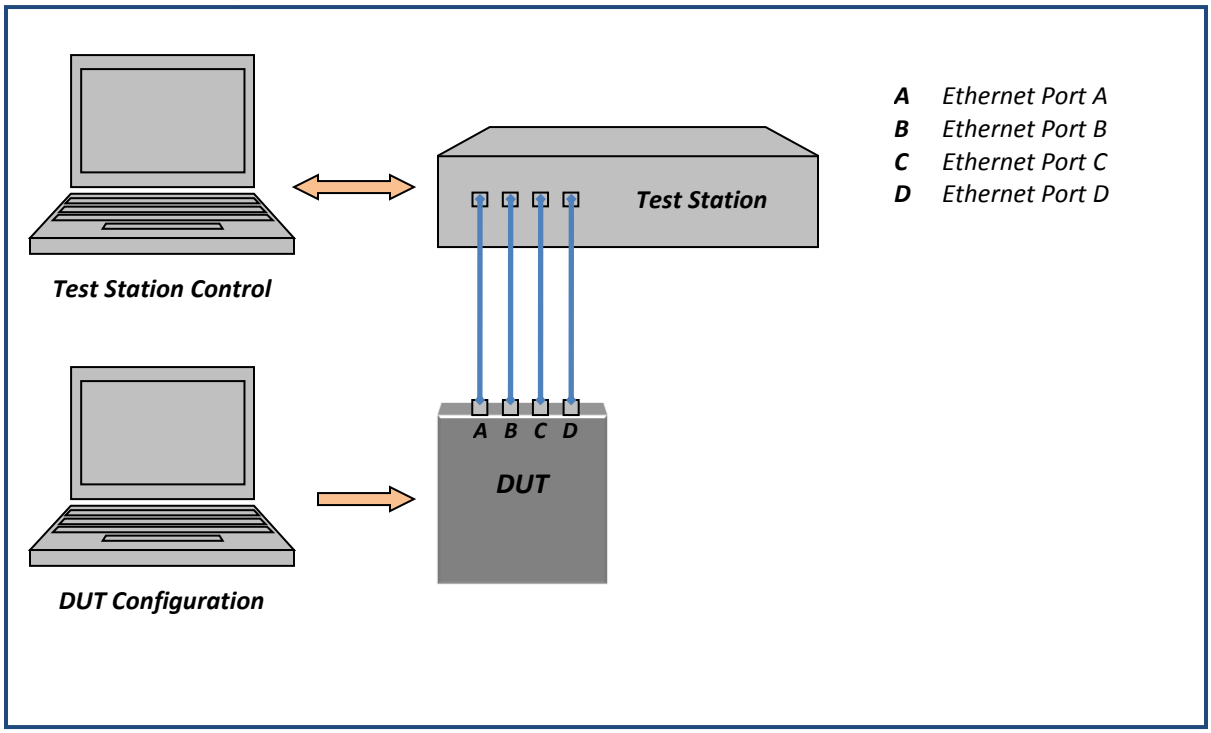

Figure 1: Switching

3.2 Test Setup Configuration

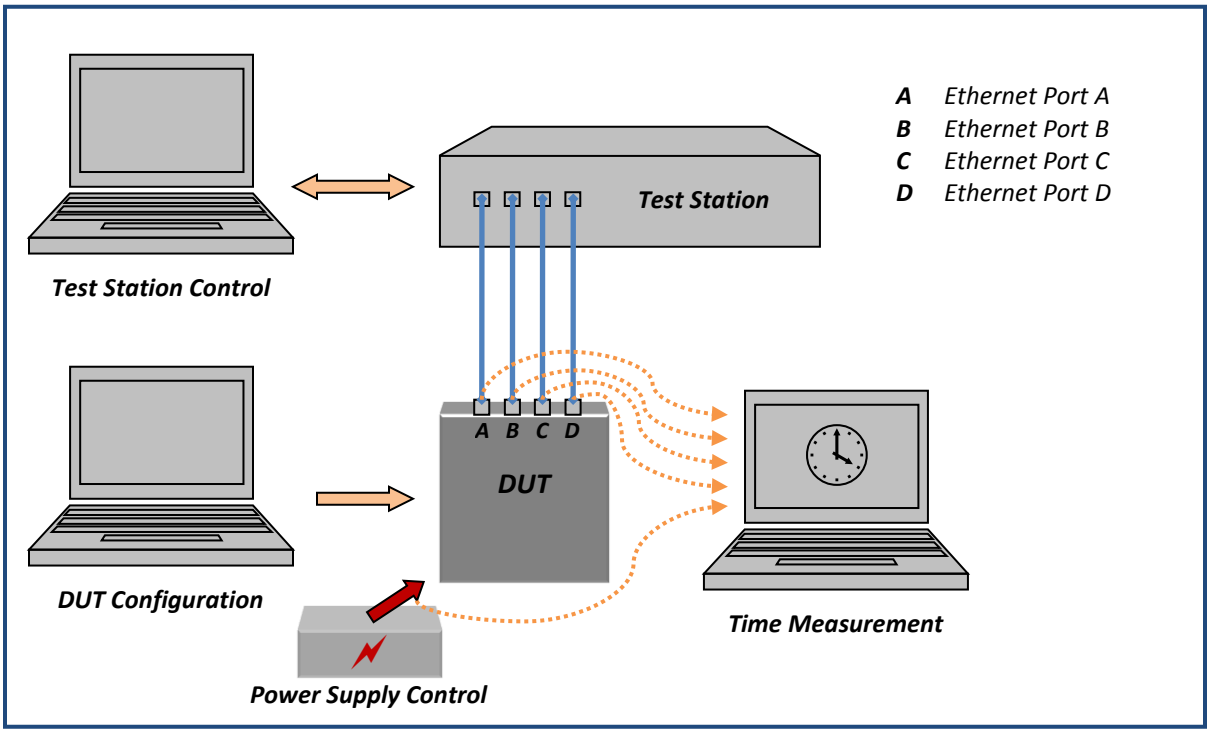

Figure 2: Configuration

3.3 Test Setup Time Sensitive Networking

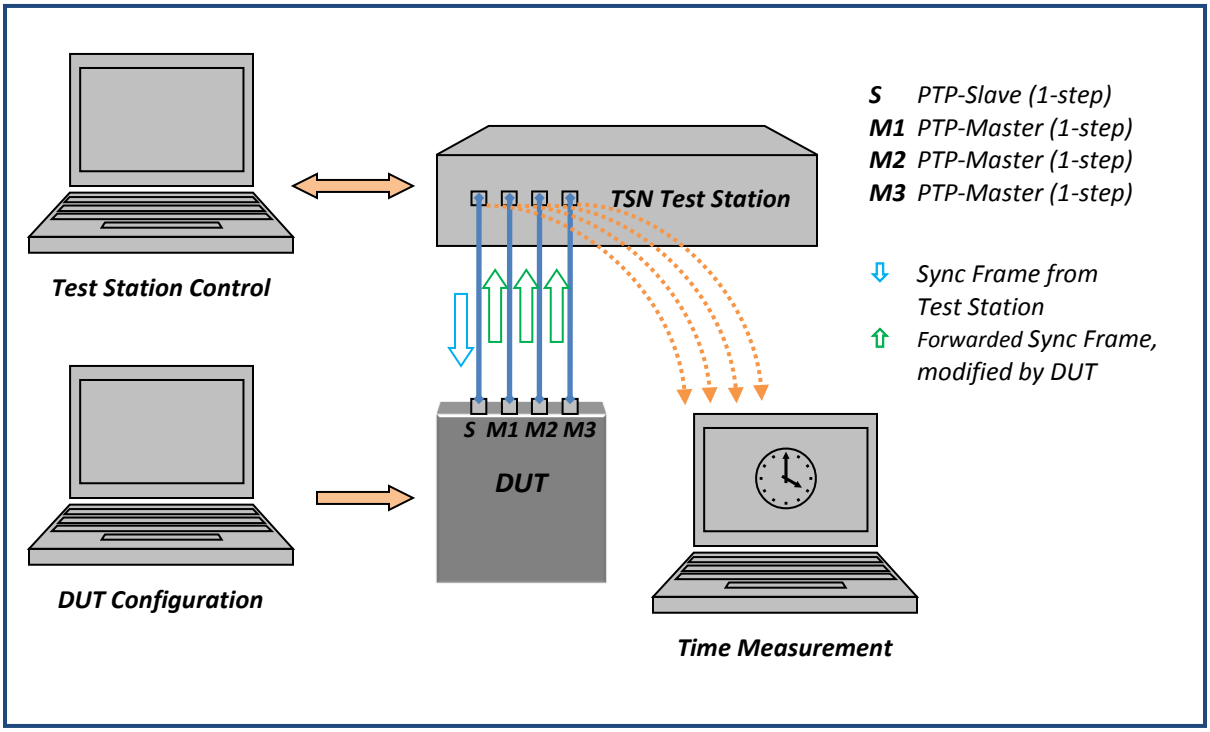

Figure 3: Time Synchronization 1-Step-Clock

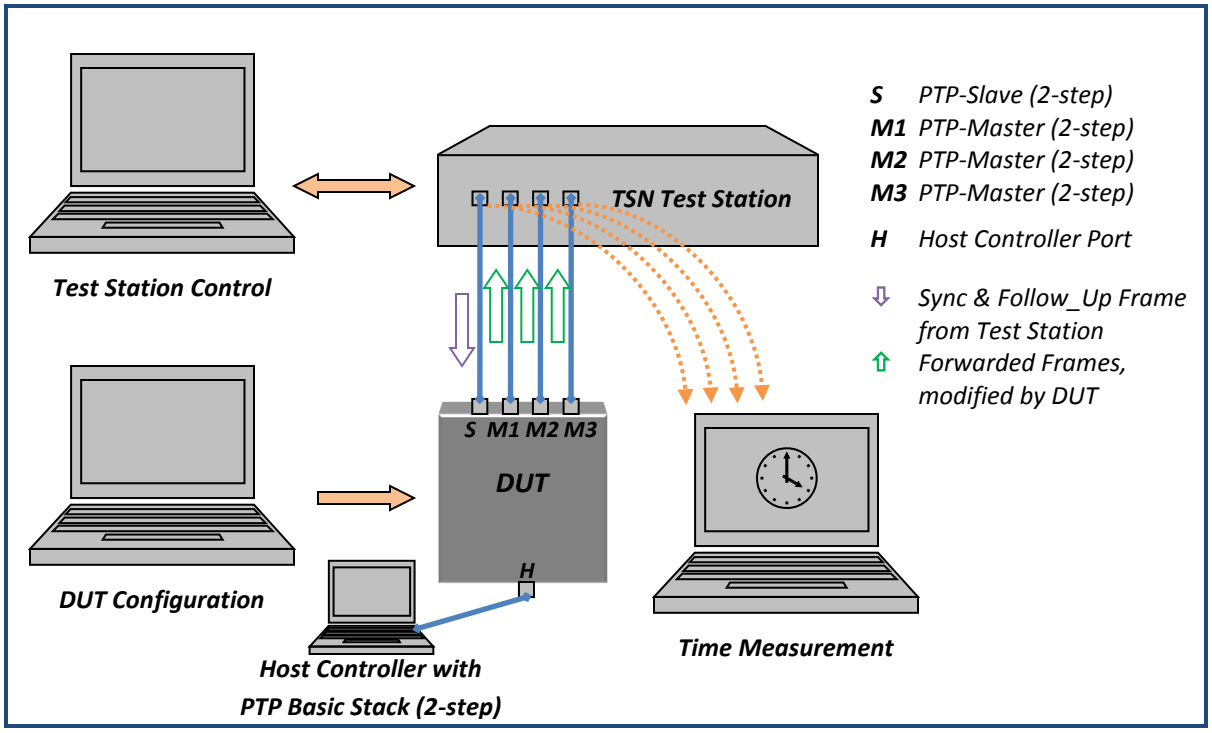

