ONVIF®

Event Handling Device Test Specification

Version 21.12

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REVISION HISTORY

Vers.	Date	Description
17.06	Jun 15, 2017	First issue. Was created by splitting Base Test Specification.
17.12	Sept 19, 2017	The following test cases were added according to #1480: EVENT-2-1-28 BASIC NOTIFICATION INTERFACE - UNSUBSCRIBE EVENT-3-1-36 REALTIME PULLPOINT SUBSCRIPTION - UNSUBSCRIBE The following test cases were changed according to #1480: EVENT-2-1-21 renamed from BASIC NOTIFICATION INTERFACE - UNSUBSCRIBE to BASIC NOTIFICATION INTERFACE - UNSUBSCRIBE (NEGATIVE TEST) EVENT-3-1-19 renamed from REALTIME PULLPOINT SUBSCRIPTION - UNSUBSCRIBE to REALTIME PULLPOINT SUBSCRIPTION - UNSUBSCRIBE (NEGATIVE TEST)
17.12	Oct 30, 2017	The following test case was added according to #1478: EVENT-3-1-37 REALTIME PULLPOINT SUBSCRIPTION – MAXIMUM SUPPORTED NUMBER OF NOTIFICATION PULL POINTS
17.12	Oct 31, 2017	The following test case was updated according to #1401: EVENT-3-1-12 REALTIME PULLPOINT SUBSCRIPTION – RENEW EVENT-3-1-19 REALTIME PULLPOINT SUBSCRIPTION – UNSUBSCRIBE EVENT-3-1-20 REALTIME PULLPOINT SUBSCRIPTION – TIMEOUT
18.06	Apr 17, 2018	The following test cases were added according to #1340: EVENT-2-1-29 BASIC NOTIFICATION INTERFACE - MESSAGE CONTENT FILTER EVENT-3-1-38 REALTIME PULLPOINT SUBSCRIPTION - MESSAGE CONTENT FILTER
18.06	Jun 21, 2018	Reformatting document using new template
20.06	Feb 25, 2020	The following were changed according to #1995: EVENT-5-1-1 EVENT SERVICE CAPABILITIES (steps 5, and 6 added) EVENT-5-1-2 GET SERVICES AND EVENT SERVICE CAPABILITIES CONSISTENCY (Note added) EVENT-7-1-1 ADD EVENT BROKER CONFIGURATION (new) EVENT-7-1-2 MODIFY EVENT BROKER CONFIGURATION (new) EVENT-7-1-3 DELETE EVENT BROKER CONFIGURATION (new)

		EVENT-7-2-1 MQTT EVENTS PUBLISHING (MQTT, QoS=0) (new) EVENT-7-2-2 MQTT EVENTS PUBLISHING (MQTT TLS, QoS=0) (new) EVENT-7-2-3 MQTT EVENTS PUBLISHING (MQTT OVER WEBSOCKET, QoS=0) (new) EVENT-7-2-4 MQTT EVENTS PUBLISHING (MQTT TLS OVER WEBSOCKET, QoS=0) (new) EVENT-7-2-5 MQTT EVENTS PUBLISHING (MQTT, QoS=1) (new) EVENT-7-2-6 MQTT EVENTS PUBLISHING (MQTT, QoS=2) (new) EVENT-7-2-7 MQTT EVENTS PUBLISHING - PUBLISH FILTER (MQTT, QoS=0) (new)
20.06	May 13, 2020	Pre-Requisite of all test cases updated with adding of Event Service according to #1999.
20.06	May 13, 2020	Pre-Requisite of the following test cases updated with adding of Pull-Point Notification feature according to #1999: EVENT-3-1-9 REALTIME PULLPOINT SUBSCRIPTION - CREATE PULL POINT SUBSCRIPTION EVENT-3-1-12 REALTIME PULLPOINT SUBSCRIPTION - RENEW EVENT-3-1-15 REALTIME PULLPOINT SUBSCRIPTION - PULLMESSAGES EVENT-3-1-16 REALTIME PULLPOINT SUBSCRIPTION - PULLMESSAGES FILTER EVENT-3-1-17 REALTIME PULLPOINT SUBSCRIPTION - INVALID MESSAGE CONTENT FILTER EVENT-3-1-19 REALTIME PULLPOINT SUBSCRIPTION - UNSUBSCRIBE (NEGATIVE TEST) EVENT-3-1-20 REALTIME PULLPOINT SUBSCRIPTION - TIMEOUT EVENT-3-1-22 REALTIME PULLPOINT SUBSCRIPTION - INVALID TOPIC EXPRESSION EVENT-3-1-24 REALTIME PULLPOINT SUBSCRIPTION – PULLMESSAGES AS KEEP-ALIVE EVENT-3-1-25 REALTIME PULLPOINT SUBSCRIPTION - SET SYNCHRONIZATION POINT EVENT-3-1-32 REALTIME PULLPOINT SUBSCRIPTION – PULLMESSAGES TIMEOUT EVENT-3-1-33 REALTIME PULLPOINT SUBSCRIPTION – CONJUNCTION IN PULLMESSAGES FILTER (OR OPERATION) EVENT-3-1-34 REALTIME PULLPOINT SUBSCRIPTION – TOPIC SUB-TREE IN PULLMESSAGES FILTER EVENT-3-1-35 REALTIME PULLPOINT SUBSCRIPTION – CONJUNCTION IN NOTIFY FILTER (TOPIC SUB-TREE AND OR OPERATION)

		EVENT-3-1-36 REALTIME PULLPOINT SUBSCRIPTION - UNSUBSCRIBE EVENT-3-1-37 REALTIME PULLPOINT SUBSCRIPTION – MAXIMUM SUPPORTED NUMBER OF NOTIFICATION PULL POINTS EVENT-3-1-38 REALTIME PULLPOINT SUBSCRIPTION - MESSAGE CONTENT FILTER
21.06	May 31, 2021	The following test cases and annex were updated according to #2006 and #2007: EVENT-7-2-2 MQTT EVENTS PUBLISHING (MQTT TLS, QoS=0) (new) EVENT-7-2-4 MQTT EVENTS PUBLISHING (MQTT TLS OVER WEBSOCKET, QoS=0) (new) A.13 MQTT Event Validation
21.12	Dec 15, 2021	Profile Q scope was removed from the Pre-Requisites of the following test cases according to #2204 EVENT-3-1-12 REALTIME PULLPOINT SUBSCRIPTION - RENEW

Table of Contents

1 Introduction

The goal of the ONVIF test specification set is to make it possible to realize fully interoperable IP physical security implementations from different vendors. The set of ONVIF test specifications describes the test cases need to verify the [ONVIF Network Interface Specs] and [ONVIF Conformance] requirements. Also the test cases are to be basic inputs for some Profile specification requirements. It also describes the test framework, test setup, pre-requisites, test policies needed for the execution of the described test cases.

This ONVIF Event Handling Specification acts as a supplementary document to the [ONVIF Network Interface Specs], illustrating test cases that need to be executed and passed. And also this specification also acts as an input document to the development of test tool which will be used to test the ONVIF device implementation conformance towards ONVIF standard. As the test tool performs as a Client during testing, this test tool is referred as ONVIF Client hereafter.

1.1 Scope

This ONVIF Event Handling Test Specification defines and regulates the conformance testing procedure for the ONVIF conformance devices. Conformance testing is meant to be functional black-box testing. The objective of this specification is to provide the test cases to test individual requirements of ONVIF devices according to ONVIF core services which are defined in [ONVIF Network Interface Specs].

The principal intended purposes are:

- Provide self-assessment tool for implementations.
- Provide comprehensive test suite coverage for [ONVIF Network Interface Specs].

This specification does not address the following:

- Product use cases and non-functional (performance and regression) testing.
- SOAP Implementation Interoperability test i.e. Web Service Interoperability Basic Profile version 2.0 (WS-I BP 2.0).
- Network protocol implementation Conformance test for HTTP, HTTPS, RTP and RTSP protocol.
- Wi-Fi Conformance test

The set of ONVIF Test Specification will not cover the complete set of requirements as defined in [ONVIF Network Interface Specs]; instead it would cover subset of it.

This ONVIF Event Handling Test Specification covers core parts of functional blocks in [ONVIF Network Interface Specs]. The following sections describe the brief overview and scope of each functional block.

1.1.1 Events

Event handling covers the test cases for the verification of the Event service as mentioned in [ONVIF Network Interface Specs] and [ONVIF Event WSDL].

The event handling test cases cover the following mandatory interfaces:

- Basic Notification Interface
  - This test specification provides test cases to verify the implementation of the Basic Notification Interface of a device. The mechanisms to subscribe and unsubscribe to an event are covered as well as the mechanism to renew a subscription manager and receive events via **Notify** messages. The correct use of the message content filter is also tested.
- Real Time Pull Point Notification Interface
  - Test cases to verify the implementation of the Realtime PullPoint Interface are provided by this test specification. The CreatePullPointSubscription command is tested as well as the PullMessages command in combination with message content filtering to retrieve the events.
- Seek
  - Test cases to verify the implementation of the Seek Interface are provided by this test specification. The Seek command is tested as well as the PullMessages command to retrieve the events from persistent notification storage.
- MQTT Notification Interface
  - Test cases to verify the implementation of the MQTT functionality. The scope of this specification section is to cover the following functions:
    - Get Event Brokers
    - Add Event Broker
    - Delete Event Broker
    - Publishing of events as MQTT events via protocols mqtt, mqtts, ws and wss to event broker server.

2 Normative references

- [ONVIF Conformance] ONVIF Conformance Process Specification:

  https://www.onvif.org/profiles/conformance/

- [ONVIF Profile Policy] ONVIF Profile Policy:

  https://www.onvif.org/profiles/

- [ONVIF Network Interface Specs] ONVIF Network Interface Specification documents:

  https://www.onvif.org/profiles/specifications/

- [ONVIF Core Specs] ONVIF Core Specifications:

  https://www.onvif.org/profiles/specifications/

- [ISO/IEC Directives, Part 2] ISO/IEC Directives, Part 2, Annex H:

  http://www.iso.org/directives

- [ISO 16484-5] ISO 16484-5:2014-09 Annex P:

  https://www.iso.org/obp/ui/#!iso:std:63753:en

- [SOAP 1.2, Part 1] W3C SOAP 1.2, Part 1, Messaging Framework:

  http://www.w3.org/TR/soap12-part1/

- [XML-Schema, Part 1] W3C XML Schema Part 1: Structures Second Edition:

  http://www.w3.org/TR/xmlschema-1/

- [XML-Schema, Part 2] W3C XML Schema Part 2: Datatypes Second Edition:

  http://www.w3.org/TR/xmlschema-2/

- [WS-Security] "Web Services Security: SOAP Message Security 1.1 (WS-Security 2004)", OASIS Standard, February 2006.:

  http://www.oasis-open.org/committees/download.php/16790/wss-v1.1-spec-os-SOAPMessageSecurity.pdf

- [RFC 3986] "Uniform Resource Identifier (URI): Generic Syntax", T. Berners-Lee et. al., January 2005.:

  http://www.ietf.org/rfc/rfc3986

- MQTT Version 3.1.1 Plus Errata 01, OASIS Standard Incorporating Approved Errata 01, 10 December2015:

  http://docs.oasis-open.org/mqtt/mqtt/v3.1.1/mqtt-v3.1.1.pdf

3 Terms and Definitions

3.1 Conventions

The key words "shall", "shall not", "should", "should not", "may", "need not", "can", "cannot" in this specification are to be interpreted as described in [ISO/IEC Directives Part 2].

3.2 Definitions

This section describes terms and definitions used in this document.

Profile	See ONVIF Profile Policy.
ONVIF Device	Computer appliance or software program that exposes one or multiple ONVIF Web Services.
ONVIF Client	Computer appliance or software program that uses ONVIF Web Services.
SOAP	SOAP is a lightweight protocol intended for exchanging structured information in a decentralized, distributed environment. It uses XML technologies to define an extensible messaging framework providing a message construct that can be exchanged over a variety of underlying protocols.
Device Test Tool	ONVIF Device Test Tool that tests ONVIF Device implementation towards the ONVIF Test Specification set.
Address	An address refers to a URI
Capability	The capability commands allow a client to ask for the services provided by an ONVIF device.
Network	A network is an interconnected group of devices communicating using the Internet protocol.
Proxy Server	A server that services the requests of its clients by forwarding requests to other servers. A Proxy provides indirect network connections to its clients.
Switching Hub	A device for connecting multiple Ethernet devices together, making them act as a single network segment.
Target Service	An endpoint that makes itself available for discovery.

3.3 Abbreviations

This section describes abbreviations used in this document.

DUT	Device Under Test
DP	Discovery Proxy
DNS	Domain Name System
DHCP	Dynamic Host Configuration Protocol

HTTP	Hyper Text Transport Protocol
HTTPS	Hyper Text Transport Protocol over Secure Socket Layer
IP	Internet Protocol
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
NTP	Network Time Protocol
POSIX	Portable Operating System Interface
RTSP	Real Time Streaming Protocol
RTP	Real-time Transport Protocol
UTC	Coordinated Universal Time
URI	Uniform Resource Identifier
WSDL	Web Services Description Language
WS-I BP 2.0	Web Services Interoperability Basic Profile version 2.0
XML	eXtensible Markup Language

4 Test Overview

This section describes the test setup procedure and prerequisites needed, and the test policies that should be followed for test case execution.

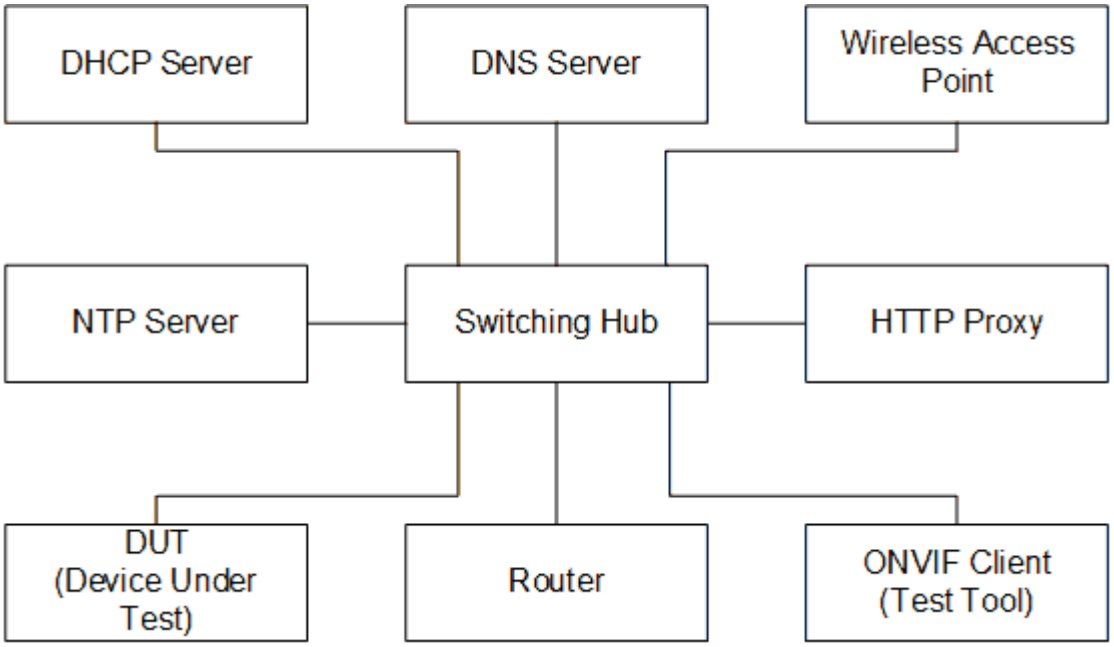
4.1 Test Setup

4.1.1 Network Configuration for DUT

The generic test configuration for the execution of test cases defined in this document is as shown below (Figure 4.1).

Based on the individual test case requirements, some of the entities in the below setup may not be needed for the execution of those corresponding test cases.

Figure 4.1. Test Configuration for DUT



DUT: ONVIF device to be tested. Hereafter, this is referred to as DUT (Device Under Test).

ONVIF Client (Test Tool): Tests are executed by this system and it controls the behavior of the DUT. It handles both expected and unexpected behavior.

HTTP Proxy: provides facilitation in case of RTP and RTSP tunneling over HTTP.

Wireless Access Point: provides wireless connectivity to the devices that support wireless connection.

DNS Server: provides DNS related information to the connected devices.

DHCP Server: provides IPv4 Address to the connected devices.

NTP Server: provides time synchronization between ONVIF Client and DUT.

Switching Hub: provides network connectivity among all the test equipments in the test environment. All devices should be connected to the Switching Hub. When running multiple test instances in parallel on the same network, the Switching Hub should be configured to use filtering in order to avoid multicast traffic being flooded to all ports, because this may affect test stability.

Router: provides router advertisements for IPv6 configuration.

4.2 Prerequisites

The pre-requisites for executing the test cases described in this Test Specification are

- The DUT shall be configured with an IPv4 address.
- The DUT shall be IP reachable [in the test configuration].
- The DUT shall be able to be discovered by the Test Tool.
- The DUT shall be configured with the time i.e. manual configuration of UTC time and if NTP is supported by DUT, then NTP time shall be synchronized with NTP Server.
- The DUT time and ONVIF Client Test tool time shall be synchronized with each other either manually or by common NTP server

4.3 Test Policy

This section describes the test policies specific to the test case execution of each functional block.

The DUT shall adhere to the test policies defined in this section.

4.3.1 Event Handling

Prior to the execution of Event handling test cases, DUT shall be discovered by the ONVIF Client and it shall demonstrate event capabilities to ONVIF Client using the device management service.

If the DUT supports "property events" the ONVIF Client uses the SetSynchronizationPoint method from the event service to trigger events for testing Basic Notification Interface, Realtime PullPoint Interface; the ONVIF Client uses the SetSynchronizationPoint from the Media service to trigger events for testing metadata streaming.

If the DUT does not support "property events", the event should be triggered manually.

The time of the ONVIF Client and the DUT should be synchronized.

In certain test cases the Test Tool may create a Subscription Manager representing the subscription. In such cases the procedure will make sure that all newly created Subscription Managers are deleted at the end of the test procedure.

In certain test cases the Test Tool may create or change media entities (e.g. add a MetadataConfiguration to a profile). In such cases the procedure will delete those modifications at the end of the test procedure.

Refer to Section 5 for Event handling Test Cases.

4.3.1.1 MQTT Notification Interface

The test policies specific to the test case execution of MQTT functional block:

- DUT shall give the MaxEventBrokers event service capability > 0, if DUT supports MQTT functionality. Otherwise, these test cases will be skipped.
- The following tests are performed about MQTT Notification Interface
  - The DUT provides existing event broker configurations via **GetEventBrokers** command.
  - The DUT adds new event broker configuration via **AddEventBroker** command.
  - The DUT modifies an event broker configuration via **AddEventBroker** command.
  - The DUT deletes an event broker configuration via **DeleteEventBroker** command.
  - If DUT supports mqtt protocol:
    - The DUT publishes MQTT events to event broker server via MQTT protocol.
  - If DUT supports mqtts protocol:
    - The DUT publishes MQTT events to event broker server via MQTT over TLS protocol.
  - If DUT supports ws protocol:
    - The DUT publishes MQTT events to event broker server via websocket protocol.
  - If DUT supports wss protocol:
    - The DUT publishes MQTT events to event broker server via websocket protocol over TLS.

Please, refer to Section 5.7 for MQTT Notification Interface Test Cases.

5 Event Handling Test Cases

5.1 Event Properties

5.1.1 GET EVENT PROPERTIES

Test Case ID: EVENT-1-1-2

Specification Coverage: GetEventProperties

Feature under test: GetEventProperties

WSDL Reference: event.wsdl

Test Purpose: To verify DUT GetEventProperties command.

Pre-Requisite: Event Service is supported by the DUT.

Test Configuration: ONVIF Client and DUT

Test Procedure:

1. Start an ONVIF Client.
2. Start the DUT.
3. ONVIF Client will invoke **GetEventProperties** request to retrieve information about the FilterDialects, schema files and supported topics of the DUT.
4. Verify that DUT sends **GetEventPropertiesResponse** message.
5. Validate that the mandatory TopicExpressionDialects are supported by the DUT (http://docs.oasis-open.org/wsn/t-1/TopicExpression/Concrete and http://www.onvif.org/ver10/tev/topicExpression/ConcreteSet).
6. Validate that the mandatory MessageContentFilterDialects is supported by the DUT (http://www.onvif.org/ver10/tev/messageContentFilter/ItemFilter).
7. Verify that the DUT returns a valid topic namespace.
8. Verify that the DUT supports at least one TopicSet, validate that the TopicSet is well formed.

Test Result:

PASS –

- DUT passes all assertions.

FAIL –

- The DUT did not send a **GetEventPropertiesResponse** message.
- The DUT did not support the mandatory TopicExpressionDialects.
- The DUT did not support the mandatory MessageContentFilterDialects.
- The DUT did not support a valid topic namespace.
- The DUT did not support at least one TopicSet or the TopicSet is invalid.
- The DUT did not send a valid WS-Addressing Action URI in SOAP Header for **GetEventPropertiesResponse** message (see Annex A.3).

5.2 Basic Notification Interface

5.2.1 BASIC NOTIFICATION INTERFACE - SUBSCRIBE

Test Case ID: EVENT-2-1-9

Specification Coverage: Basic Notification Interface

Feature Under Test: Subscribe

WSDL Reference: event.wsdl

Test Purpose: To verify DUT Subscribe command.

Pre-Requisite: Event Service is supported by the DUT.

Test Configuration: ONVIF Client and DUT

Test Procedure:

1. Start an ONVIF Client.
2. Start the DUT.
3. ONVIF Client will invoke **Subscribe** request to instantiate a Subscription Manager. The **Subscribe** request does not contain a TopicExpression or a Message Content Filter. The Message contains an InitialTerminationTime of 10s to ensure that the Subscription is terminated after end of this test.
4. Verify that the DUT sends **SubscribeResponse** message. Verify that a valid SubscriptionReference is returned (valid EndpointReference); verify that valid values for CurrentTime and TerminationTime are returned (TerminationTime >= CurrentTime + InitialTerminationTime).

Test Result:

PASS –

- DUT passes all assertions.

FAIL –

- The DUT did not send **SubscribeResponse** message.
- The DUT did not return a valid SubscriptionReference.
- The DUT did not return valid values for CurrentTime and TerminationTime.
- The DUT did not send valid WS-Addressing Action URI in SOAP Header for **SubscribeResponse** message (see Annex A.3).

Note: The Subscription Manager has to be deleted at the end of the test either by calling unsubscribe or through a timeout.

Note: If the DUT cannot accept the set value to an InitialTerminationTime, ONVIF Client retries to send the Subscribe request with MinimumTime value included in UnacceptableInitialTerminationTimeFault.

5.2.2 BASIC NOTIFICATION INTERFACE - RENEW

Test Case ID: EVENT-2-1-12

Specification Coverage: Basic Notification Interface

Feature Under Test: Subscribe, Renew

WSDL Reference: event.wsdl

Test Purpose: To verify Renew command.

Pre-Requisite: Event Service is supported by the DUT.

Test Configuration: ONVIF Client and DUT

Test Procedure:

1. Start an ONVIF Client.
2. Start the DUT.
3. ONVIF Client will invoke **Subscribe** request with an InitialTerminationTime of 10s.
4. Verify that the DUT sends a **SubscribeResponse**.

5. Validate CurrentTime and TerminationTime (TerminationTime >= CurrentTime + InitialTerminationTime).
6. ONVIF Client will invoke **Renew** request with a TerminationTime of 10s to ensure that the Subscription times out after 10s.
7. Verify that the DUT sends a **RenewResponse** message.
8. Verify CurrentTime and TerminationTime (TerminationTime >= CurrentTime + TerminationTime).
9. ONVIF Client will invoke **Renew** request with a TerminationTime in xs:dateTime format. The TerminationTime shall be current time + 10s.
10. Verify that the DUT sends a **RenewResponse** message.
11. Verify CurrentTime and TerminationTime (TerminationTime(Response) >= TerminationTime(Request) and CurrentTime(Response) <= TerminationTime(Response)).

Test Result:

PASS –

- DUT passes all assertions.

FAIL –

- The DUT did not send **SubscribeResponse** message.
- The DUT did not send valid values for CurrentTime and TerminationTime.
- The DUT did not send a **RenewResponse** message.
- The DUT did not send valid values for CurrentTime and TerminationTime.
- The DUT did not send valid WS-Addressing Action URI in SOAP Header for **SubscribeResponse** message (see Annex A.3).
- The DUT did not send valid WS-Addressing Action URI in SOAP Header for **RenewResponse** message (see Annex A.3).

Note: The Subscription Manager has to be deleted at the end of the test either by calling unsubscribe or through a timeout.

Note: If DUT cannot accept the set value to an InitialTerminationTime, ONVIF Client retries to send the Subscribe request with MinimumTime value which is contained in UnacceptableInitialTerminationTimeFault.

Note: If DUT cannot accept the set value to a TerminationTime, ONVIF Client retries to send the Renew request MinimumTime value included in UnacceptableTerminationTimeFault.

5.2.3 BASIC NOTIFICATION INTERFACE - NOTIFY

Test Case ID: EVENT-2-1-17

Specification Coverage: Basic Notification Interface, SetSynchronizationPoint

Feature Under Test: Subscribe, Unsubscribe, SetSynchronizationPoint, Notify

WSDL Reference: event.wsdl

Test Purpose: To verify **Notify** message

Pre-Requisite: Event Service is supported by the DUT. The DUT shall provide at least one event. The test operator has to ensure that the event is triggered and sent out. ONVIF Client will invoke a SetSynchronizationPoint request. If the DUT does not support property events or if it is not possible to invoke a SetSynchronizationPoint, the test operator has to trigger the event manually.

Test Configuration: ONVIF Client and DUT

Test Procedure:

1. Start an ONVIF Client.
2. Start the DUT.
3. ONVIF Client will invoke **Subscribe** request with an InitialTerminationTime of 60s to ensure that the SubscriptionManager is deleted after one minute.
4. Verify that the DUT sends a **SubscribeResponse** with valid values for SubscriptionReference, TerminationTime and CurrentTime TerminationTime >= CurrentTime + InitialTerminationTime.
5. Invoke **SetSynchronizationPoint** request to trigger a property event.
6. Verify that DUT sends **SetSynchronizationPointResponse**.
7. If the DUT does not support property events, the test operator has to trigger an event manually.
8. Verify that DUT sends **Notify** message(s).
9. Verify received **Notify** messages (correct value for UTC time, TopicExpression and wsnt:Message).

Test Result:

PASS –

- DUT passes all assertions.

FAIL –

- The DUT did not send **SubscribeResponse** message.
- The DUT did not send valid SubscriptionReference.
- The DUT did not send a **SetSynchronizationPointResponse** message.
- The DUT did not a **Notify** message.
- The DUT sends an invalid **Notify** message.
- DUT did not send valid WS-Addressing Action URI in SOAP Header for **SubscribeResponse** message (see Annex A.3).
- DUT did not send valid WS-Addressing Action URI in SOAP Header for **SetSynchronizationPointResponse** message (see Annex A.3).
- DUT did not send valid WS-Addressing Action URI in SOAP Header for **Notify** message (see Annex A.3).
- DUT did not send WS-Addressing MessageID SOAP Header if WS-Addressing ReplyTo is included in **Notify** message.
- DUT sent invalid WS-Addressing MessageID.
- DUT use wrong HTTP address for **Notify** message.

Note: The Subscription Manager has to be deleted at the end of the test either by calling unsubscribe or through a timeout.

Note: See Annex A.1 for instructions on how to construct Subscribe when it is required for the ONVIF Client to receive all events supported by the DUT.

5.2.4 BASIC NOTIFICATION INTERFACE - NOTIFY FILTER

Test Case ID: EVENT-2-1-18

Specification Coverage: Basic Notification Interface, SetSynchronizationPoint

Feature Under Test: GetEventProperties, Subscribe, Unsubscribe, SetSynchronizationPoint, Notify

WSDL Reference: event.wsdl

Test Purpose: To verify that the device sends Notification messages; to verify if the DUT handles event filtering in a correct way.

Pre-Requisite: Event Service is supported by the DUT. The DUT shall provide at least one event. The test operator has to ensure that the event is triggered and sent out. ONVIF Client will invoke a SetSynchronizationPoint request. If the DUT does not support property event or if it is not possible to invoke a SetSynchronizationPoint, the test operator has to trigger the event manually.

Test Configuration: ONVIF Client and DUT

Test Procedure:

1. Start an ONVIF Client.
2. Start the DUT.
3. ONVIF Client will invoke **GetEventProperties** request.
4. Verify that the DUT sends a **GetEventPropertiesResponse** message, select one Topic.
5. ONVIF Client will invoke **Subscribe** request with this Topic as Filter and an InitialTerminationTime of 60s to ensure that the SubscriptionManager is deleted after one minute.
6. Verify that the DUT sends a **SubscribeResponse** message with valid values for SubscriptionReference, TerminationTime and CurrentTime TerminationTime >= CurrentTime + 60S.
7. Invoke **SetSynchronizationPoint** request to trigger an event.
8. Verify that the DUT sends **SetSynchronizationPointResponse** message.
9. If the DUT does not support property events, the operator has to trigger an event manually.
10. Verify that the DUT sends **Notify** message(s).
11. Check that at least one **Notify** message that contains a property event is returned. Verify this **Notify** messages (correct value for Utc time, TopicExpression and wsnt:Message).
12. Check if **Notify** message(s) are filtered according to the selected Filter.

Test Result:

PASS –

- DUT passes all assertions.

FAIL –

- The DUT did not send a **GetEventPropertiesResponse** message.
- The DUT did not send **SubscribeResponse** message.
- The DUT did not send valid SubscriptionReference.
- The DUT did not send a **SetSynchronizationPointResponse** message.
- The DUT did not a **Notify** message that contains a property event
- The DUT send an invalid **Notify** message.
- The DUT did not send valid WS-Addressing Action URI in SOAP Header for **GetEventPropertiesResponse** message (see Annex A.3).
- The DUT did not send valid WS-Addressing Action URI in SOAP Header for **SubscribeResponse** message (see Annex A.3).
- The DUT did not send valid WS-Addressing Action URI in SOAP Header for **SetSynchronizationPointResponse** message (see Annex A.3).
- The DUT did not send valid WS-Addressing Action URI in SOAP Header for **Notify** message (see Annex A.3).
- DUT did not send WS-Addressing MessageID in SOAP Header if WS-Addressing ReplyTo is included in **Notify** message.
- DUT sent invalid WS-Addressing MessageID in SOAP Header in **Notify** message.
- DUT used wrong HTTP address for **Notify** message.

Note: The Subscription Manager has to be deleted at the end of the test either by calling unsubscribe or through a timeout.

5.2.5 BASIC NOTIFICATION INTERFACE - INVALID MESSAGE CONTENT FILTER

Test Case ID: EVENT-2-1-19

Specification Coverage: Basic Notification Interface

Feature Under Test: Subscribe

WSDL Reference: event.wsdl

Test Purpose: To verify that a correct error message "InvalidFilterFault" or "InvalidMessageContentExpressionFault" is returned if a Subscribe Request with an invalid MessageContentFilter is invoked.

Pre-Requisite: Event Service is supported by the DUT.

Test Configuration: ONVIF Client and DUT

Test Procedure:

1. Start an ONVIF Client.
2. Start the DUT.
3. ONVIF Client will invoke **Subscribe** request with an invalid Filter (boolean (// tt:SimpleItem[@Name="xyz" and @Value="xyz"])).
4. Verify that the DUT generates an "InvalidFilterFault" or an "InvalidMessageContentExpressionFault" fault message.
5. Validate the fault message (valid UTC time, valid description).

Test Result:

PASS –

- DUT passes all assertions.

FAIL –

- The DUT did not send an "InvalidFilterFault" or "InvalidMessageContentExpressionFault" fault message.
- The DUT did not send a valid fault message.
- The DUT did not send valid WS-Addressing Action URI in SOAP Header for Fault message (see Annex A.3).

5.2.6 BASIC NOTIFICATION INTERFACE - UNSUBSCRIBE (NEGATIVE TEST)

Test Case ID: EVENT-2-1-21

Specification Coverage: Basic Notification Interface

Feature Under Test: Subscribe, Unsubscribe

WSDL Reference: event.wsdl

Test Purpose: To verify Unsubscribe command.

Pre-Requisite: Event Service is supported by the DUT.

Test Configuration: ONVIF Client and DUT

Test Procedure:

1. Start an ONVIF Client.
2. Start the DUT.
3. ONVIF Client will invoke **Subscribe** request (InitialTerminationTime = PT10S) to instantiate a SubscriptionManager.
4. Verify that the DUT sends a **SubscribeResponse** message with valid values for SubscriptionManager, CurrentTime and TerminationTime.
5. ONVIF Client will invoke **Unsubscribe** request.
6. Verify that the DUT sends an **UnsubscribeResponse** message.
7. ONVIF Client will invoke a **Renew** request to verify that the SubscriptionManager is deleted.
8. Verify that the DUT sends a Soap 1.2 Fault (e.g. a "ResourceUnknown" fault message).

Test Result:

PASS –

- DUT passes all assertions.

FAIL –

- The DUT did not send **SubscribeResponse** message.
- The DUT did not send valid values for CurrentTime and TerminationTime (TerminationTime >= CurrentTime + InitialTerminationTime).
- The DUT did not send an **UnsubscribeResponse** message.
- The DUT did not send a Soap 1.2 fault message.
- The DUT did not send valid WS-Addressing Action URI in SOAP Header for **SubscribeResponse** message (see Annex A.3).
- The DUT did not send valid WS-Addressing Action URI in SOAP Header for **UnsubscribeResponse** message (see Annex A.3).
- The DUT did not send valid WS-Addressing Action URI in SOAP Header for Fault message (see Annex A.3).

Note: If the DUT cannot accept the set value to an InitialTerminationTime, ONVIF Client retries to send the Subscribe request with MinimumTime value included in UnacceptableInitialTerminationTimeFault.

5.2.7 BASIC NOTIFICATION INTERFACE - RESOURCE UNKNOWN

Test Case ID: EVENT-2-1-22

Specification Coverage: Basic Notification Interface

Feature Under Test: Subscribe, Unsubscribe

WSDL Reference: event.wsdl

Test Purpose: To verify that a Soap 1.2 Fault Message is returned if an UnsubscribeRequest to a non-existing Subscription is sent.

Pre-Requisite: Event Service is supported by the DUT.

Test Configuration: ONVIF Client and DUT

Test Procedure:

1. Start an ONVIF Client.
2. Start the DUT.
3. ONVIF Client will invoke **Subscribe** request with an InitialTerminationTime of 10 s to ensure that the SubscriptionManager will be deleted after testing.
4. Verify that the DUT sends a **SubscribeResponse** message with valid values for SubscriptionReference and TerminationTime).
5. ONVIF Client will invoke **Unsubscribe** request to delete the SubscriptionManager.
6. Verify that the DUT sends an **UnsubscribeResponse** message.
7. Send the second Unsubscribe Request to the just deleted SubscriptionReference.
8. Verify that the DUT sends a Soap 1.2 Fault (e.g. a "ResourceUnknown" or a "UnableToDestroySubscription" Fault).

Test Result:

PASS –

- DUT passes all assertions.

FAIL –

- The DUT did not send **SubscribeResponse** message.
- The DUT did not send valid SubscriptionReference.
- The DUT did not send an **UnsubscribeResponse** message.
- The DUT did not delete the SubscriptionManager.
- The DUT did not send a Soap 1.2 Fault.
- The DUT did not send valid WS-Addressing Action URI in SOAP Header for **SubscribeResponse** message (see Annex A.3).
- The DUT did not send valid WS-Addressing Action URI in SOAP Header for **UnsubscribeResponse** message (see Annex A.3).
- The DUT did not send valid WS-Addressing Action URI in SOAP Header for Fault message (see Annex A.3).

Note: If DUT cannot accept the set value to an InitialTerminationTime, ONVIF Client retries to send the Subscribe request with MinimumTime value included in UnacceptableInitialTerminationTimeFault.