Figure 4: Time Synchronistation 2-Step-Clock

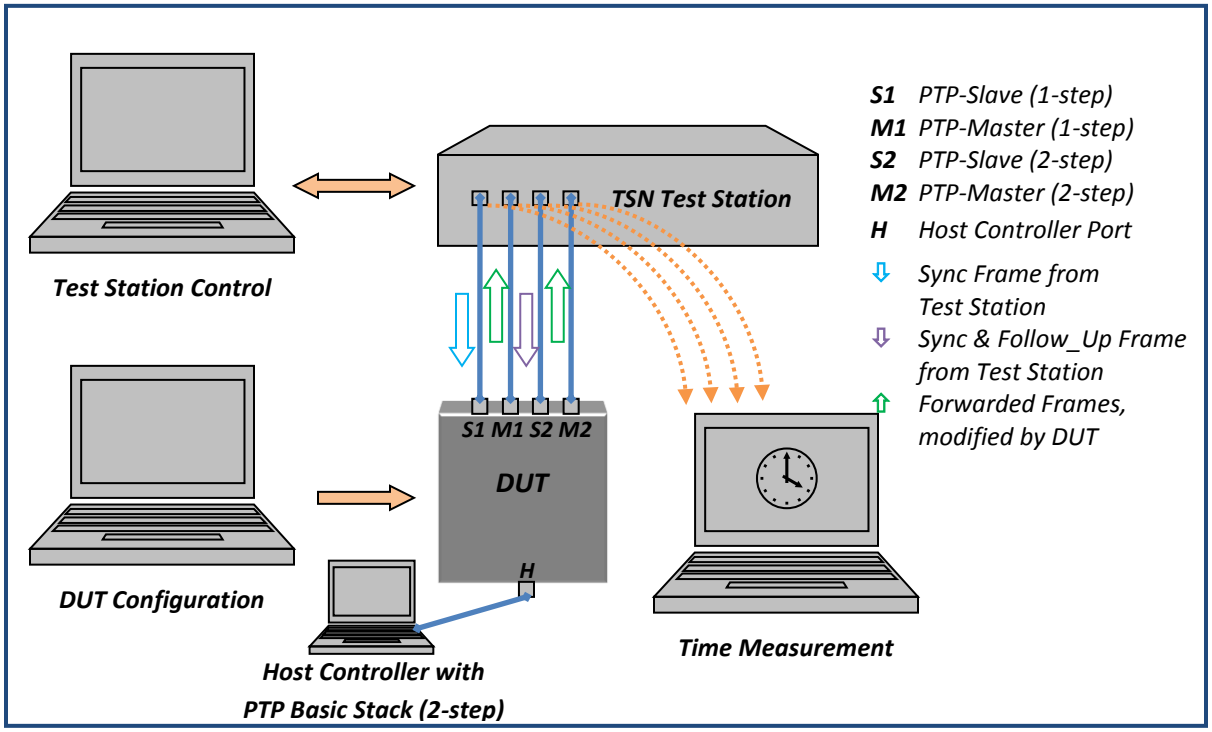

Figure 5: Time Synchronisation 1-Step and 2-Step Clock

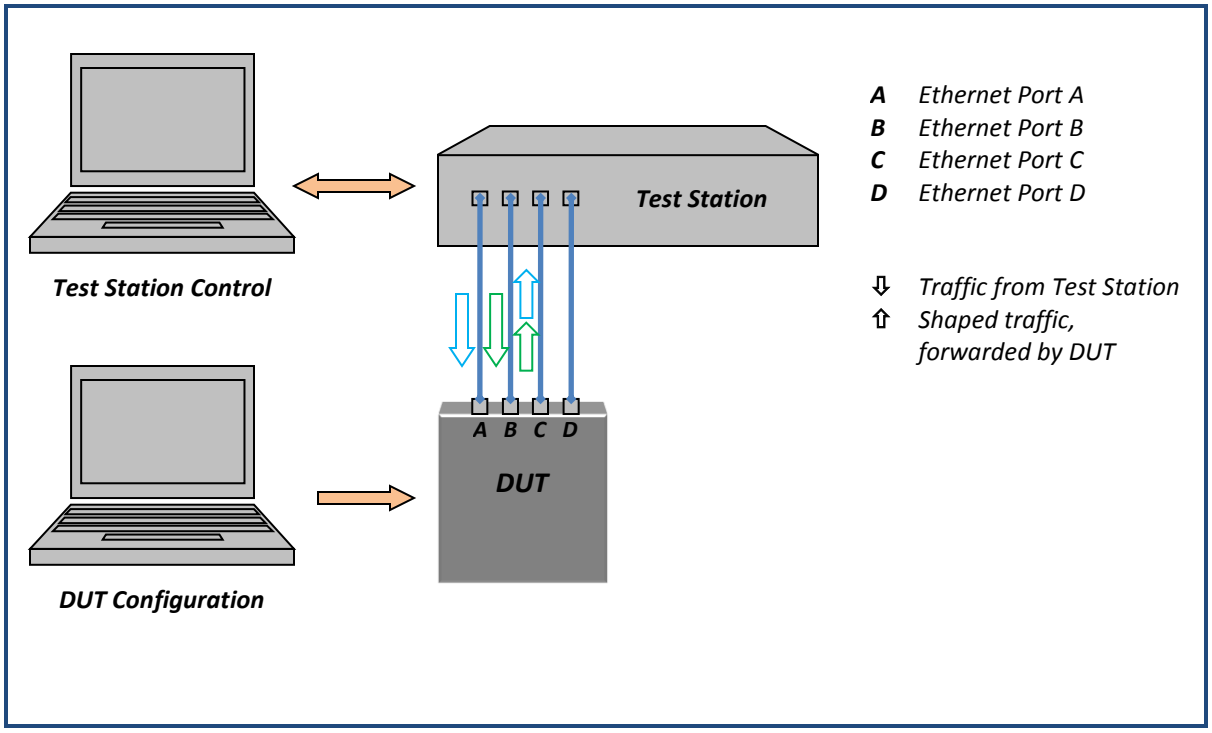

Figure 6: Shaping

3.4 Test Setup VLAN

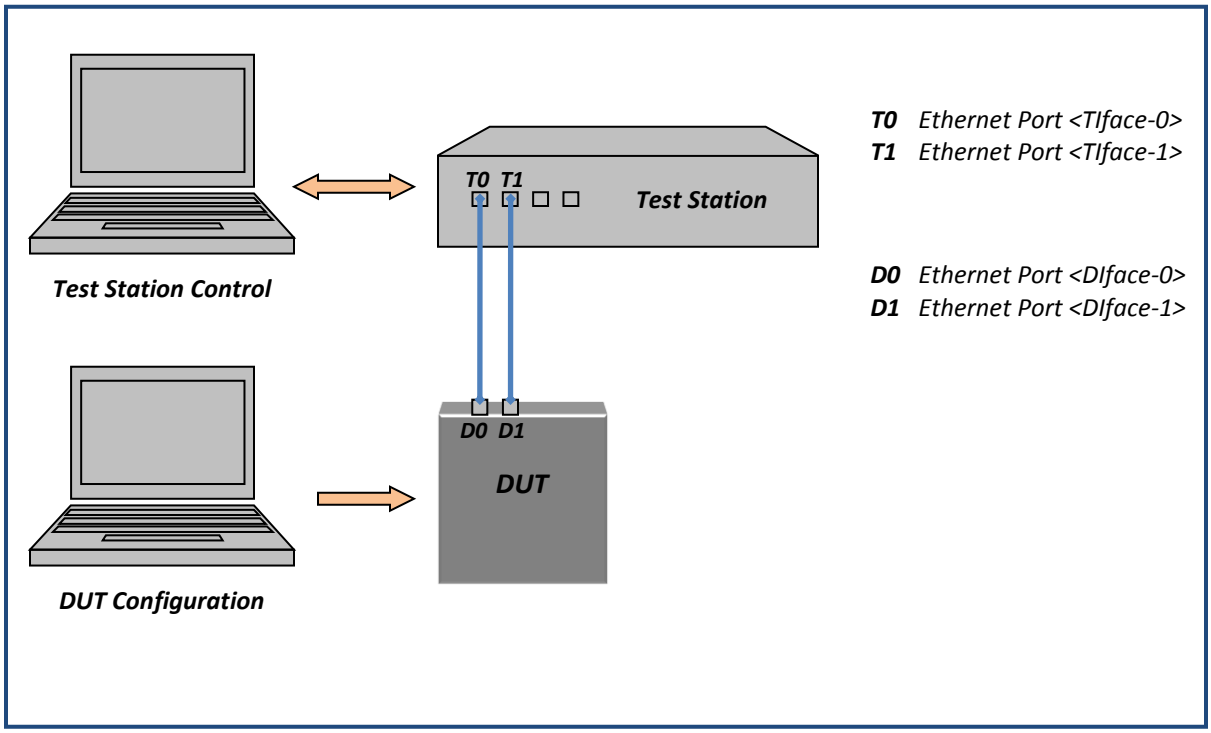

Figure 7: SETUP 1

Tests that indicate SETUP 1 require two ports connnected to the DUT