5.2.8 BASIC NOTIFICATION INTERFACE - INVALID TOPIC EXPRESSION

Test Case ID: EVENT-2-1-23

Specification Coverage: Basic Notification Interface

Feature Under Test: Subscribe

WSDL Reference: event.wsdl

Test Purpose: To verify that a correct error message "InvalidFilterFault" or "TopicNotSupported" or "InvalidTopicExpressionFault" is returned if a Subscribe Request with an invalid Topic Expression is invoked.

Pre-Requisite: Event Service is supported by the DUT.

Test Configuration: ONVIF Client and DUT

Test Procedure:

1. Start an ONVIF Client.
2. Start the DUT.
3. ONVIF Client will invoke **Subscribe** request with an invalid Topic Expression (boolean(//tt:SimpleItem[@Name="xyz" and @Value="xyz"])).
4. Verify that the DUT generates an "InvalidFilterFault" or "TopicNotSupported" or "InvalidTopicExpressionFault" fault message.
5. Validate the fault message (valid UTC time, valid description).

Test Result:

PASS –

- DUT passes all assertions.

FAIL –

- The DUT did not send an "InvalidFilterFault" or "TopicNotSupported" or "InvalidTopicExpressionFault" fault message.
- The DUT did not send a valid fault message.
- The DUT did not send valid WS-Addressing Action URI in SOAP Header for Fault message (see Annex A.3).

5.2.9 BASIC NOTIFICATION INTERFACE - SET SYNCHRONIZATION POINT

Test Case ID: EVENT-2-1-24

Specification Coverage: Basic Notification Interface, SetSynchronizationPoint

Feature Under Test: Subscribe, SetSynchronizationPoint, Notify

WSDL Reference: event.wsdl

Test Purpose: To verify that the DUT sends properties to the Client when SetSynchronizationPoint operation is invoked.

Pre-Requisite: Event Service is supported by the DUT.

Test Configuration: ONVIF Client and DUT

Test Procedure:

1. Start an ONVIF Client.
2. Start the DUT.
3. ONVIF Client invokes **GetEventProperties** request.
4. The DUT responds with a **GetEventPropertiesResponse** message with parameters
   - TopicNamespaceLocation list
   - FixedTopicSet
   - TopicSet =: *topicSet*
   - TopicExpressionDialect list
   - MessageContentFilterDialect list
   - MessageContentSchemaLocation list
5. If *topicSet* does not contain topic with MessageDescription with IsProperty = true, skip other steps.
6. ONVIF Client sets the following
   - *topic* := the Event topic provided on Management Tab
7. ONVIF Client invokes **Subscribe** request with parameters
   - ConsumerReference := NotificationConsumer interface of the ONVIF Client
   - Filter.TopicExpression := *topic*
   - Filter.TopicExpression.@Dialect := "http://www.onvif.org/ver10/tev/topicExpression/ConcreteSet"
   - InitialTerminationTime := PT60S
8. The DUT responds with **SubscribeResponse** message with parameters
   - SubscriptionReference =: *s*
   - CurrentTime
   - TerminationTime
9. Until *timeout1* timeout expires:

   9.1. The DUT sends **Notify** message with parameters:

- NotificationMessage list := *notificationList*

9.2. If *notificationList* contains NotificationMessage (*notification*) with Message.Message.@PropertyOperation = Initialized, ONVIF Client sets the following and goes to step 10:

- *notificationList*[0].NotificationMessage = *notification*, where NotificationMessage is the first NotificationMessage with Message.Message.@PropertyOperation = Initialized

9.3. If *timeout1* expires for step 9.1 without **Notify** message that contains NotificationMessage with Message.Message.@PropertyOperation = Initialized, FAIL the test and skip other steps.

10. If *notification*.Topic value is not equal to *topic*, FAIL the test and skip other steps.

11. ONVIF Client invokes **SetSynchronizationPoint**.

12. The DUT responds with **SetSynchronizationPointResponse** message.

13. Until *timeout1* timeout expires:

13.1. The DUT sends **Notify** message with parameters:

- NotificationMessage list := *notificationList*

13.2. If *notificationList* contains the following NotificationMessage (*repeatedNotification*), go to step 14:

- *repeatedNotification*.Message.Message.@PropertyOperation = Initialized
- *repeatedNotification*.Topic = *topic*
- *repeatedNotification*.Message.Message.Source item is equal to *notification*.Message.Message.Source item if *notificationMessage*.Message.Message contains not empty Source element
- *repeatedNotification*.Message.Message.Key item is equal to *notification*.Message.Message.Key item If *notificationMessage*.Message.Message contains not empty Key element

13.3. If *timeout1* expires for step 13.1 without **Notify** message that is corresponding to step 13.2, FAIL the test and skip other steps.

14. If subscription timeout is not expired, ONVIF Client invokes **Unsubscribe** request to the subscription endpoint *s*.

15. The DUT responds with **UnsubscribeResponse** message.

Test Result:

PASS –

- DUT passes all assertions.
- The DUT returned **GetEventPropertiesResponse** without topic with IsProperty = true.

FAIL –

- The DUT did not send **SubscribeResponse** message.
- The DUT did not send **SetSynchronizationPointResponse** message.
- The DUT did not send **UnsubscribeResponse message** message.

Note: ONVIF Client shall use Renew request in order to postpone the termination time.

Note: If the DUT cannot accept the set value to an InitialTerminationTime, ONVIF Client retries to send the Subscribe request with MinimumTime value included in UnacceptableInitialTerminationTimeFault.

Note: *timeout1* will be taken from Operation Delay field of ONVIF Device Test Tool.

5.2.10 BASIC NOTIFICATION INTERFACE – CONJUNCTION IN NOTIFY FILTER (OR OPERATION)

Test Case ID: EVENT-2-1-25

Specification Coverage: Topic Filter (ONVIF Core Specification), Basic Notification Interface (ONVIF Core Specification)

Feature Under Test: Topic Filter, http://www.onvif.org/ver10/tev/topicExpression/ConcreteSet TopicExpression Dialect, Subscribe

WSDL Reference: event.wsdl

Test Purpose: To verify that the DUT supports "or" operation in conjunction of topics in the Topic Expressions.

Pre-Requisite: Event Service is supported by the DUT. If the DUT does not support at least two property events, the test operator has to provide two topics for test on the Management tab and trigger the events manually.

Test Configuration: ONVIF Client and DUT

Test Procedure:

1. Start an ONVIF Client.
2. Start the DUT.
3. ONVIF Client invokes **GetEventProperties** request.
4. The DUT responds with a **GetEventPropertiesResponse** message with parameters
   - TopicNamespaceLocation list
   - FixedTopicSet
   - TopicSet =: *topicSet*
   - TopicExpressionDialect list
   - MessageContentFilterDialect list
   - MessageContentSchemaLocation list
5. If *topicSet* contains less than 2 topics, skip other steps.
6. ONVIF Client sets the following
   - *topic1* := the first Event topic provided on Management Tab
   - *topic2* := the second Event topic provided on Management Tab
7. ONVIF Client invokes **Subscribe** request with parameters
   - ConsumerReference := NotificationConsumer interface of the ONVIF Client
   - Filter.TopicExpression := *topic1*|*topic2*
   - Filter.TopicExpression.@Dialect := http://www.onvif.org/ver10/tev/topicExpression/ConcreteSet
   - InitialTerminationTime := PT60S
8. The DUT responds with **SubscribeResponse** message with parameters
   - SubscriptionReference =: *s*
   - CurrentTime =: *ct*
   - TerminationTime =: *tt*
9. Until *timeout1* timeout expires, repeat the following steps:

9.1. The DUT sends **Notify** message with parameters:

- NotificationMessage list := *notificationList*

9.2. For each NotificationMessage (*notification*) in *notificationList*

9.2.1. If *notification*.Topic value is not equal to *topic1* or *topic2*, FAIL the test and skip other steps.

9.3. If NotificationMessage with topic value is equal to *topic1* and NotificationMessage with topic value is equal to *topic2* were received, go to step 10.

9.4. If *timeout1* expires for step 9.2 without NotificationMessage with topic value equals to *topic1* or without NotificationMessage with topic value equals to *topic2*, FAIL the test and skip other steps.

10. ONVIF Client sends an **Unsubscribe** request to the subscription endpoint *s*.

11. The DUT responds with **UnsubscribeResponse** message.

Test Result:

PASS –

- DUT passes all assertions.

FAIL –

- The DUT did not send **GetEventPropertiesResponse** message.
- The DUT did not send **SubscribeResponse** message.
- The DUT did not send **UnsubscribeResponse** message.

Note: *timeout1* will be taken from Operation Delay field of ONVIF Device Test Tool.

Note: Test Operator has to select property enents if supported by the Device on the Management tab in Event section.

Note: if *topicSet* does not contain at least 2 topics with IsPropery = true, ONVIF Client provides user interaction window at step 9 and Test Operator has to generate events manually.

5.2.11 BASIC NOTIFICATION INTERFACE – TOPIC SUB-TREE IN PULLMESSAGES FILTER

Test Case ID: EVENT-2-1-26

Specification Coverage: Topic Filter (ONVIF Core Specification), Basic Notification Interface (ONVIF Core Specification)

Feature Under Test: Topic Filter, http://www.onvif.org/ver10/tev/topicExpression/ConcreteSet TopicExpression Dialect, Subscribe

WSDL Reference: event.wsdl

Test Purpose: To verify that the DUT supports "//." operation in topic filter in the Topic Expressions.

Pre-Requisite: Event Service is supported by the DUT. If the DUT does not support property event, the test operator has to provide topic for test on the Management tab and trigger the events manually.

Test Configuration: ONVIF Client and DUT

Test Procedure:

1. Start an ONVIF Client.
2. Start the DUT.
3. ONVIF Client invokes **GetEventProperties** request.
4. The DUT responds with a **GetEventPropertiesResponse** message with parameters
   - TopicNamespaceLocation list
   - FixedTopicSet
   - TopicSet =: *topicSet*
   - TopicExpressionDialect list
   - MessageContentFilterDialect list
   - MessageContentSchemaLocation list
5. ONVIF Client sets the following
   - *topic* := the first Event topic provided on Management Tab
   - *root* := root element of *topic*
6. ONVIF Client invokes **Subscribe** request with parameters
   - ConsumerReference := NotificationConsumer interface of the ONVIF Client
   - Filter.TopicExpression := *root*//.

- Filter.TopicExpression.@Dialect := http://www.onvif.org/ver10/tev/topicExpression/ConcreteSet
- InitialTerminationTime := PT60S

7. The DUT responds with **SubscribeResponse** message with parameters
   - SubscriptionReference =: *s*
   - CurrentTime =: *ct*
   - TerminationTime =: *tt*
8. Until *timeout1* timeout expires:
   - 8.1. The DUT sends **Notify** message with parameters:
     - NotificationMessage list := *notificationList*
   - 8.2. For each NotificationMessage (*notification*) in *notificationList*
     - 8.2.1. If root element of *notification*.Topic is not equal to *root*, FAIL the test and skip other steps.
   - 8.3. If NotificationMessage with topic value is equal to *topic* was received, go to step 9.
   - 8.4. If *timeout1* expires for step 8.2 without NotificationMessage with topic value equals to *topic*, FAIL the test and skip other steps.
9. ONVIF Client sends an **Unsubscribe** request to the subscription endpoint *s*.
10. The DUT responds with **UnsubscribeResponse** message.

Test Result:

PASS –

- DUT passes all assertions.

FAIL –

- The DUT did not send **GetEventPropertiesResponse** message.
- The DUT did not send **SubscribeResponse** message.
- The DUT did not send **UnsubscribeResponse** message.

Note: *timeout1* will be taken from Operation Delay field of ONVIF Device Test Tool.

Note: Test Operator has to select property event if supported by the Device on the Management tab in Event section.

Note: if *topicSet* does not contain at least one topic with IsPropery = true, ONVIF Client provides user interaction window and Test Operator has to generate events manually.

5.2.12 BASIC NOTIFICATION INTERFACE – CONJUNCTION IN NOTIFY FILTER (TOPIC SUB-TREE AND OR OPERATION)

Test Case ID: EVENT-2-1-27

Specification Coverage: Topic Filter (ONVIF Core Specification), Basic Notification Interface (ONVIF Core Specification)

Feature Under Test: Topic Filter, http://www.onvif.org/ver10/tev/topicExpression/ConcreteSet TopicExpression Dialect, Subscribe

WSDL Reference: event.wsdl

Test Purpose: To verify that the DUT supports combination of "or" operation and "//." operation in topic filter in the Topic Expressions.

Pre-Requisite: Event Service is supported by the DUT. If the DUT does not support at least two property events, the test operator has to provide two topics for test on the Management tab and trigger the events manually.

Test Configuration: ONVIF Client and DUT

Test Procedure:

1. Start an ONVIF Client.
2. Start the DUT.
3. ONVIF Client invokes **GetEventProperties** request.
4. The DUT responds with a **GetEventPropertiesResponse** message with parameters
   - TopicNamespaceLocation list
   - FixedTopicSet
   - TopicSet =: *topicSet*
   - TopicExpressionDialect list
   - MessageContentFilterDialect list

- MessageContentSchemaLocation list

5. If *topicSet* contains less than 2 topics, skip other steps.
6. ONVIF Client sets the following
   - *topic1* := the first Event topic provided on Management Tab
   - *topic2* := the second Event topic provided on Management Tab
   - *root1* := root element of *topic1*
7. ONVIF Client invokes **Subscribe** request with parameters
   - ConsumerReference := NotificationConsumer interface of the ONVIF Client
   - Filter.TopicExpression := *root1*//|*topic2*.
   - Filter.TopicExpression.@Dialect := "http://www.onvif.org/ver10/tev/topicExpression/ConcreteSet"
8. The DUT responds with **SubscribeResponse** message with parameters
   - SubscriptionReference =: *s*
   - CurrentTime =: *ct*
   - TerminationTime =: *tt*
9. Until *timeout1* timeout expires:
   - 9.1. The DUT sends **Notify** message with parameters:
     - NotificationMessage list := *notificationList*
   - 9.2. For each NotificationMessage (*notification*) in *notificationList*
     - 9.2.1. If root element of *notification*.Topic is not equal to *root1* or if *notification*.Topic is not equal to *topic2*, FAIL the test and skip other steps.
   - 9.3. If NotificationMessage with topic value is equal to *topic1* and NotificationMessage with topic value is equal to *topic2* were received, go to step 10.
   - 9.4. If *timeout1* expires for step 9.2 without NotificationMessage with topic value equals to *topic1* or without NotificationMessage with topic value equals to *topic2*, FAIL the test and skip other steps.
10. ONVIF Client sends an **Unsubscribe** request to the subscription endpoint *s*.

11. The DUT responds with **UnsubscribeResponse** message.

Test Result:

PASS –

- DUT passes all assertions.

FAIL –

- The DUT did not send **GetEventPropertiesResponse** message.
- The DUT did not send **SubscribeResponse** message.
- The DUT did not send **UnsubscribeResponse** message.

Note: *timeout1* will be taken from Operation Delay field of ONVIF Device Test Tool.

Note: Test Operator has to select property events if supported by the Device on the Management tab in Event section.

Note: if *topicSet* does not contain at least 2 topics with IsPropery = true, ONVIF Client provides user interaction window at step 9 and Test Operator has to generate events manually.

5.2.13 BASIC NOTIFICATION INTERFACE - UNSUBSCRIBE

Test Case ID: EVENT-2-1-28

Specification Coverage: Basic Notification Interface

Feature Under Test: Unsubscribe

WSDL Reference: event.wsdl

Test Purpose: To verify DUT Unsubscribe command.

Pre-Requisite: Event Service is supported by the DUT.

Test Configuration: ONVIF Client and DUT

Test Procedure:

1. Start an ONVIF Client.
2. Start the DUT.
3. ONVIF Client will invokes **Subscribe** with parameters:
   - InitialTerminationTime = 60 second

4. The DUT responds with **SubscribeResponse** messagewith parameters:
   - SubscriptionReference =: *s*
   - CurrentTime
   - TerminationTime
5. Set *timeout1* := "PT1S"
6. Wait until *timeout1* Timeout expires.
7. ONVIF Client invokes **Unsubscribe** to the subscription endpoint *s*.
8. The DUT responds with **UnsubscribeResponse** message.

Test Result:

PASS –

- DUT passes all assertions.

FAIL –

- The DUT did not send **SubscribeResponse** message.
- The DUT did not send **UnsubscribeResponse** message.

5.2.14 BASIC NOTIFICATION INTERFACE - MESSAGE CONTENT FILTER

Test Case ID: EVENT-2-1-29

Specification Coverage: Subscribe, Message Content Filter

Feature Under Test: Subscribe

WSDL Reference: event.wsdl

Test Purpose: To verify that the DUT supports message content filter.

Pre-Requisite: Event Service is supported by the DUT. Message Content Filter is supported by DUT.

Test Configuration: ONVIF Client and DUT

Test Procedure:

1. Start an ONVIF Client.
2. Start the DUT.
3. ONVIF Client invokes **GetEventProperties** request.
4. The DUT responds with a **GetEventPropertiesResponse** message with parameters
   - TopicNamespaceLocation list
   - FixedTopicSet
   - TopicSet =: *topicSet*
   - TopicExpressionDialect list
   - MessageContentFilterDialect list := *messageContentFilterDialectList*
   - MessageContentSchemaLocation list
5. If *topicSet* does not contain at least one topic with MessageDescription.@IsProperty = "true", skip other steps.
6. If *messageContentFilterDialectList* does not contain at least one item with non empty value, FAIL the test and skip other steps.
7. If *messageContentFilterDialectList* does not contain item with value is equal to "http://www.onvif.org/ver10/tev/messageContentFilter/ItemFilter", skip other steps.
8. ONVIF Client sets the following
   - *topic* := the Event topic provided on Management Tab
9. ONVIF Client invokes **Subscribe** request with parameters
   - ConsumerReference := NotificationConsumer interface of the ONVIF Client
   - Filter.TopicExpression := *topic*
   - Filter.TopicExpression.@Dialect := "http://www.onvif.org/ver10/tev/topicExpression/ConcreteSet"
   - InitialTerminationTime := PT60S
10. The DUT responds with **SubscribeResponse** message with parameters
    - SubscriptionReference =: *s*
    - CurrentTime =: *ct*

- TerminationTime =: *tt*

11. Until *timeout1* timeout expires:

    11.1. The DUT sends **Notify** message with parameters:

    - NotificationMessage list := *notificationMessageList*

    11.2. If *notificationMessageList* contains NotificationMessage with Message.Message.@PropertyOperation = Initialized:

    - set *notification1* := the first NotificationMessage in *notificationMessageList* with Message.Message.@PropertyOperation = Initialized
    - Go to 12 [46] step.

    11.3. If *timeout1* expires for step 11 [46] without NotificationMessage message with Message.Message.@PropertyOperation = Initialized, FAIL the test and skip other steps.

12. If *notification1*.Topic value is not equal to *topic*, FAIL the test and skip other steps.
13. ONVIF Client invokes **Unsubscribe** to the subscription endpoint *s*.
14. The DUT responds with **UnsubscribeResponse** message.
15. ONVIF Client generates message content filter by following the procedure mentioned in Annex A.6 with the following input and output parameters
    - in *notification1* - Notification message
    - out *messageContentFilter* - message content filter
    - out *name* - SimpleItem Name
    - out *value* - SimpleItem Value
16. ONVIF Client invokes **Subscribe** request with parameters
    - ConsumerReference := NotificationConsumer interface of the ONVIF Client
    - Filter.TopicExpression skipped
    - Filter.MessageContent := *messageContentFilter*
    - Filter.MessageContent.@Dialect := "http://www.onvif.org/ver10/tev/messageContentFilter/ItemFilter"

- InitialTerminationTime := PT60S

17. The DUT responds with **SubscribeResponse** message with parameters
    - SubscriptionReference =: *s*
    - CurrentTime =: *ct*
    - TerminationTime =: *tt*
18. Until *timeout1* timeout expires, repeat the following steps:
    18.1. The DUT sends **Notify** message with parameters:
        - NotificationMessage list := *notificationMessageList*

    18.2. For each notification message (*notificationMessage*) in *notificationMessageList*:
        - If *notificationMessage*.Message.Message does not contain SimpleItem with Name = *name* and with Value = *value*, FAIL the test and skip other steps.

    18.3. If notificationMessageList contains notification with Topic = *topic* and with Message.Message.PropertyOperation="Initialized", go to 19 [47] step.

    18.4. If *timeout1* expires for step 18 without NotificationMessage message with Topic = *topic* with Message.Message.@PropertyOperation = Initialized, FAIL the test and skip other steps.
19. ONVIF Client invokes **Unsubscribe** to the subscription endpoint *s*.
20. The DUT responds with **UnsubscribeResponse** message.

Test Result:

PASS –

- DUT passes all assertions.
- The DUT returned **GetEventPropertiesResponse** message with empty TopicSet.

FAIL –

- The DUT did not send **SubscribeResponse** message.
- The DUT did not send **GetEventPropertiesResponse** message.

Note: *timeout1* will be taken from Operation Delay field of ONVIF Device Test Tool.

5.3 Real-Time Pull-Point Notification Interface

5.3.1 REALTIME PULLPOINT SUBSCRIPTION - CREATE PULL POINT SUBSCRIPTION

Test Case ID: EVENT-3-1-9

Specification Coverage: CreatePullPointSubscription

Feature Under Test: CreatePullPointSubscription

WSDL Reference: event.wsdl

Test Purpose: To verify the DUT CreatePullPointSubscription command

Pre-Requisite: Event Service is supported by the DUT. Device supports Pull-Point Notification feature.

Test Configuration: ONVIF Client and DUT

Test Procedure:

1. Start an ONVIF Client.
2. Start the DUT.
3. ONVIF Client will invoke **CreatePullPointSubscription** request to instantiate a Subscription Manager. The **CreatePullPointSubscription** request does not contain a TopicExpression or Message Content Filter. The Message contains an InitialTerminationTime of 10s to ensure that the SubscriptionManager is terminated after end of this test.
4. Verify that the DUT sends **CreatePullPointSubscriptionResponse** message.
5. Validate that valid values for SubscriptionReference CurrentTime and TerminationTime are returned (TerminationTime >= CurrentTime + InitialTerminationTime).

Test Result:

PASS –

- DUT passes all assertions.

FAIL –

- The DUT did not send **CreatePullPointSubscriptionResponse** message.
- The DUT did not return a valid SubscriptionReference.

- The DUT did not return valid values for CurrentTime and TerminationTime.
- The DUT did not send valid WS-Addressing Action URI in SOAP Header for **CreatePullPointSubscriptionResponse** message (see Annex A.3).

Note: The Subscription Manager has to be deleted at the end of the test either by calling unsubscribe or through a timeout.

Note: If DUT cannot accept the set value to an InitialTerminationTime, ONVIF Client retries to send the CreatePullPointSubscription request with MinimumTime value included in UnacceptableInitialTerminationTime fault.

5.3.2 REALTIME PULLPOINT SUBSCRIPTION - RENEW

Test Case ID: EVENT-3-1-12

Specification Coverage: Basic Notification Interface, CreatePullPointSubscription

Feature Under Test: CreatePullPointSubscription, Renew

WSDL Reference: event.wsdl

Test Purpose: To verify Renew command

Pre-Requisite: Event Service is supported by the DUT. Device supports Pull-Point Notification feature. Profile A or Profile C or Profile S or Profile G is supported by the DUT.

Test Configuration: ONVIF Client and DUT

Test Procedure:

1. Start an ONVIF Client.
2. Start the DUT.
3. ONVIF Client will invoke **CreatePullPointSubscription** request with an InitialTerminationTime of 10s.
4. Verify that the DUT sends a **CreatePullPointSubscriptionResponse** message.
5. Validate CurrentTime and TerminationTime (TerminationTime >= CurrentTime + 10s).
6. ONVIF Client will invoke **Renew** request with a TerminationTime of 10s to ensure that the Subscription times out after the test.
7. Verify that the DUT sends a **RenewResponse** message.
8. Verify CurrentTime and TerminationTime (TerminationTime >= CurrentTime + 10s).

Test Result:

PASS –

- DUT passes all assertions.

FAIL –

- The DUT did not send **SubscribeResponse** message.
- The DUT did not send valid values for CurrentTime and TerminationTime.
- The DUT did not send a **RenewResponse** message.
- The DUT did not send valid values for CurrentTime and TerminationTime.
- DUT did not send valid WS-Addressing Action URI in SOAP Header for **CreatePullPointSubscriptionResponse** message (see Annex A.3).
- DUT did not send valid WS-Addressing Action URI in SOAP Header for **RenewResponse** message (see Annex A.3).

Note: The Subscription Manager has to be deleted at the end of the test either by calling unsubscribe or through a timeout.

Note: If DUT cannot accept the set value to an InitialTerminationTime, ONVIF Client retries to send the CreatePullPointSubscription request with MinimumTime value included in UnacceptableInitialTerminationTime fault.

5.3.3 REALTIME PULLPOINT SUBSCRIPTION - PULLMESSAGES

Test Case ID: EVENT-3-1-15

Specification Coverage: CreatePullPointSubscription, SetSynchronizationPoint, PullMessages

Feature Under Test: CreatePullPointSubscription, SetSynchronizationPoint, PullMessages

WSDL Reference: event.wsdl

Test Purpose: To verify PullMessages command

Pre-Requisite: Event Service is supported by the DUT. Device supports Pull-Point Notification feature. The DUT shall provide at least one event. The test operator has to ensure that the event is triggered and sent out. ONVIF Client will invoke a SetSynchronizationPoint request. If the device does not support property events or if it is not possible to invoke a SetSynchronizationPoint, the test operator has to trigger event manually.

Test Configuration: ONVIF Client and DUT

Test Procedure:

1. Start an ONVIF Client.
2. Start the DUT.
3. ONVIF Client will invoke **CreatePullPointSubscription** request with a suggested timeout of PT60S.
4. Verify that the DUT sends a **CreatePullPointSubscriptionResponse** message. Validate that correct values for CurrentTime and TerminationTime and SubscriptionReference are returned.
5. ONVIF Client will invoke **PullMessages** command with a PullMessagesTimeout of 20s and a MessageLimit of 2.
6. ONVIF Client will invoke **SetSynchronizationPoint** request to trigger an event.
7. Verify that the DUT sends a **SetSynchronizationPointResponse** message.
8. If the DUT does not support property events, the operator has to trigger an event manually.
9. Verify that the DUT sends a **PullMessagesResponse** that contains at least one NotificationMessage that represents a property.
10. Verify NotificationMessage (a maximum number of 2 Notification Messages is included in the **PullMessagesResponse** message; well formed and valid values for CurrentTime and TerminationTime (TerminationTime > CurrentTime).

Test Result:

PASS –

- DUT passes all assertions.

FAIL –

- The DUT did not send **CreatePullPointSubscriptionResponse** message.
- The DUT did not send valid values for CurrentTime and TerminationTime (TerminationTime > CurrentTime).
- The DUT did not send a **SetSynchronizationPointResponse** message.
- The DUT did not send a **PullMessagesResponse** message.
- The **PullMessagesResponse** message does not contain a NotificationMessage.

- The **PullMessagesResponse** message contains more than 2 NotificationMessages.
- The NotificationMessages are not well formed.
- The **PullMessagesResponse** message contains invalid values for Current or TerminationTime.
- The DUT did not send a **PullMessagesFaultResponse** message.
- The DUT did not send valid WS-Addressing Action URI in SOAP Header for **CreatePullPointSubscriptionResponse** message (see Annex A.3).
- The DUT did not send valid WS-Addressing Action URI in SOAP Header for **SetSynchronizationPointResponse** message (see Annex A.3).
- The DUT did not send valid WS-Addressing Action URI in SOAP Header for **PullMessagesResponse** message (see Annex A.3).

Note: The Subscription Manager has to be deleted at the end of the test either by calling unsubscribe or through a timeout.

Note: It may be possible that some other events than the event which is being verified will be sent as PullMessages response during this test case. In such case, ONVIF Client should simply discard such response and they retry PullMessages request for the very event for verification.

Note: During test case execution, it should be guaranteed that the DUT should not delete the property event which is being used for verification.

Note: If DUT cannot accept the set value to Timeout or MessageLimit, ONVIF Client retries to send the PullMessage message with Timeout and MessageLimit which is contained in **PullMessagesFaultResponse** message.

Note: See Annex A.1 for instructions on how to construct Subscribe when it is required for the ONVIF Client to receive all events supported by the DUT.

5.3.4 REALTIME PULLPOINT SUBSCRIPTION - PULLMESSAGES FILTER

Test Case ID: EVENT-3-1-16

Specification Coverage: CreatePullPointSubscription, SetSynchronizationPoint, PullMessages, MessageFilter

Feature Under Test: GetEventProperties, CreatePullPointSubscription, SetSynchronizationPoint, PullMessages

WSDL Reference: event.wsdl

Test Purpose: To verify PullMessages command

Pre-Requisite: Event Service is supported by the DUT. Device supports Pull-Point Notification feature. The DUT shall provide at least one event. The test operator has to ensure that the event is triggered and sent out. ONVIF Client will invoke a SetSynchronizationPoint request. If the DUT does not support property events of if it is not possible to invoke a SynchronizationPoint, the test operator has to trigger an event manually.

Test Configuration: ONVIF Client and DUT

Test Procedure:

1. Start an ONVIF Client.
2. Start the DUT.
3. ONVIF Client invokes GetEventProperties command to retrieve the supported Topics.
4. Verify that the DUT sends a **GetEventPropertiesResponse**; select one Topic
5. ONVIF Client will invoke **CreatePullPointSubscription** request with a suggested timeout of PT60S and a Filter including the selected Topic.
6. Verify that the DUT sends a **CreatePullPointSubscriptionResponse** message.
7. Validate CurrentTime and TerminationTime and SubscriptionReference.
8. ONVIF Client will invoke **PullMessages** command with a PullMessagesTimeout of 20s and a MessageLimit of 2.
9. ONVIF Client will invoke **SetSynchronizationPoint** request to trigger a property event.
10. Verify that the DUT sends a **SetSynchronizationPointResponse** message.
11. If the DUT does not support property events, the operator has to trigger an event manually.
12. Verify that the DUT sends a **PullMessagesResponse** that contains at least one NotificationMessage.
13. Verify that that a maximum number of 2 Notification Messages is included in the PullMessages Response.
14. Verify that at least one property event is returned.
15. Verify that this NotificationMessage is well formed; Verify CurrentTime and TerminationTime (TerminationTime > CurrentTime).

16. Verify that the Topic of the NotificationMessage matches the filter.

Test Result:

PASS –

- DUT passes all assertions.

FAIL –

- The DUT did not send a **GetEventPropertiesResponse**
- The DUT did not send a valid **GetEventPropertiesResponse** (containing at least one Topic).
- The DUT did not send **CreatePullPointSubscriptionResponse** message.
- The DUT did not send valid values for CurrentTime and TerminationTime (TerminationTime > CurrentTime).
- The DUT did not send a **SetSynchronizationPointResponse** message.
- The DUT did not send a **PullMessagesResponse** message.
- The **PullMessagesResponse** message does not contain a NotificationMessage.
- The **PullMessagesResponse** message contains more than 2 NotificationMessages.
- The **PullMessagesResponse** message does not contain at least one event.
- The NotificationMessages are not well formed.
- The NotificationMessage contains to a topic that was not requested.
- The **PullMessagesResponse** message contains invalid values for Current or TerminationTime.
- The DUT did not send valid WS-Addressing Action URI in SOAP Header for **GetEventPropertiesResponse** message (see Annex A.3).
- The DUT did not send valid WS-Addressing Action URI in SOAP Header for **CreatePullPointSubscriptionResponse** message (see Annex A.3).
- The DUT did not send valid WS-Addressing Action URI in SOAP Header for **SetSynchronizationPointResponse** message (see Annex A.3).
- The DUT did not send valid WS-Addressing Action URI in SOAP Header for **PullMessagesResponse** message (see Annex A.3).

Note: The Subscription Manager has to be deleted at the end of the test either by calling unsubscribe or through a timeout.

Note: It may be possible that some other events than the event which is being verified will be sent as PullMessages response during this test case. In such case, ONVIF Client should simply discard such response and they retry PullMessages request for the very event for verification.

Note: During test case execution, it should be guaranteed that the DUT should not delete the property event which is being used for verification.

Note: If DUT cannot accept the set value to Timeout or MessageLimit, ONVIF Client retries to send the PullMessage message with Timeout and MessageLimit included in **PullMessagesFaultResponse** message.

5.3.5 REALTIME PULLPOINT SUBSCRIPTION - INVALID MESSAGE CONTENT FILTER

Test Case ID: EVENT-3-1-17

Specification Coverage: CreatePullPointSubscription

Feature Under Test: CreatePullPointSubscription

WSDL Reference: event.wsdl

Test Purpose: Event Service is supported by the DUT. Device supports Pull-Point Notification feature. To verify that a correct error message "InvalidFilterFault" or "InvalidMessageContentExpressionFault" is returned if a CreatePullPointSubscription command with an invalid MessageContentFilter is invoked.

Pre-Requisite: None

Test Configuration: ONVIF Client and DUT

Test Procedure:

1. Start an ONVIF Client.
2. Start the DUT.
3. ONVIF Client will invoke **CreatePullPointSubscription** request with an invalid Filter boolean(//tt:SimpleItem[@Name="xyz" and @Value="xyz"]).
4. Verify that the DUT generates an "InvalidFilterFault" or an "InvalidMessageContentExpressionFault" fault message. Validate that Utc time and description are correct.

Test Result:

PASS –

- DUT passes all assertions.

FAIL –

- The DUT did not send an "InvalidFilterFault" or "InvalidMessageContentExpressionFault" fault message.
- The DUT did not send a valid fault message.
- The DUT did not send valid WS-Addressing Action URI in SOAP Header for Fault message (see Annex A.3).

5.3.6 REALTIME PULLPOINT SUBSCRIPTION - UNSUBSCRIBE (NEGATIVE TEST)

Test Case ID: EVENT-3-1-19

Specification Coverage: Basic Notification Interface, CreatePullPointSubscription

Feature Under Test: CreatePullPointSubscription, Unsubscribe, Renew

WSDL Reference: event.wsdl

Test Purpose: To verify Unsubscribe command

Pre-Requisite: Event Service is supported by the DUT. Device supports Pull-Point Notification feature.

Test Configuration: ONVIF Client and DUT

Test Procedure:

1. Start an ONVIF Client.
2. Start the DUT.
3. ONVIF Client will invoke **CreatePullPointSubscription** request (InitialTerminationTime=PT10S) to instantiate a SubscriptionManager.
4. Verify that the DUT sends a **CreatePullPointSubscriptionResponse** message. Validate CurrentTime and TerminationTime.
5. ONVIF Client will invoke **Unsubscribe** request to terminate the SubscriptionManager.

6. Verify that the DUT sends an **UnsubscribeResponse** message.
7. ONVIF Client will invoke a **Unsubscribe** request to verify that the SubscriptionManager is deleted.
8. Verify that the DUT sends a Soap 1.2 Fault (e.g. a "ResourceUnknown" fault message).

Test Result:

PASS –

- DUT passes all assertions.

FAIL –

- The DUT did not send **CreatePullPointSubscriptionResponse** message.
- The DUT did not send valid values for CurrentTime and TerminationTime (TerminationTime=CurrentTime + 10s).
- The DUT did not send an **UnsubscribeResponse** message.
- The DUT did not send a Soap 1.2 Fault.
- The DUT did not send valid WS-Addressing Action URI in SOAP Header for **CreatePullPointSubscriptionResponse** message (see Annex A.3).
- The DUT did not send valid WS-Addressing Action URI in SOAP Header for **UnsubscribeResponse** message (see Annex A.3).
- The DUT did not send valid WS-Addressing Action URI in SOAP Header for Fault message (see Annex A.3).

Note: If DUT cannot accept the set value to an InitialTerminationTime, ONVIF Client retries to send the CreatePullPointSubscription request with MinimumTime value included in UnacceptableInitialTerminationTime fault.

5.3.7 REALTIME PULLPOINT SUBSCRIPTION - TIMEOUT

Test Case ID: EVENT-3-1-20

Specification Coverage: CreatePullPointSubscription, Basic Notification Interface

Feature Under Test: CreatePullPointSubscription

WSDL Reference: event.wsdl

Test Purpose: To verify if a SubscriptionManager times out correctly.

Pre-Requisite: Event Service is supported by the DUT. Device supports Pull-Point Notification feature.