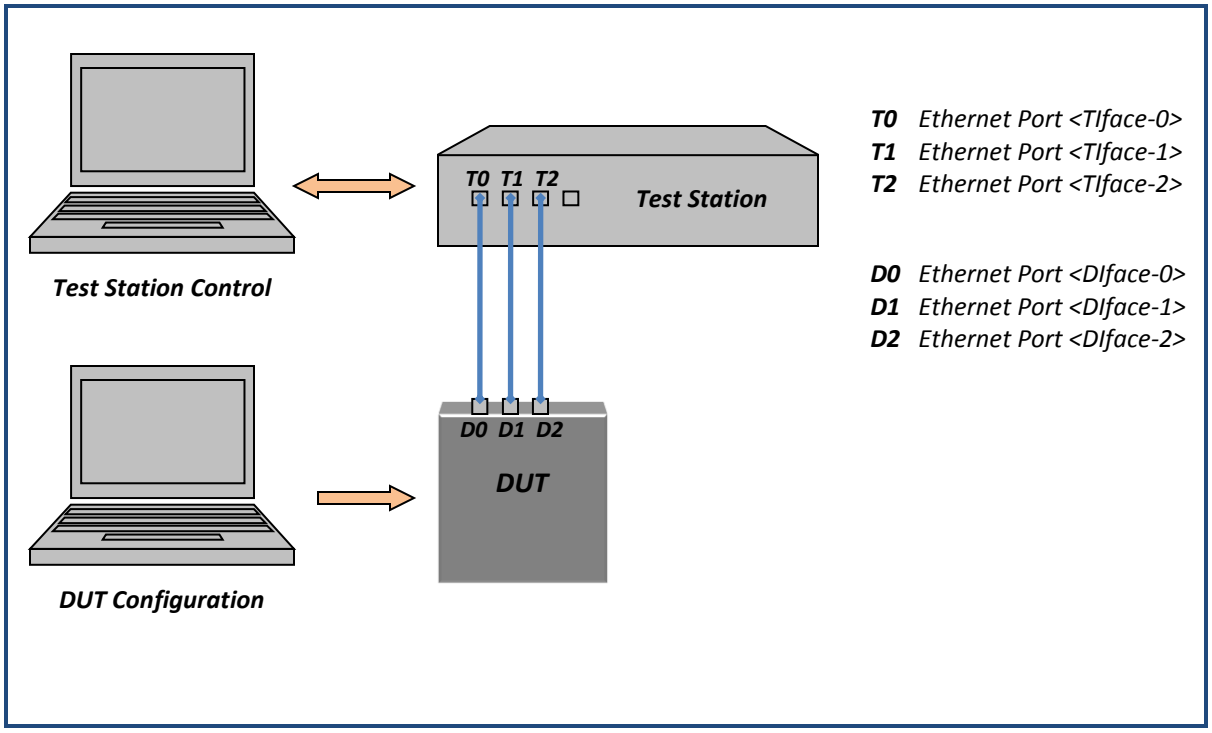

Figure 8: SETUP 2

Tests that indicate SETUP 2 require three ports connnected to the DUT

4 Appendix B

As long as not mentioned otherwise in the test case itself, the following configuration parameters have to be set by deafault.

4.1 Standard Configuration for switching und forwarding

4.1.1 General

- Broadcast/Multicast storm protection disabled
- Rate limitation disabled
- Jumbo frame support disabled

4.1.2 Address learning

- aging time: 300s
- Default behavior for unlearned destination MAC addresses
    - Flooding to all ports

4.1.3 VLAN

- At least two VLAN must be configured
- Shared VLAN learning (SVL) shall be used
- Double tagging shall not be used

4.1.4 QoS

- Scheduling Algorithm: Strict Priority

4.2 Standard configuration for VLAN test cases

The following configuration shall be used for conducting the test cases of chapter 2.4.1 IEEE 802.1Q - VLAN.

4.2.1 Topology related configuration

VLAN Configuration 2 Port Membership			
	<DIface-0>	<DIface-1>	<DIface-2>
VLAN <VID1>	VLAN-tagged	VLAN-tagged	VLAN-tagged

TEST STATION simulates a bridge B1 with three ports connected to DUT ports <DIface-0>, <DIface-1>, and <DIface-2>. One VLAN is configured on the DUT with VLAN ID <VID1> and the port membership shown in table VLAN Configuration 2 Port Membership. The PVIDs of <DIface-0>, <DIface-1>, and <DIface-2> all are <DefaultPVID>.