Test Configuration: ONVIF Client and DUT

Test Procedure:

1. Start an ONVIF Client.
2. Start the DUT.
3. ONVIF Client will invoke **CreatePullPointSubscription** request with a suggested timeout of PT20S.
4. Verify that the DUT sends a **CreatePullPointSubscriptionResponse** message.
5. Validate CurrentTime and TerminationTime and SubscriptionReference.
6. Wait for 20 s (SubscriptionManager timeout).
7. ONVIF Client will invoke **Unsubscribe** request to check if the SubscriptionManager is timed out.
8. Verify that the DUT sends a Soap 1.2 fault (e.g. a "ResourceUnknown" fault).

Test Result:

PASS –

- DUT passes all assertions.

FAIL –

- The DUT did not send **CreatePullPointSubscriptionResponse** message.
- The DUT did not send valid values for CurrentTime and TerminationTime (TerminationTime >= CurrentTime + 10s).
- The DUT did not send a Soap 1.2 fault.
- The DUT did not send valid WS-Addressing Action URI in SOAP Header for **CreatePullPointSubscriptionResponse** message (see Annex A.3).
- The DUT did not send valid WS-Addressing Action URI in SOAP Header for Fault message (see Annex A.3).

Note: If DUT cannot accept the set value to an InitialTerminationTime, ONVIF Client retries to send the CreatePullPointSubscription request with MinimumTime value included in UnacceptableInitialTerminationTime fault.

5.3.8 REALTIME PULLPOINT SUBSCRIPTION - INVALID TOPIC EXPRESSION

Test Case ID: EVENT-3-1-22

Specification Coverage: CreatePullPointSubscription

Feature Under Test: CreatePullPointSubscription

WSDL Reference: event.wsdl

Test Purpose: To verify that a correct error message "InvalidFilterFault" or "TopicNotSupported" or "InvalidTopicExpressionFault" is returned if a CreatePullPointSubscription command with an invalid TopicExpression is invoked.

Pre-Requisite: Event Service is supported by the DUT. Device supports Pull-Point Notification feature.

Test Configuration: ONVIF Client and DUT

Test Procedure:

1. Start an ONVIF Client.
2. Start the DUT.
3. ONVIF Client will invoke **CreatePullPointSubscription** request with an invalid Topic Expression "xyz".
4. Verify that the DUT generates an "InvalidFilterFault" or "TopicNotSupported" or "InvalidTopicExpressionFault" fault message.
5. Validate valid the fault message (valid Utc time, valid description).

Test Result:

PASS –

- DUT passes all assertions.

FAIL –

- The DUT did not send an "InvalidFilterFault" or "TopicNotSupported" or "InvalidTopicExpressionFault" fault message.
- The DUT did not send a valid fault message.
- The DUT did not send valid WS-Addressing Action URI in SOAP Header for Fault message (see Annex A.3).

5.3.9 REALTIME PULLPOINT SUBSCRIPTION – PULLMESSAGES AS KEEP-ALIVE

Test Case ID: EVENT-3-1-24

Specification Coverage: Realtime PullPoint Notification Interface, CreatePullPointSubscription, PullMessages

Feature Under Test: CreatePullPointSubscription, PullMessages

WSDL Reference: event.wsdl

Test Purpose: To verify PullMessages command as the one being kept alive.

Pre-Requisite: Event Service is supported by the DUT. Device supports Pull-Point Notification feature.

Test Configuration: ONVIF Client and DUT

Test Procedure:

1. Start an ONVIF Client.
2. Start the DUT.
3. ONVIF Client invokes **GetEventProperties** request to retrieve the supported Topics.
4. Verify that the DUT sends a **GetEventPropertiesResponse** message.
5. ONVIF Client will invoke **CreatePullPointSubscription** message (no filter, no InitialTerminationTime).
6. Verify that the DUT sends a **CreatePullPointSubscriptionResponse** message. Validate CurrentTime and TerminationTime. Mark Termination Time as T1. Mark Current Time as C1.
7. ONVIF Client waits for 1s.
8. ONVIF Client will invoke **PullMessages** request with a PullMessages Timeout of [T1 – C1 + 20s] and a MessageLimit of 1 to update termination time of subscription.

9. Verify **PullMessagesResponse** message or **PullMessagesFaultResponse** from the DUT.
10. If **PullMessagesResponse** is received from the DUT then ONVIF Client will invoke **PullMessages** request with a PullMessages Timeout equal to MaxTimeout from **PullMessagesFaultResponse** message and a MessageLimit of 1 to update termination time of subscription. Otherwise, go to step 11.
11. Verify **PullMessagesResponse** message from the DUT.
12. Validate Current Time and Termination Time. Check that TerminationTime > CurrentTime. Check that TerminationTime > T1.

Test Result:

PASS –

- DUT passes all assertions.

FAIL –

- The DUT did not send **CreatePullPointSubscriptionResponse** message.
- The DUT did not send valid values for CurrentTime and TerminationTime.
- The DUT did not send a **PullMessagesResponse** message or **PullMessagesFaultResponse** message at step 6.
- The DUT did not send a **PullMessagesResponse** message at step 8.
- The **PullMessagesResponse** message contained invalid values for Current or TerminationTime.
- The **PullMessagesResponse** message to the **PullMessages** request with a PullMessages Timeout of [T1 – C1 + 20s] contained TerminationTime value less or equal to T1.

Note: If the DUT does not update termination time after PullMessagesRequest, then the ONVIF Client passes the test with a warning.

Note: The Subscription Manager has to be deleted at the end of the test either by calling unsubscribe or through a timeout.

Note: If the DUT does not support property events, then test operator will send event manually (user interaction window will be used).

Note: To avoid long time of test execution, the test tool waits PullMessagesResponse during Operation delay timeout time. If the DUT does not send PullMessagesResponse during Operation delay timeout time, the test tool terminates subscription and fails the test.

5.3.10 REALTIME PULLPOINT SUBSCRIPTION - SET SYNCHRONIZATION POINT

Test Case ID: EVENT-3-1-25

Specification Coverage: CreatePullPointSubscription, SetSynchronizationPoint, PullMessages

Feature Under Test: CreatePullPointSubscription, SetSynchronizationPoint, PullMessages

WSDL Reference: event.wsdl

Test Purpose: To verify that the DUT sends properties to the Client when SetSynchronizationPoint operation is invoked.

Pre-Requisite: Event Service is supported by the DUT. Device supports Pull-Point Notification feature.

Test Configuration: ONVIF Client and DUT

Test Procedure:

1. Start an ONVIF Client.
2. Start the DUT.
3. ONVIF Client invokes **GetEventProperties** request.
4. The DUT responds with a **GetEventPropertiesResponse** message with parameters
   - TopicNamespaceLocation list
   - FixedTopicSet
   - TopicSet =: *topicSet*
   - TopicExpressionDialect list
   - MessageContentFilterDialect list
   - MessageContentSchemaLocation list
5. If *topicSet* does not contain topic with MessageDescription with IsProperty = true, skip other steps.
6. ONVIF Client sets the following
   - *topic* := the Event topic provided on Management Tab
7. ONVIF Client invokes **CreatePullPointSubscription** request with parameters

- Filter.TopicExpression := *topic*
- Filter.TopicExpression.@Dialect := "http://www.onvif.org/ver10/tev/topicExpression/ConcreteSet"

8. The DUT responds with **CreatePullPointSubscriptionResponse** message with parameters
   - SubscriptionReference =: *s*
   - CurrentTime =: *ct*
   - TerminationTime =: *tt*
9. Until *timeout1* timeout expires, repeat the following steps:
   9.1. ONVIF Client waits for time *t* := min{(*tt*-*ct*)/2, 1 second}.
   9.2. ONVIF Client invokes **PullMessages** to the subscription endpoint *s* with parameters
      - Timeout := PT60S
      - MessageLimit := 1
   9.3. The DUT responds with **PullMessagesResponse** message with parameters:
      - CurrentTime =: *ct*
      - TerminationTime =: *tt*
      - NotificationMessage list =: *notificationMessageList*
   9.4. If *notificationMessageList* contains NotificationMessage with Message.Message.@PropertyOperation = Initialized set the following:
      - *notification* := the first NotificationMessage in *notificationMessageList* with Message.Message.@PropertyOperation = Initialized
   9.5. If *timeout1* expires for step 9 without NotificationMessage message with Message.Message.@PropertyOperation = Initialized, FAIL the test and skip other steps.
10. If *notification*.Topic value is not equal to topic, FAIL the test and skip other steps.
11. ONVIF Client invokes **SetSynchronizationPoint**.
12. The DUT responds with **SetSynchronizationPointResponse** message.

13. Until *timeout1* timeout expires:

    13.1. ONVIF Client waits for time *t* := min{(*tt*-*ct*)/2, 1 second}.

    13.2. ONVIF Client invokes **PullMessages** to the subscription endpoint *s* with parameters

    - Timeout := PT60S
    - MessageLimit := 1

    13.3. The DUT responds with **PullMessagesResponse** message with parameters:

    - CurrentTime =: *ct*
    - TerminationTime =: *tt*
    - NotificationMessage list =: *notificationMessageList*

    13.4. If *notificationMessageList* contains the following NotificationMessage (*repeatedNotification*), go to step 14:

    - *repeatedNotification*.Message.Message.@PropertyOperation = Initialized
    - *repeatedNotification*.Topic = *topic*
    - *repeatedNotification*.Message.Message.Source item is equal to *notification*.Message.Message.Source item if *notificationMessage*.Message.Message contains not empty Source element
    - *repeatedNotification*.Message.Message.Key item is equal to *notification*.Message.Message.Key item If *notificationMessage*.Message.Message contains not empty Key element

    13.5. If *timeout1* expires for step 13 without *repeatedNotification* Notification, FAIL the test and skip other steps.

14. If subscription timeout is not expired, ONVIF Client invokes **Unsubscribe** to the subscription endpoint *s*.

15. The DUT responds with **UnsubscribeResponse** message.

Test Result:

PASS –

- DUT passes all assertions.
- The DUT returned **GetEventPropertiesResponse** message with empty TopicSet.

FAIL –

- The DUT did not send **CreatePullPointSubscriptionResponse** message.
- The DUT did not send a **SetSynchronizationPointResponse** message.
- The DUT did not send a **PullMessagesResponse** message.

Note: *timeout1* will be taken from Operation Delay field of ONVIF Device Test Tool.

5.3.11 REALTIME PULLPOINT SUBSCRIPTION – PULLMESSAGES TIMEOUT

Test Case ID: EVENT-3-1-32

Specification Coverage: PullMessages

Feature Under Test: PullMessages

WSDL Reference: event.wsdl

Test Purpose: To verify that the DUT accepts 60s timeout value in PullMessages request.

Pre-Requisite: Event Service is supported by the DUT. Device supports Pull-Point Notification feature.

Test Configuration: ONVIF Client and DUT

Test Procedure:

1. Start an ONVIF Client.
2. Start the DUT.
3. ONVIF Client invokes **CreatePullPointSubscription** request with parameters
   - Filter skipped
4. The DUT responds with **CreatePullPointSubscriptionResponse** message with parameters
   - SubscriptionReference =: *s*
   - CurrentTime =: *ct*
   - TerminationTime =: *tt*

5. ONVIF Client invokes **PullMessages** to the subscription endpoint *s* with parameters
   - Timeout := PT60S
   - MessageLimit := 1
6. The DUT responds with **PullMessagesResponse** message with parameters:
   - CurrentTime =: *ct*
   - TerminationTime =: *tt*
   - NotificationMessage list
7. If *tt* is not more than *ct*, FAIL the test and skip other steps.
8. ONVIF Client sends an **Unsubscribe** request to the subscription endpoint *s*.
9. The DUT responds with **UnsubscribeResponse** message.

Test Result:

PASS –

- DUT passes all assertions.

FAIL –

- The DUT did not send **CreatePullPointSubscriptionResponse** message.
- The DUT did not send **PullMessagesResponse** message.
- The DUT did not send **UnsubscribeResponse** message.

5.3.12 REALTIME PULLPOINT SUBSCRIPTION – CONJUNCTION IN PULLMESSAGES FILTER (OR OPERATION)

Test Case ID: EVENT-3-1-33

Specification Coverage: Topic Filter (ONVIF Core Specification), Create pull point subscription (ONVIF Core Specification)

Feature Under Test: Topic Filter, http://www.onvif.org/ver10/tev/topicExpression/ConcreteSet TopicExpression Dialect, CreatePullPointSubscription

WSDL Reference: event.wsdl

Test Purpose: To verify that the DUT supports "or" operation in conjunction of topics in the Topic Expressions.

Pre-Requisite: Event Service is supported by the DUT. Device supports Pull-Point Notification feature. If the DUT does not support at least two property events, the test operator has to provide two topics for test on the Management tab and trigger the events manually.

Test Configuration: ONVIF Client and DUT

Test Procedure:

1. Start an ONVIF Client.
2. Start the DUT.
3. ONVIF Client invokes **GetEventProperties** request.
4. The DUT responds with a **GetEventPropertiesResponse** message with parameters
   - TopicNamespaceLocation list
   - FixedTopicSet
   - TopicSet =: *topicSet*
   - TopicExpressionDialect list
   - MessageContentFilterDialect list
   - MessageContentSchemaLocation list
5. If *topicSet* contains less than 2 topics, skip other steps.
6. ONVIF Client sets the following
   - *topic1* := the first Event topic provided on Management Tab
   - *topic2* := the second Event topic provided on Management Tab
7. ONVIF Client invokes **CreatePullPointSubscription** request with parameters
   - Filter.TopicExpression := *topic1*|*topic2*
   - Filter.TopicExpression.@Dialect := "http://www.onvif.org/ver10/tev/topicExpression/ConcreteSet"

8. The DUT responds with **CreatePullPointSubscriptionResponse** message with parameters
   - SubscriptionReference =: *s*
   - CurrentTime =: *ct*
   - TerminationTime =: *tt*
9. Until *timeout1* timeout expires, repeat the following steps:
   9.1. ONVIF Client waits for time *t* := min{(*tt*-*ct*)/2, 1 second}.
   9.2. ONVIF Client invokes **PullMessages** to the subscription endpoint *s* with parameters
      - Timeout := PT60S
      - MessageLimit := 1
   9.3. The DUT responds with **PullMessagesResponse** message with parameters:
      - CurrentTime =: *ct*
      - TerminationTime =: *tt*
      - NotificationMessage list =: *notificationMessageList*
   9.4. For each NotificationMessage (*notification*) in *notificationMessageList*
      9.4.1. If *notification*.Topic value is not equal to *topic1* or *topic2*, FAIL the test and skip other steps.
   9.5. If NotificationMessage with topic value is equal to *topic1* and NotificationMessage with topic value is equal to *topic2* were received, go to step 10.
   9.6. If *timeout1* expires for step 9 without NotificationMessage with topic value equals to *topic1* or without NotificationMessage with topic value equals to *topic2*, FAIL the test and skip other steps.
10. ONVIF Client sends an **Unsubscribe** request to the subscription endpoint *s*.
11. The DUT responds with **UnsubscribeResponse** message.

Test Result:

PASS –

- DUT passes all assertions.

FAIL –

- The DUT did not send **CreatePullPointSubscriptionResponse** message.
- The DUT did not send **PullMessagesResponse** message
- The DUT did not send a **UnsubscribeResponse**.

Note: *timeout1* will be taken from Operation Delay field of ONVIF Device Test Tool.

Note: Test Operator has to select property enents if supported by the Device on the Management tab in Event section.

Note: if *topicSet* does not contain at least 2 topics with IsPropery = true, ONVIF Client provides user interaction window at step 10 and Test Operator has to generate events manually.

5.3.13 REALTIME PULLPOINT SUBSCRIPTION – TOPIC SUB-TREE IN PULLMESSAGES FILTER

Test Case ID: EVENT-3-1-34

Specification Coverage: Topic Filter (ONVIF Core Specification), Create pull point subscription (ONVIF Core Specification)

Feature Under Test: Topic Filter, http://www.onvif.org/ver10/tev/topicExpression/ConcreteSet TopicExpression Dialect, CreatePullPointSubscription

WSDL Reference: event.wsdl

Test Purpose: To verify that the DUT supports "//." operation in topic filter in the Topic Expressions.

Pre-Requisite: Event Service is supported by the DUT. Device supports Pull-Point Notification feature. If the DUT does not support property event, the test operator has to provide topic for test on the Management tab and trigger the events manually.

Test Configuration: ONVIF Client and DUT

Test Procedure:

1. Start an ONVIF Client.
2. Start the DUT.
3. ONVIF Client invokes **GetEventProperties** request.

4. The DUT responds with a **GetEventPropertiesResponse** message with parameters
   - TopicNamespaceLocation list
   - FixedTopicSet
   - TopicSet =: *topicSet*
   - TopicExpressionDialect list
   - MessageContentFilterDialect list
   - MessageContentSchemaLocation list
5. ONVIF Client sets the following
   - *topic* := the Event topic provided on Management Tab
   - *root* := root element of *topic*
6. ONVIF Client invokes **CreatePullPointSubscription** request with parameters
   - Filter.TopicExpression := *root*//.
   - Filter.TopicExpression.@Dialect := "http://www.onvif.org/ver10/tev/topicExpression/ConcreteSet"
7. The DUT responds with **CreatePullPointSubscriptionResponse** message with parameters
   - SubscriptionReference =: *s*
   - CurrentTime =: *ct*
   - TerminationTime =: *tt*
8. Until *timeout1* timeout expires, repeat the following steps:

   8.1. ONVIF Client waits for time *t* := min{(*tt*-*ct*)/2, 1 second}.

   8.2. ONVIF Client invokes **PullMessages** to the subscription endpoint *s* with parameters
      - Timeout := PT60S
      - MessageLimit := 1

   8.3. The DUT responds with **PullMessagesResponse** message with parameters:
      - CurrentTime =: *ct*

- TerminationTime =: *tt*
- NotificationMessage list =: *notificationMessageList*

8.4. For each NotificationMessage (*notification*) in *notificationMessageList*

a. If root element of *notification*.Topic is not equal to *root*, FAIL the test and skip other steps.

8.5. If NotificationMessage with topic value is equal to *topic* was received, go to step 9.

8.6. If *timeout1* expires for step 8 without NotificationMessage with topic value equals to *topic*, FAIL the test and skip other steps.

9. ONVIF Client sends an **Unsubscribe** request to the subscription endpoint *s*.

10. The DUT responds with **UnsubscribeResponse** message.

Test Result:

PASS –

- DUT passes all assertions.

FAIL –

- The DUT did not send **GetEventPropertiesResponse** message.
- The DUT did not send **CreatePullPointSubscriptionResponse** message.
- The DUT did not send **PullMessagesResponse** message.
- The DUT did not send **UnsubscribeResponse** message.

Note: *timeout1* will be taken from Operation Delay field of ONVIF Device Test Tool.

Note: Test Operator has to select property event if supported by the Device on the Management tab in Event section.

Note: if *topicSet* does not contain at least one topic with IsPropery = true, ONVIF Client provides user interaction window and Test Operator has to generate events manually.

5.3.14 REALTIME PULLPOINT SUBSCRIPTION – CONJUNCTION IN NOTIFY FILTER (TOPIC SUB-TREE AND OR OPERATION)

Test Case ID: EVENT-3-1-35

Specification Coverage: Topic Filter (ONVIF Core Specification), Create pull point subscription (ONVIF Core Specification)

Feature Under Test: Topic Filter, http://www.onvif.org/ver10/tev/topicExpression/ConcreteSet TopicExpression Dialect, CreatePullPointSubscription

WSDL Reference: event.wsdl

Test Purpose: To verify that the DUT supports combination of "or" operation and "//." operation in topic filter in the Topic Expressions.

Pre-Requisite: Event Service is supported by the DUT. Device supports Pull-Point Notification feature. If the DUT does not support at least two property events, the test operator has to provide two topics for test on the Management tab and trigger the events manually.

Test Configuration: ONVIF Client and DUT

Test Procedure:

1. Start an ONVIF Client.
2. Start the DUT.
3. ONVIF Client invokes **GetEventProperties** request.
4. The DUT responds with a **GetEventPropertiesResponse** message with parameters
   - TopicNamespaceLocation list
   - FixedTopicSet
   - TopicSet =: *topicSet*
   - TopicExpressionDialect list
   - MessageContentFilterDialect list
   - MessageContentSchemaLocation list
5. If *topicSet* contains less than 2 topics, skip other steps.
6. ONVIF Client sets the following
   - *topic1* := the first Event topic provided on Management Tab
   - *topic2* := the second Event topic provided on Management Tab
   - *root1* := root element of *topic1*
7. ONVIF Client invokes **CreatePullPointSubscription** request with parameters

- Filter.TopicExpression := *root*//.|*topic2*
- Filter.TopicExpression.@Dialect := "http://www.onvif.org/ver10/tev/topicExpression/ConcreteSet"

8. The DUT responds with **CreatePullPointSubscriptionResponse** message with parameters
   - SubscriptionReference =: *s*
   - CurrentTime =: *ct*
   - TerminationTime =: *tt*
9. Until *timeout1* timeout expires, repeat the following steps:
   9.1. ONVIF Client waits for time *t* := min{(*tt*-*ct*)/2, 1 second}.
   9.2. ONVIF Client invokes **PullMessages** to the subscription endpoint *s* with parameters
      - Timeout := PT60S
      - MessageLimit := 1
   9.3. The DUT responds with **PullMessagesResponse** message with parameters:
      - CurrentTime =: *ct*
      - TerminationTime =: *tt*
      - NotificationMessage list =: *notificationMessageList*
   9.4. For each NotificationMessage (*notification*) in *notificationMessageList*
      9.4.1. If root element of *notification*.Topic is not equal to *root1* or if *notification*.Topic is not equal to *topic2*, FAIL the test and skip other steps.
   9.5. If NotificationMessage with topic value is equal to *topic1* and NotificationMessage with topic value is equal to *topic2* were received, go to step 10.
   9.6. If *timeout1* expires for step 9 without NotificationMessage with topic value equals to *topic1* or without NotificationMessage with topic value equals to *topic2*, FAIL the test and skip other steps.
10. ONVIF Client sends an **Unsubscribe** request to the subscription endpoint *s*.
11. The DUT responds with **UnsubscribeResponse** message.

Test Result:

PASS –

- DUT passes all assertions.

FAIL –

- The DUT did not send **GetEventPropertiesResponse** message.
- The DUT did not send **CreatePullPointSubscriptionResponse** message.
- The DUT did not send **PullMessagesResponse** message.
- The DUT did not send **UnsubscribeResponse** message.

Note: *timeout1* will be taken from Operation Delay field of ONVIF Device Test Tool.

Note: Test Operator has to select property event if supported by the Device on the Management tab in Event section.

Note: if *topicSet* does not contain at least 2 topics with IsPropery = true, ONVIF Client provides user interaction window at step 9 and Test Operator has to generate events manually.

5.3.15 REALTIME PULLPOINT SUBSCRIPTION - UNSUBSCRIBE

Test Case ID: EVENT-3-1-36

Specification Coverage: Unsubscribe

Feature Under Test: Unsubscribe

WSDL Reference: event.wsdl

Test Purpose: To verify the DUT Unsubscribe command

Pre-Requisite: Event Service is supported by the DUT. Device supports Pull-Point Notification feature.

Test Configuration: ONVIF Client and DUT

Test Procedure:

1. Start an ONVIF Client.
2. Start the DUT.

3. ONVIF Client will invokes **CreatePullPointSubscription** request.
4. The DUT responds with a **CreatePullPointSubscriptionResponse** message with parameters
   - SubscriptionReference =: *s*
   - CurrentTime
   - TerminationTime
5. Set *timeout1* := "PT1S"
6. Wait until *timeout1* Timeout expires.
7. ONVIF Client invokes **Unsubscribe** to the subscription endpoint *s*.
8. The DUT responds with **UnsubscribeResponse** message.

Test Result:

PASS –

- DUT passes all assertions.

FAIL –

- The DUT did not send **CreatePullPointSubscriptionResponse** message.
- The DUT did not send **UnsubscribeResponse** message.

5.3.16 REALTIME PULLPOINT SUBSCRIPTION – MAXIMUM SUPPORTED NUMBER OF NOTIFICATION PULL POINTS

Test Case ID: EVENT-3-1-37

Specification Coverage: Pull Point Lifecycle (ONVIF Core Specification), Create pull point subscription (ONVIF Core Specification)

Feature Under Test: CreatePullPointSubscription

WSDL Reference: event.wsdl

Test Purpose: To verify that the DUT creates a new pull point on each CreatePullPointSubscription command as long as the number of instantiated pull points does not exceed the capability MaxPullPoints.

Pre-Requisite: Event Service is supported by the DUT. Device supports Pull-Point Notification feature. DUT supports MaxPullPoints capability feature as indicated by Capabilities.MaxPullPoints.

Test Configuration: ONVIF Client and DUT

Test Procedure:

1. Start an ONVIF Client.
2. Start the DUT.
3. ONVIF Client retrieves Event Service Capabilities by following the procedure mentioned in Annex A.5 with the following input and output parameters
   - out *cap* - Event Service Capabilities
4. If *cap* does not contain MaxPullPoints, FAIL the test and skip other steps.
5. If *cap*.MaxPullPoints < 2, skip other steps.
6. ONVIF Client invokes **GetEventProperties** request.
7. The DUT responds with a **GetEventPropertiesResponse** message with parameters
   - TopicNamespaceLocation list
   - FixedTopicSet
   - TopicSet =: *topicSet*
   - TopicExpressionDialect list
   - MessageContentFilterDialect list
   - MessageContentSchemaLocation list
8. If *topicSet* does not contain at least one topic with MessageDescription with IsProperty = true, ONVIF Client will provide an User Interaction window on step 10.4.3. Test Operator shall provide any property event manually.
9. Set *countPullPoints* := 1.
10. Until *countPullPoints* < = *cap*.MaxPullPoints, repeat the following steps:

    10.1. ONVIF Client invokes **CreatePullPointSubscription** request with parameters
    - Filter skipped
    - InitialTerminationTime skipped

10.2. The DUT responds with **CreatePullPointSubscriptionResponse** message with parameters

- SubscriptionReference =: *s<n>*, where n is an index that is equal to *countPullPoints*
- CurrentTime =: *ct*
- TerminationTime =: *tt*

10.3. If *s<n>* = *s<n-1>*, close all subscriptions and FAIL the test.

10.4. Until *timeout1* timeout expires, repeat the following steps:

10.4.1. ONVIF Client waits for time *t* := min{(*tt*-*ct*)/2, 1 second}.

10.4.2. ONVIF Client invokes **PullMessages** to the subscription endpoint *s<n>* with parameters

- Timeout := PT60S
- MessageLimit := 1

10.4.3. The DUT responds with **PullMessagesResponse** message with parameters:

- CurrentTime =: *ct*
- TerminationTime =: *tt*
- NotificationMessage list =: *notificationMessageList*

10.4.4. If *notificationMessageList* is empty, go to step 10.4.

10.4.5. If *timeout1* expires for step 10 without NotificationMessage in *notificationMessageList*, FAIL the test and skip other steps.

10.5. Set *countPullPoints* := *countPullPoints* + 1.

11. For each subscription endpoint *s<n>*

11.1. ONVIF Client sends an **Unsubscribe** request to the subscription endpoint *s<n>*.

11.2. The DUT responds with **UnsubscribeResponse** message.

Test Result:

PASS –

- DUT passes all assertions.

FAIL –

- The DUT did not send **CreatePullPointSubscriptionResponse** message.
- The DUT did not send **PullMessagesResponse** message
- The DUT did not send a **UnsubscribeResponse**.

Note: *timeout1* will be taken from Operation Delay field of ONVIF Device Test Tool.

5.3.17 REALTIME PULLPOINT SUBSCRIPTION - MESSAGE CONTENT FILTER

Test Case ID: EVENT-3-1-38

Specification Coverage: CreatePullPointSubscription, PullMessages, Message Content Filter

Feature Under Test: CreatePullPointSubscription, PullMessages

WSDL Reference: event.wsdl

Test Purpose: To verify that the DUT supports message content filter.

Pre-Requisite: Event Service is supported by the DUT. Device supports Pull-Point Notification feature. Message Content Filter is supported by DUT.

Test Configuration: ONVIF Client and DUT

Test Procedure:

1. Start an ONVIF Client.
2. Start the DUT.
3. ONVIF Client invokes **GetEventProperties** request.
4. The DUT responds with a **GetEventPropertiesResponse** message with parameters
   - TopicNamespaceLocation list
   - FixedTopicSet
   - TopicSet =: *topicSet*
   - TopicExpressionDialect list
   - MessageContentFilterDialect list := *messageContentFilterDialectList*

- MessageContentSchemaLocation list

5. If *topicSet* does not contain at least one topic with MessageDescription.@IsProperty = "true", skip other steps.
6. If *messageContentFilterDialectList* does not contain at least one item with non empty value, FAIL the test and skip other steps.
7. If *messageContentFilterDialectList* does not contain item with value is equal to "http://www.onvif.org/ver10/tev/messageContentFilter/ItemFilter", skip other steps.
8. ONVIF Client sets the following
   - *topic* := the Event topic provided on Management Tab
9. ONVIF Client invokes **CreatePullPointSubscription** request with parameters
   - Filter.TopicExpression := *topic*
   - Filter.TopicExpression.@Dialect := "http://www.onvif.org/ver10/tev/topicExpression/ConcreteSet"
10. The DUT responds with **CreatePullPointSubscriptionResponse** message with parameters
    - SubscriptionReference =: *s*
    - CurrentTime =: *ct*
    - TerminationTime =: *tt*
11. Until *timeout1* timeout expires, repeat the following steps:
    11.1. ONVIF Client waits for time *t* := min{(*tt*-*ct*)/2, 1 second}.
    11.2. ONVIF Client invokes **PullMessages** to the subscription endpoint *s* with parameters
       - Timeout := PT60S
       - MessageLimit := 1
    11.3. The DUT responds with **PullMessagesResponse** message with parameters:
       - CurrentTime =: *ct*
       - TerminationTime =: *tt*
       - NotificationMessage list =: *notificationMessageList*

11.4. If *notificationMessageList* contains NotificationMessage with Message.Message.@PropertyOperation = Initialized:

- set *notification1* := the first NotificationMessage in *notificationMessageList* with Message.Message.@PropertyOperation = Initialized
- Go to 12 step.

11.5. If *timeout1* expires for step 11 without NotificationMessage message with Message.Message.@PropertyOperation = Initialized, FAIL the test and skip other steps.

12. If *notification1*.Topic value is not equal to *topic*, FAIL the test and skip other steps.
13. ONVIF Client invokes **Unsubscribe** to the subscription endpoint *s*.
14. The DUT responds with **UnsubscribeResponse** message.
15. ONVIF Client generates message content filter by following the procedure mentioned in Annex A.6 with the following input and output parameters
    - in *notification1* - Notification message
    - out *messageContentFilter* - message content filter
    - out *name* - SimpleItem Name
    - out *value* - SimpleItem Value
16. ONVIF Client invokes **CreatePullPointSubscription** request with parameters
    - Filter.TopicExpression skipped
    - Filter.MessageContent := *messageContentFilter*
    - Filter.MessageContent.@Dialect := "http://www.onvif.org/ver10/tev/messageContentFilter/ItemFilter"
17. The DUT responds with **CreatePullPointSubscriptionResponse** message with parameters
    - SubscriptionReference =: *s*
    - CurrentTime =: *ct*
    - TerminationTime =: *tt*
18. Until *timeout1* timeout expires, repeat the following steps:

18.1. ONVIF Client waits for time *t* := min{(*tt*-*ct*)/2, 1 second}.

18.2. ONVIF Client invokes **PullMessages** to the subscription endpoint *s* with parameters

- Timeout := PT60S
- MessageLimit := 1

18.3. The DUT responds with **PullMessagesResponse** message with parameters:

- CurrentTime =: *ct*
- TerminationTime =: *tt*
- NotificationMessage list =: *notificationMessageList*

18.4. If *notificationMessageList* is not empty:

- If *notificationMessageList* contains more than one notification item, FAIL the test and skip other steps.
- If *notificationMessageList*[0].Message.Message does not contain SimpleItem with Name = *name* and with Value = *value*, FAIL the test and skip other steps.
- If *notificationMessageList*[0].Topic = *topic* and *notificationMessageList*[0].Message.Message.PropertyOperation="Initialized", go to 19 [81] step.

18.5. If *timeout1* expires for step 18 without NotificationMessage message with Topic = *topic* with Message.Message.@PropertyOperation = Initialized, FAIL the test and skip other steps.

19. ONVIF Client invokes **Unsubscribe** to the subscription endpoint *s*.

20. The DUT responds with **UnsubscribeResponse** message.

Test Result:

PASS –

- DUT passes all assertions.
- The DUT returned **GetEventPropertiesResponse** message with empty TopicSet.

FAIL –

- The DUT did not send **CreatePullPointSubscriptionResponse** message.

- The DUT did not send a **PullMessagesResponse** message.

Note: *timeout1* will be taken from Operation Delay field of ONVIF Device Test Tool.

5.4 Namespace Handling

5.4.1 EVENT - NAMESPACES (DEFAULT NAMESPACES FOR EACH TAG)

Test Case ID: EVENT-4-1-6

Specification Coverage: None

Feature Under Test: None

WSDL Reference: event.wsdl

Test Purpose: To verify that the DUT accepts requests for Event Service with different namespaces definition.

Pre-Requisite: Event Service is supported by the DUT.

Test Configuration: ONVIF Client and DUT

Test Procedure:

1. Start an ONVIF Client.
2. Start the DUT.
3. ONVIF Client will invoke **Subscribe** request to instantiate a Subscription Manager. The **Subscribe** request does not contain a TopicExpression or a Message Content Filter. The Message contains an InitialTerminationTime of 10s to ensure that the Subscription is terminated after end of this test.
4. Verify that the device sends **SubscribeResponse** message. Validate that a valid SubscriptionReference is returned (valid EndpointReference); verify that valid values for CurrentTime and TerminationTime are returned (TerminationTime >= CurrentTime + InitialTerminationTime).
5. ONVIF Client will invoke **Subscribe** request to instantiate a Subscription Manager. The **Subscribe** request does not contain a TopicExpression or a Message Content Filter. The Message contains an InitialTerminationTime of 10s to ensure that the Subscription is terminated after end of this test.

6. Verify that the DUT sends **SubscribeResponse** message. Validate that a valid SubscriptionReference is returned (valid EndpointReference); verify that valid values for CurrentTime and TerminationTime are returned (TerminationTime >= CurrentTime + InitialTerminationTime).

Test Result:

PASS –

- DUT passes all assertions.

FAIL –

- The DUT did not send **SubscribeResponse** message.
- The DUT did not return a valid SubscriptionReference.
- The DUT did not return valid values for CurrentTime and TerminationTime.
- The DUT returned different results at step 4 and step 6 (EndpointReference, TerminationTime, CurrentTime fields could be different, only types of response shall be the same).
- The DUT did not send valid WS-Addressing Action URI in SOAP Header for **SubscribeResponse** message (see Annex A.3).

Note: The Subscription Manager has to be deleted at the end of the test either by calling unsubscribe or through a timeout.

Note: If the DUT cannot accept the set value to an InitialTerminationTime, ONVIF Client retries to send the Subscribe request with MinimumTime value included in UnacceptableInitialTerminationTimeFault.

Note: Everything that happens at step 4 shall happen at step 6 as well. Otherwise, it indicates that the DUT processes namespaces in a wrong way and the test shall be failed.

Note: All requests for steps 5-6 to the DUT shall have default namespaces definition in each tag (see examples in Annex A.2).

5.4.2 EVENT - NAMESPACES (DEFAULT NAMESPACES FOR PARENT TAG)

Test Case ID: EVENT-4-1-7

Specification Coverage: None

Feature Under Test: None

WSDL Reference: event.wsdl

Test Purpose: To verify that the DUT accepts requests for Event Service with different namespaces definition.

Pre-Requisite: Event Service is supported by the DUT.