VLAN Configuration 3 Port Membership		
	<DIface-0>	<DIface-1>
VLAN <VID1>	VLAN-tagged	VLAN-tagged

TEST STATION simulates a bridge B1 with two ports connected to DUT port <DIface-0> and <DIface-1>. One VLAN is configured on the DUT with VLAN ID <VID1> and the port membership shown in table VLAN Configuration 3 Port Membership. The PVIDs of <DIface-0> and <DIface-1> both are <DefaultPVID>.

VLAN Configuration 4 Port Membership		
	<DIface-0>	<DIface-1>
VLAN <VID1>	VLAN-tagged	untagged
VLAN <VID2>	VLAN-tagged	VLAN-tagged

TEST STATION simulates a bridge B1 with two ports connected to DUT ports <DIface-0> and <DIface-1>. Two VLANs are configured on the DUT with VLAN IDs <VID1> and <VID2> and the port membership shown in table VLAN Configuration 4 Port Membership. The PVIDs of <DIface-0> and <DIface-1> are <DefaultPVID> and <VID1>, respectively.

VLAN Configuration 5 Port Membership		
	<DIface-0>	<DIface-1>
VLAN <VID1>	untagged	untagged

TEST STATION simulates a bridge B1 with two ports connected to DUT port <DIface-0> and <DIface-1>. One VLAN (VLAN ID <VID1>) is configured on the DUT with the port membership shown in table VLAN Configuration 5 Port Membership. The PVIDs of <DIface-0> and <DIface-1> both are <VID1>.

VLAN Configuration 6 Port Membership		
	<DIface-0>	<DIface-1>
VLAN <VID1>	VLAN-tagged	untagged

TEST STATION simulates a bridge B1 with two ports connected to DUT port <DIface-0> and DIface-1>. One VLAN (VLAN ID <VID1>) is configured on the DUT with the port membership shown in table VLAN Configuration 6 Port Membership. The PVIDs of <DIface-0> and <DIface-1> are <DefaultPVID> and <VID1>, respectively.

VLAN Configuration 7 Port Membership			
	<DIface-0>	<DIface-1>	<DIface-2>
VLAN <VID1>	VLAN-tagged	VLAN-tagged	VLAN-tagged
VLAN <VID2>	VLAN-tagged	VLAN-tagged	VLAN-tagged

TEST STATION simulates a bridge B1 with three ports connected to DUT ports <DIface-0>, <DIface-1>, and <DIface-2>. Two VLANs (VLAN ID <VID1> and <VID2>) are configured on the DUT with the port membership shown in table VLAN Configuration 7 Port Membership. The PVIDs of <DIface-0>, <DIface-1>, and <DIface-2> all are <DefaultPVID>.

4.2.2 Parameters

Parameter used in test	Description
<TIface-0>	This denotes the first interface of the simulated host of the TEST STATION
<DIface-0>	This denotes the first DUT interface to which TEST STATION is connected.
<TIface-1>	This denotes the second interface of the simulated host of the TEST STATION

<DIface-1>	This denotes the second DUT interface to which TEST STATION is connected.
<TIface-2>	This denotes the third interface of the simulated host of the TEST STATION
<DIface-2>	This denotes the third DUT interface to which TEST STATION is connected.
<ParamListenTime>	This is the maximum time interval for which TEST STATION waits for a packet for cases when a certain event has been triggered on the DUT either by some protocol timer or using some external mechanism.
<ParamToleranceTime>	This value depicts the time variance associated to any wait-event. It is a constant time and it is specific to each test cases.
<ParamProcessTime>	Time to allow DUT to process a certain command and update behaviour.
<unusedMACAddr-0>	The first unused MAC address that the TEST STATION can use for emulating specific topologies needed in test.
<unusedMACAddr-X>	The X-th unused MAC address that the TEST STATION can use for emulating specific topologies needed in test. This is auto generated as <unusedMACAddr-0> + X by adding X to the bits of the first address.
<dut-uses-default-vlan>	• TRUE The DUT supports a default VLAN that cannot be deleted. • FALSE The DUT does not support a default VLAN. Default value: TRUE
<dut-default-vid>	If the DUT supports a default VLAN, use this entry to specify its VID. Default value: 0
<dut-mac-address>	This is the MAC Address of the individual MAC Entity associated with the port. Default value: 00:00:00:00:00:00
<unusedVID-0>	The first unused VLAN address that the TEST STATION can use for emulating specific topologies needed in test.
<unusedVID-X>	The X-th unused VID address that the TEST STATION can use for emulating specific topologies needed in test. This is auto generated as <unusedVID-0> + X