Test Configuration: ONVIF Client and DUT

Test Procedure:

1. Start an ONVIF Client.
2. Start the DUT.
3. ONVIF Client will invoke **Subscribe** request to instantiate a Subscription Manager. The **Subscribe** request does not contain a TopicExpression or a Message Content Filter. The Message contains an InitialTerminationTime of 10s to ensure that the Subscription is terminated after end of this test.
4. Verify that the DUT sends **SubscribeResponse** message. Validate that a valid SubscriptionReference is returned (valid EndpointReference); verify that valid values for CurrentTime and TerminationTime are returned (TerminationTime >= CurrentTime + InitialTerminationTime).
5. ONVIF Client will invoke **Subscribe** request to instantiate a Subscription Manager. The **Subscribe** request does not contain a TopicExpression or a Message Content Filter. The Message contains an InitialTerminationTime of 10s to ensure that the Subscription is terminated after end of this test.
6. Verify that the DUT sends **SubscribeResponse** message. Validate that a valid SubscriptionReference is returned (valid EndpointReference); verify that valid values for CurrentTime and TerminationTime are returned (TerminationTime >= CurrentTime + InitialTerminationTime).

Test Result:

PASS –

- DUT passes all assertions.

FAIL –

- The DUT did not send **SubscribeResponse** message.
- The DUT did not return a valid SubscriptionReference.

- The DUT did not return valid values for CurrentTime and TerminationTime.
- The DUT returned different results at step 4 and step 6 (EndpointReference, TerminationTime, CurrentTime fields could be different, only type of response shall be the same).
- The DUT did not send valid WS-Addressing Action URI in SOAP Header for **SubscribeResponse** message (see Annex A.3).

Note: The Subscription Manager has to be deleted at the end of the test either by calling unsubscribe or through a timeout.

Note: If the DUT cannot accept the set value to an InitialTerminationTime, ONVIF Client retries to send the Subscribe request with MinimumTime value included in UnacceptableInitialTerminationTimeFault.

Note: Everything that happens at step 4 shall happen at step 6 as well. Otherwise, it indicates that the DUT processes namespaces in a wrong way and the test shall be failed.

Note: All requests for steps 5-6 to the DUT shall have default namespaces definition in parent tag (see examples in Annex A.2).

5.4.3 EVENT - NAMESPACES (NOT STANDARD PREFIXES)

Test Case ID: EVENT-4-1-8

Specification Coverage: None

Feature Under Test: None

WSDL Reference: event.wsdl

Test Purpose: To verify that the DUT accepts requests for Event Service with different namespaces definition.

Pre-Requisite: Event Service is supported by the DUT.

Test Configuration: ONVIF Client and DUT

Test Procedure:

1. Start an ONVIF Client.
2. Start the DUT.
3. ONVIF Client will invoke **Subscribe** request to instantiate a Subscription Manager. The **Subscribe** request does not contain a TopicExpression or a Message Content Filter.

The Message contains an InitialTerminationTime of 10s to ensure that the Subscription is terminated after end of this test.

4. Verify that the DUT sends **SubscribeResponse** message. Validate that a valid SubscriptionReference is returned (valid EndpointReference); verify that valid values for CurrentTime and TerminationTime are returned (TerminationTime >= CurrentTime + InitialTerminationTime).
5. ONVIF Client will invoke **Subscribe** request to instantiate a Subscription Manager. The **Subscribe** request does not contain a TopicExpression or a Message Content Filter. The Message contains an InitialTerminationTime of 10s to ensure that the Subscription is terminated after end of this test.
6. Verify that the DUT sends **SubscribeResponse** message. Validate that a valid SubscriptionReference is returned (valid EndpointReference); verify that valid values for CurrentTime and TerminationTime are returned (TerminationTime >= CurrentTime + InitialTerminationTime).

Test Result:

PASS –

- DUT passes all assertions.

FAIL –

- The DUT did not send **SubscribeResponse** message.
- The DUT did not return a valid SubscriptionReference
- The DUT did not return valid values for CurrentTime and TerminationTime.
- The DUT returned different results at step 4 and step 6 (EndpointReference, TerminationTime, CurrentTime fields could be different, only type of response shall be the same).
- The DUT did not send valid WS-Addressing Action URI in SOAP Header for **SubscribeResponse** message (see Annex A.3).

Note: The Subscription Manager has to be deleted at the end of the test either by calling unsubscribe or through a timeout.

Note: If the DUT cannot accept the set value to an InitialTerminationTime, ONVIF Client retries to send the Subscribe request with MinimumTime value included in UnacceptableInitialTerminationTimeFault.

Note: Everything that happens at step 4 shall happen at step 6 as well. Otherwise, it indicates that the DUT processes namespaces in a wrong way and the test shall be failed.

Note: All requests for steps 5-6 to the DUT shall have namespaces definition with not standard prefixes (see examples in Annex A.2).

5.4.4 EVENT - NAMESPACES (DIFFERENT PREFIXES FOR THE SAME NAMESPACE)

Test Case ID: EVENT-4-1-9

Specification Coverage: None

Feature Under Test: None

WSDL Reference: event.wsdl

Test Purpose: To verify that the DUT accepts requests for Event Service with different namespaces definition.

Pre-Requisite: Event Service is supported by the DUT.

Test Configuration: ONVIF Client and DUT

Test Procedure:

1. Start an ONVIF Client.
2. Start the DUT.
3. ONVIF Client will invoke **Subscribe** request to instantiate a Subscription Manager. The **Subscribe** request does not contain a TopicExpression or a Message Content Filter. The Message contains an InitialTerminationTime of 10s to ensure that the Subscription is terminated after end of this test.
4. Verify that ONVIF Client sends **SubscribeResponse** message. Validate that a valid SubscriptionReference is returned (valid EndpointReference); verify that valid values for CurrentTime and TerminationTime are returned (TerminationTime >= CurrentTime + InitialTerminationTime).
5. ONVIF Client will invoke **Subscribe** request to instantiate a Subscription Manager. The **Subscribe** request does not contain a TopicExpression or a Message Content Filter. The Message contains an InitialTerminationTime of 10s to ensure that the Subscription is terminated after end of this test.
6. Verify that the DUT sends **SubscribeResponse** message. Validate that a valid SubscriptionReference is returned (valid EndpointReference); verify that valid values

for CurrentTime and TerminationTime are returned (TerminationTime >= CurrentTime + InitialTerminationTime).

Test Result:

PASS –

- DUT passes all assertions.

FAIL –

- The DUT did not send **SubscribeResponse** message.
- The DUT did not return a valid SubscriptionReference
- The DUT did not return valid values for CurrentTime and TerminationTime.
- The DUT returned different results at step 4 and step 6 (EndpointReference, TerminationTime, CurrentTime fields could be different, only types of response shall be the same).
- The DUT did not send valid WS-Addressing Action URI in SOAP Header for **SubscribeResponse** message (see Annex A.3).

Note: The Subscription Manager has to be deleted at the end of the test either by calling unsubscribe or through a timeout.

Note: If the DUT cannot accept the set value to an InitialTerminationTime, ONVIF Client retries to send the Subscribe request with MinimumTime value which is contained in UnacceptableInitialTerminationTimeFault.

Note: Everything that happens at step 4 shall happen at step 6 as well. Otherwise, it indicates that the DUT processes namespaces in a wrong way and the test shall be failed.

Note: All requests for steps 5-6 to the DUT shall have namespaces definition with different prefixes for the same namespace (see examples in Annex A.2).

5.4.5 EVENT - NAMESPACES (THE SAME PREFIX FOR DIFFERENT NAMESPACES)

Test Case ID: EVENT-4-1-10

Specification Coverage: None

Feature Under Test: None

WSDL Reference: event.wsdl

Test Purpose: To verify that the DUT accepts requests for Event Service with different namespaces definition.

Pre-Requisite: Event Service is supported by the DUT.

Test Configuration: ONVIF Client and DUT

Test Procedure:

1. Start an ONVIF Client.
2. Start the DUT.
3. ONVIF Client will invoke **Subscribe** request to instantiate a Subscription Manager. The **Subscribe** request does not contain a TopicExpression or a Message Content Filter. The Message contains an InitialTerminationTime of 10s to ensure that the Subscription is terminated after end of this test.
4. Verify that the DUT sends **SubscribeResponse** message. Verify that a valid SubscriptionReference is returned (valid EndpointReference); verify that valid values for CurrentTime and TerminationTime are returned (TerminationTime >= CurrentTime + InitialTerminationTime).
5. ONVIF Client will invoke **Subscribe** request to instantiate a Subscription Manager. The **Subscribe** request does not contain a TopicExpression or a Message Content Filter. The Message contains an InitialTerminationTime of 10s to ensure that the Subscription is terminated after end of this test.
6. Verify that the DUT sends **SubscribeResponse** message. Validate that a valid SubscriptionReference is returned (valid EndpointReference); verify that valid values for CurrentTime and TerminationTime are returned (TerminationTime >= CurrentTime + InitialTerminationTime).

Test Result:

PASS –

- DUT passes all assertions.

FAIL –

- The DUT did not send **SubscribeResponse** message.
- The DUT did not return a valid SubscriptionReference
- The DUT did not return valid values for CurrentTime and TerminationTime.

- The DUT returned different results at step 4 and step 6 (EndpointReference, TerminationTime, CurrentTime fields could be different, only type of response shall be the same).
- The DUT did not send valid WS-Addressing Action URI in SOAP Header for **SubscribeResponse** message (see Annex A.3).

Note: The Subscription Manager has to be deleted at the end of the test either by calling unsubscribe or through a timeout.

Note: If the DUT cannot accept the set value to an InitialTerminationTime, ONVIF Client retries to send the Subscribe request with MinimumTime value included in UnacceptableInitialTerminationTimeFault.

Note: Everything that happens at step 4 shall happen at step 6 as well. Otherwise, it indicates that the DUT processes namespaces in a wrong way and the test shall be failed.

Note: All requests for steps 5-6 to the DUT shall have namespaces definition with the same prefixes for different namespaces (see examples in Annex A.2).

5.5 Capabilities

5.5.1 EVENT SERVICE CAPABILITIES

Test Case ID: EVENT-5-1-1

Specification Coverage: Capability exchange

Feature Under Test: GetServiceCapabilities (for Event Service)

WSDL Reference: events.wsdl

Test Purpose: To verify Event Service Capabilities of the DUT.

Pre-Requisite: Event Service is supported by the DUT.

Test Configuration: ONVIF Client and DUT

Test Procedure:

1. Start an ONVIF Client.
2. Start the DUT.
3. ONVIF Client invokes **GetServiceCapabilities** request to retrieve event service capabilities of the DUT.

4. The DUT responds with **GetServiceCapabilitiesResponse** message with parameters
   - Capabilities := *cap*
5. If *cap* contains non-empty @EventBrokerProtocols list and at least one item does not correspond to requirements for schema name, FAIL the test and skip other steps.
6. If *cap*.@MaxEventBrokers > 0 and *cap* does not contain non-empty @EventBrokerProtocols list, FAIL the test and skip other steps.
7. If *cap* contains non-empty @EventBrokerProtocols list and @MaxEventBrokers is skipped or @MaxEventBrokers < 1, FAIL the test and skip other steps.

Test Result:

PASS –

- DUT passes all assertions.

FAIL –

- The DUT did not send valid **GetServiceCapabilitiesResponse** message.
- The DUT did not send valid WS-Addressing Action URI in SOAP Header for **GetServiceCapabilitiesResponse** message (see Annex A.3).

5.5.2 GET SERVICES AND EVENT SERVICE CAPABILITIES CONSISTENCY

Test Case ID: EVENT-5-1-2

Specification Coverage: Capability exchange

Feature Under Test: GetServices, GetServiceCapabilities (for Event Service)

WSDL Reference: devicemgmt.wsdl, events.wsdl

Test Purpose: To verify Get Services and Events Service Capabilities consistency.

Pre-Requisite: Event Service is supported by the DUT.

Test Configuration: ONVIF Client and DUT

Test Procedure:

1. Start an ONVIF Client.

2. Start the DUT.
3. ONVIF Client will invoke **GetServices** request (IncludeCapability = true) to retrieve all services of the DUT with service capabilities.
4. Verify the **GetServicesResponse** message from the DUT.
5. ONVIF Client will invoke **GetServiceCapabilities** request to retrieve Event service capabilities of the DUT.
6. Verify the **GetServiceCapabilitiesResponse** message from the DUT.
7. If the DUT sent different Capabilities in **GetServicesResponse** message and in **GetServiceCapabilitiesResponse** message, FAIL the test.

Test Result:

PASS –

- DUT passes all assertions.

FAIL –

- The DUT did not send valid **GetServicesResponse** message.
- The DUT did not send valid **GetServiceCapabilitiesResponse** message.
- The DUT sent different Capabilities in **GetServicesResponse** message and in **GetServiceCapabilitiesResponse** message.
- The DUT did not send valid WS-Addressing Action URI in SOAP Header for **GetServiceCapabilitiesResponse** message (see Annex A.3).

Note: Service will be defined as Event service if it has Namespace element that is equal to "http://www.onvif.org/ver10/events/wsdl".

Note: The following fields will be compared at step 7:

- @WSSubscriptionPolicySupport
- @WSPullPointSupport
- @WSPausableSubscriptionManagerInterfaceSupport
- @MaxNotificationProducers
- @MaxPullPoints

- @PersistentNotificationStorage
- @EventBrokerProtocols
- @MaxEventBrokers

5.6 Seek

5.6.1 SEEK EVENTS – BEGIN OF BUFFER

Test Case ID: EVENT-6-1-3

Specification Coverage: BeginOfBuffer (ONVIF Core Specification), Real-time Pull-Point Notification Interface (ONVIF Core Specification), Seek (ONVIF Core Specification), Persistent notification storage (ONVIF Core Specification)

Feature Under Test: Seek

WSDL Reference: event.wsdl

Test Purpose: To verify Seek function and that events are received from persistent notification storage when pull point was set before beginning of buffer. Verify tns1:EventBuffer/Begin event.

Pre-Requisite: Event Service is supported by the DUT. Persistent notification storage is supported by the DUT. Persistent notification storage contains notifications.

Test Configuration: ONVIF Client and DUT

Test Procedure:

1. Start an ONVIF Client.
2. Start the DUT.
3. ONVIF Client will invoke **GetEventProperties** request to retrieve all events supported by the DUT.
4. Verify the **GetEventPropertiesResponse** message from the DUT.
5. Check if there is an event with Topic tns1:EventBuffer/Begin. If there is no event with such Topic, skip other steps, fail the test and go to the next test.
6. Check that this event is not a Property event (MessageDescription.IsProperty = false).
7. ONVIF Client will invoke **CreatePullPointSubscription** request with TopicFilter = tns1:EventBuffer/Begin.

8. Verify that the DUT sends a **CreatePullPointSubscriptionResponse** message. Validate that correct values for CurrentTime and TerminationTime and SubscriptionReference are returned.
9. ONVIF Client will invoke **Seek** request (UtcTime = [Current UTC Time], Reverse = true) to start reverse seek.
10. Verify that the DUT sends a **SeekResponse** message.
11. ONVIF Client will invoke **PullMessages** command with a PullMessagesTimeout of 20s and a MessageLimit of 1.
12. Verify that the DUT sends a **PullMessagesResponse** that contains one NotificationMessage.
13. Verify NotificationMessage (a maximum number of 1 Notification Messages is included in the **PullMessagesResponse** message; well formed and valid values for CurrentTime and TerminationTime (TerminationTime > CurrentTime).
14. Verify that received event is event with Topic = tns1:EventBuffer/Begin.
15. ONVIF Client will invoke **PullMessages** command with a PullMessagesTimeout of 20s and a MessageLimit of 1.
16. Verify that the DUT sends a **PullMessagesResponse** that contains no NotificationMessages.
17. ONVIF Client will invoke **Seek** request (UtcTime = Message.UtcTime of tns1:EventBuffer/Begin message from step 12, Reverse = false) to put pull point in the past.
18. Verify that the DUT sends a **SeekResponse** message.
19. ONVIF Client will invoke **PullMessages** command with a PullMessagesTimeout of 20s and a MessageLimit of 1.
20. Verify that the DUT sends a **PullMessagesResponse** that contains one NotificationMessage.
21. Verify NotificationMessage (a maximum number of 1 Notification Messages is included in the **PullMessagesResponse** message; well formed and valid values for CurrentTime and TerminationTime (TerminationTime > CurrentTime).
22. Verify that received event is event with Topic = tns1:EventBuffer/Begin.
23. ONVIF Client will invoke **PullMessages** command with a PullMessagesTimeout of 20s and a MessageLimit of 1.

24. Verify that the DUT sends a **PullMessagesResponse** that contains no NotificationMessages.

25. Verify that there was **PullMessagesResponse** without messages.

Test Result:

PASS –

- DUT passes all assertions.

FAIL –

- The DUT did not send **CreatePullPointSubscriptionResponse** message.
- The DUT did not send valid values for CurrentTime and TerminationTime (TerminationTime > CurrentTime).
- The DUT did not send a **PullMessagesResponse** message.
- The DUT did not send a **GetEventsPropertiesResponse** message.
- The **PullMessagesResponse** message does not contain a NotificationMessage.
- The **PullMessagesResponse** message contains more than 1 NotificationMessages.
- The NotificationMessages are not well formed.
- The **PullMessagesResponse** message contains invalid values for Current or TerminationTime.
- The DUT did not send event with Topic = tns1:EventBuffer/Begin from persistent notification storage for step 12 and 20.
- The DUT sent event for step 16 and 24.
- The DUT did not return correct event with Topic = tns1:EventBuffer/Begin in GetEventsPropertiesResponse.
- The DUT did not send valid WS-Addressing Action URI in SOAP Header for **CreatePullPointSubscriptionResponse** message (see Annex A.3).
- The DUT did not send valid WS-Addressing Action URI in SOAP Header for **SetSynchronizationPointResponse** message (see Annex A.3).
- The DUT did not send valid WS-Addressing Action URI in SOAP Header for **PullMessagesResponse** message (see Annex A.3).

Note: The Subscription Manager has to be deleted at the end of the test either by calling unsubscribe or through a timeout.

Note: If DUT cannot accept the set value to Timeout or MessageLimit, ONVIF Client retries to send the PullMessage message with Timeout and MessageLimit included in PullMessagesFaultResponse message.

5.6.2 SEEK EVENTS

Test Case ID: EVENT-6-1-4

Specification Coverage: Real-time Pull-Point Notification Interface (ONVIF Core Specification), Seek (ONVIF Core Specification), Persistent notification storage (ONVIF Core Specification)

Feature Under Test: Seek

WSDL Reference: event.wsdl

Test Purpose: To verify Seek function and those events are received from persistent notification storage.

Pre-Requisite: Event Service is supported by the DUT. Persistent notification storage is supported by the DUT. Persistent notification storage contains notifications.

Test Configuration: ONVIF Client and DUT

Test Procedure:

1. Start an ONVIF Client.
2. Start the DUT.
3. Find the beginning of buffer time BeginOfBufferTime1 (see Annex A.4)
4. ONVIF Client will invoke **CreatePullPointSubscription** request.
5. Verify that the DUT sends a **CreatePullPointSubscriptionResponse** message. Validate that correct values for CurrentTime and TerminationTime and SubscriptionReference are returned.
6. ONVIF Client will invoke **Seek** request (UtcTime = BeginOfBufferTime1 – 1s, no Reverse) to put pull point in the past.
7. Verify that the DUT sends a **SeekResponse** message.
8. ONVIF Client will invoke **PullMessages** command with a PullMessagesTimeout of 20s and a MessageLimit of 1.

9. Verify that the DUT sends a **PullMessagesResponse**.
10. Verify NotificationMessage (a maximum number of 1 Notification Messages is included in the **PullMessagesResponse** message; well formed and valid values for CurrentTime and TerminationTime (TerminationTime > CurrentTime).
11. Verify that Message.UtcTime is greater or equal to BeginOfBufferTime1.
12. Repeat steps 8-11 until Message.UtcTime is equal or greater than time of Pullpoint Subscrbtion creation (CurrentTime from step 5) or there are **PullMessagesResponse** without Notifications to get all messages from persistent notification storage.
13. Verify that the first notification has Topic = tns1:EventBuffer/Begin.
14. Verify that all events across **PullMessagesResponse** messages are ordered by increasing Message.UtcTime and if events occur in the incorrect order that they are only misplaced by a maximum of 5 seconds.
15. Verify that there is at least one message from persistent notification storage.
16. Verify that all Messages have Message.UtcTime that is greater or equal to BeginOfBufferTime1.

Test Result:

PASS –

- DUT passes all assertions.

FAIL –

- The DUT did not send **CreatePullPointSubscriptionResponse** message.
- The DUT did not send valid values for CurrentTime and TerminationTime (TerminationTime > CurrentTime).
- The DUT did not send a **PullMessagesResponse** message.
- The DUT did not send a **SeekResponse** message.
- The **PullMessagesResponse** message does not contain a NotificationMessage.
- The **PullMessagesResponse** message contains more than 1 NotificationMessages.
- The NotificationMessages are not well formed.
- The **PullMessagesResponse** message contains invalid values for Current or TerminationTime.

- The DUT did not return at least one NotificationMessage from persistent notification storage.
- The DUT did not return NotificationMessages from persistent notification storage ordered by increasing Message.UtcTime and events that occurred in the incorrect order were misplaced by more than 5 seconds.
- The DUT returned NotificationMessages from persistent notification storage that has Message.UtcTime < BeginOfBufferTime1.
- The DUT returned the first Notification with Topic which differs from tns1:EventBuffer/Begin.
- The DUT did not send valid WS-Addressing Action URI in SOAP Header for **CreatePullPointSubscriptionResponse** message (see Annex A.3).
- The DUT did not send valid WS-Addressing Action URI in SOAP Header for **SeekResponse** message (see Annex A.3).
- The DUT did not send valid WS-Addressing Action URI in SOAP Header for **PullMessagesResponse** message (see Annex A.3).

Note: The Subscription Manager has to be deleted at the end of the test either by calling unsubscribe or through a timeout.

Note: If the DUT cannot accept the set value to Timeout or MessageLimit, ONVIF Client retries to send the PullMessage message with Timeout and MessageLimit included in PullMessagesFaultResponse message.

5.6.3 SEEK EVENTS – REVERSE

Test Case ID: EVENT-6-1-5

Specification Coverage: BeginOfBuffer (ONVIF Core Specification), Real-time Pull-Point Notification Interface (ONVIF Core Specification), Seek (ONVIF Core Specification), Persistent notification storage (ONVIF Core Specification)

Feature Under Test: Seek

WSDL Reference: event.wsdl

Test Purpose: To verify Seek function and those events are received from persistent notification storage in reverse order. Verify tns1:EventBuffer/Begin event.

Pre-Requisite: Event Service is supported by the DUT. Persistent notification storage is supported by the DUT. Persistent notification storage contains notifications.

Test Configuration: ONVIF Client and DUT

Test Procedure:

1. Start an ONVIF Client.
2. Start the DUT.
3. Find beginning of buffer time BeginOfBufferTime1 (see Annex A.4)
4. ONVIF Client will invoke **CreatePullPointSubscription** request.
5. Verify that the DUT sends a **CreatePullPointSubscriptionResponse** message. Validate that correct values for CurrentTime and TerminationTime and SubscriptionReference are returned.
6. ONVIF Client will invoke **Seek** request (UtcTime = [Current UTC Time], Reverse = «true») to start reverse seek.
7. Verify that the DUT sends a **SeekResponse** message.
8. ONVIF Client will invoke **PullMessages** command with a PullMessagesTimeout of 20s and a MessageLimit of 1.
9. Verify that the DUT sends a **PullMessagesResponse**.
10. Verify NotificationMessage (a maximum number of 1 Notification Messages is included in the **PullMessagesResponse** message; well formed and valid values for CurrentTime and TerminationTime (TerminationTime > CurrentTime).
11. Verify that Message.UtcTime is greater or equal to BeginOfBufferTime1.
12. Repeat steps 8-11 until Notification with Topic tns1:EventBuffer/Begin is received or there is **PullMessagesResponse** message without Notifications to get all messages from persistent notification storage.
13. Verify that the last notification has Topic = tns1:EventBuffer/Begin.
14. Verify that all events across **PullMessagesResponse** messages are ordered by decreasing Message.UtcTime and if events occur in the incorrect order that they are only misplaced by a maximum of 5 seconds.
15. Verify that there is at least one message from persistent notification storage.
16. Verify that all Messages have Message.UtcTime that is greater or equal to BeginOfBufferTime1.

Test Result:

PASS –

- DUT passes all assertions.

FAIL –

- The DUT did not send **CreatePullPointSubscriptionResponse** message.
- The DUT did not send valid values for CurrentTime and TerminationTime (TerminationTime > CurrentTime).
- The DUT did not send a **PullMessagesResponse** message.
- The DUT did not send a **SeekResponse** message.
- The **PullMessagesResponse** message does not contain a NotificationMessage.
- The **PullMessagesResponse** message contains more than 1 NotificationMessages.
- The NotificationMessages are not well formed.
- The **PullMessagesResponse** message contains invalid values for Current or TerminationTime.
- The DUT did not return at least one NotificationMessage from persistent notification storage.
- The DUT did not return NotificationMessages from persistent notification storage ordered by decreasing Message.UtcTime and events that occurred in the incorrect order were misplaced by more than 5 seconds.
- The DUT returned NotificationMessages from persistent notification storage that has Message.UtcTime < BeginOfBufferTime1.
- The DUT returned the last Notification with Topic which differs from tns1:EventBuffer/Begin.
- The DUT did not send valid WS-Addressing Action URI in SOAP Header for **CreatePullPointSubscriptionResponse** message (see Annex A.3).
- The DUT did not send valid WS-Addressing Action URI in SOAP Header for **SeekResponse** message (see Annex A.3).
- The DUT did not send valid WS-Addressing Action URI in SOAP Header for **PullMessagesResponse** message (see Annex A.3).

Note: The Subscription Manager has to be deleted at the end of the test either by calling unsubscribe or through a timeout.

Note: If DUT cannot accept the set value to Timeout or MessageLimit, ONVIF Client retries to send the PullMessage message with Timeout and MessageLimit included in PullMessagesFaultResponse message.

5.7 MQTT Notification Interface

5.7.1 Event Broker Configuration

5.7.1.1 GET EVENT BROKER CONFIGURATIONS

Test Case ID: EVENT-7-1-1

Specification Coverage: Event Broker, Get Event Brokers (ONVIF Core Specification),

Feature Under Test: GetEventBrokers (Event Service)

WSDL Reference: event.wsdl

Test Purpose: To verify getting of an event broker configurations from the device.

Pre-Requisite: Event Service is supported by the DUT. Event Broker feature is supported by the DUT.

Test Configuration: ONVIF Client and DUT

Test Procedure:

1. Start an ONVIF Client.
2. Start the DUT.
3. ONVIF Client retrieves Event Service Capabilities by following the procedure mentioned in Annex A.5 with the following input and output parameters
   - out *cap* - Event Service Capabilities
4. ONVIF Client invokes **GetEventBrokers** request with parameters
   - Address skipped
5. DUT responds with **GetEventBrokersResponse** message with parameters
   - EventBroker list =: *eventBrokerConfigList*
6. If amount of items in *eventBrokerConfigList* > *cap*.MaxEventBrokers, FAIL the test and skip other steps.
7. If *eventBrokerConfigList* contains at least two items with equal Address fields, FAIL the test and skip other steps.

8. For each Event Broker Configuration (*eventBrokerConfig*) in *eventBrokerConfigList*:

   8.1. ONVIF Client invokes **GetEventBrokers** request with parameters

   - Address := *eventBrokerConfig*.Address

   8.2. DUT responds with **GetEventBrokersResponse** message with parameters

   - EventBroker list =: *eventBrokerConfigList2*

   8.3. If *eventBrokerConfigList2* does not have exactly one item, FAIL the test and restore DUT settings.

   8.4. If *eventBrokerConfigList2*[0].Address != *eventBrokerConfig*.Address, FAIL the test and restore DUT settings.

   8.5. If *eventBrokerConfigList2*[0] contains Password field, FAIL the test and restore DUT settings.

   8.6. If fields of *eventBrokerConfigList2*[0] does not equal to corresponding fields of *eventBrokerConfig*, FAIL the test and restore DUT settings.

Test Result:

PASS –

- DUT passes all assertions.

FAIL –

- The DUT did not send **GetEventBrokersResponse** message.

Note: The following fields are compared at step 8.6:

- TopicPrefix
- UserName
- CertificateID
- PublishFilter
- QoS

5.7.1.2 ADD EVENT BROKER CONFIGURATION

Test Case ID: EVENT-7-1-2

Specification Coverage: Event Broker, Add Event Broker, Get Event Brokers (ONVIF Core Specification),

Feature Under Test: AddEventBroker, GetEventBrokers (Event Service)

WSDL Reference: event.wsdl

Test Purpose: To verify adding of an event broker configuration to the device.

Pre-Requisite: Event Service is supported by the DUT. Event Broker feature is supported by the DUT.

Test Configuration: ONVIF Client and DUT

Test Procedure:

1. Start an ONVIF Client.
2. Start the DUT.
3. ONVIF Client retrieves Event Service Capabilities by following the procedure mentioned in Annex A.5 with the following input and output parameters
   - out *cap* - Event Service Capabilities
4. If *cap*.@MaxEventBrokers is not greater than 0, FAIL the test.
5. Set *eventBrokerAddress* := ONVIF Client event broker address where scheme = *cap*.EventBrokerProtocols[0]
6. ONVIF Client configures the DUT to have free space for adding at least one event broker by following the procedure mentioned in Annex A.9 with the following input parameter
   - in *cap*.@MaxEventBrokers - Maxiumum number of event broker configurations that can be added to the device
   - out (Optional) *eventBrokerConfigToRestore* - deleted event broker configuration to restore
7. ONVIF Client invokes **AddEventBroker** request with parameters
   - EventBroker.Address := *eventBrokerAddress*
   - EventBroker.TopicPrefix := "TestDevice"
   - EventBroker.UserName := "TestUserName"
   - EventBroker.Password := "TestPassword"
   - EventBroker.CertificateID skipped

- EventBroker.PublishFilter skipped
- EventBroker.QoS := 0

8. DUT responds with **AddEventBrokerResponse** message.
9. ONVIF Client retrieves event broker configuration by following the procedure mentioned in Annex A.8 with the following input and output parameters
   - in *eventBrokerAddress* - created Event Broker Configuration address
   - out *eventBrokerConfigList1* - Event Broker Configurations list
10. If *eventBrokerConfigList1*[0].Address != *eventBrokerAddress*, FAIL the test and restore DUT settings.
11. If *eventBrokerConfigList1*[0].TopicPrefix != "TestDevice", FAIL the test and restore DUT settings.
12. If *eventBrokerConfigList1*[0].UserName != "TestUserName", FAIL the test and restore DUT settings.
13. If *eventBrokerConfigList1*[0] contains Password field, FAIL the test and restore DUT settings.
14. If *eventBrokerConfigList1*[0] contains CertificateID field, FAIL the test and restore DUT settings.
15. If *eventBrokerConfigList1*[0] contains PublishFilter field, FAIL the test and restore DUT settings.
16. If *eventBrokerConfigList1*[0].QoS != 0, FAIL the test and restore DUT settings.
17. ONVIF Client retrieves event broker configurations list by following the procedure mentioned in Annex A.7 with the following input and output parameters
   - out *eventBrokerConfigList2* - Event Broker Configurations list
18. If *eventBrokerConfigList2* does not contain configuration with Address = *eventBrokerAddress*, FAIL the test and restore DUT settings.
19. If event broker configuration with Address = *eventBrokerAddress* from *eventBrokerConfigList2* contains Password field, FAIL the test and restore DUT settings.
20. If event broker configuration with Address = *eventBrokerAddress* from *eventBrokerConfigList2* is not equal to *eventBrokerConfigList1*[0], FAIL the test and restore DUT settings.

21. ONVIF Client deletes created event broker configuration from the DUT by following the procedure mentioned in Annex A.32 with the following input parameter
    - in *eventBrokerAddress* - event broker address
22. ONVIF Client restores *eventBrokerConfigToRestore* if any.

Test Result:

PASS –

- DUT passes all assertions.

FAIL –

- The DUT did not send **AddEventBrokerResponse** message.

Note: The following fields are compared at step 20:

- TopicPrefix
- UserName
- CertificateID
- PublishFilter
- QoS

5.7.1.3 MODIFY EVENT BROKER CONFIGURATION

Test Case ID: EVENT-7-1-3

Specification Coverage: Event Broker, Add Event Broker, Get Event Brokers (ONVIF Core Specification),

Feature Under Test: AddEventBroker, GetEventBrokers (Event Service)

WSDL Reference: event.wsdl

Test Purpose: To verify modifying of an existing event broker configuration on the device.

Pre-Requisite: Event Service is supported by the DUT. Event Broker feature is supported by the DUT.

Test Configuration: ONVIF Client and DUT

Test Procedure:

1. Start an ONVIF Client.
2. Start the DUT.
3. ONVIF Client retrieves Event Service Capabilities by following the procedure mentioned in Annex A.5 with the following input and output parameters
   - out *cap* - Event Service Capabilities
4. If *cap*.@MaxEventBrokers is not greater than 0, FAIL the test.
5. Set *eventBrokerAddress* := ONVIF Client event broker address where scheme = *cap*.EventBrokerProtocols[0]
6. ONVIF Client configures the DUT to have free space for adding at least one event broker by following the procedure mentioned in Annex A.9 with the following input parameter
   - in *cap*.@MaxEventBrokers - Maxiumum number of event broker configurations that can be added to the device
   - out (Optional) *eventBrokerConfigToRestore* - deleted event broker configuration to restore
7. ONVIF Client invokes **AddEventBroker** request with parameters
   - EventBroker.Address := *eventBrokerAddress*
   - EventBroker.TopicPrefix := "TestDevice"
   - EventBroker.UserName := "TestUserName"
   - EventBroker.Password := "TestPassword"
   - EventBroker.CertificateID skipped
   - EventBroker.PublishFilter skipped
   - EventBroker.QoS := 0
8. DUT responds with **AddEventBrokerResponse** message.
9. Set *topicFilter* := value of the 1st topic specifiled on the Device Test Tool UI.
10. ONVIF Client invokes **AddEventBroker** request with parameters
    - EventBroker.Address := *eventBrokerAddress*
    - EventBroker.TopicPrefix := "TestDevice1"
    - EventBroker.UserName := "TestUserName1"

- EventBroker.Password := "TestPassword"
- EventBroker.CertificateID skipped
- EventBroker.PublishFilter.TopicExpression := *topicFilter*
- EventBroker.PublishFilter.@Dialect = "http://www.onvif.org/ver10/tev/topicExpression/ConcreteSet"
- EventBroker.QoS := 1

11. DUT responds with **AddEventBrokerResponse** message.
12. ONVIF Client retrieves event broker configuration by following the procedure mentioned in Annex A.8 with the following input and output parameters
    - in *eventBrokerAddress* - created Event Broker Configuration address
    - out *eventBrokerConfigList1* - Event Broker Configurations list
13. If *eventBrokerConfigList1*[0].Address != *eventBrokerAddress*, FAIL the test and restore DUT settings.
14. If *eventBrokerConfigList1*[0].TopicPrefix != "TestDevice1", FAIL the test and restore DUT settings.
15. If *eventBrokerConfigList1*[0].UserName != "TestUserName1", FAIL the test and restore DUT settings.
16. If *eventBrokerConfigList1*[0] contains Password field, FAIL the test and restore DUT settings.
17. If *eventBrokerConfigList1*[0] contains CertificateID field, FAIL the test and restore DUT settings.
18. If *eventBrokerConfigList1*[0].PublishFilter.TopicExpression != *topicFilter*, FAIL the test and restore DUT settings.
19. If *eventBrokerConfigList1*[0].PublishFilter.@Dialect != "http://www.onvif.org/ver10/tev/topicExpression/ConcreteSet", FAIL the test and restore DUT settings.
20. If *eventBrokerConfigList1*[0].QoS != 1, FAIL the test and restore DUT settings.
21. ONVIF Client retrieves event broker configurations list by following the procedure mentioned in Annex A.7 with the following input and output parameters
    - out *eventBrokerConfigList2* - Event Broker Configurations list

22. If *eventBrokerConfigList2* does not contain configuration with Address = *eventBrokerAddress*, FAIL the test and restore DUT settings.
23. If event broker configuration with Address = *eventBrokerAddress* from *eventBrokerConfigList2* contains Password field, FAIL the test and restore DUT settings.
24. If event broker configuration with Address = *eventBrokerAddress* from *eventBrokerConfigList2* is not equal to *eventBrokerConfigList1*[0], FAIL the test and restore DUT settings.
25. ONVIF Client deletes created event broker configuration from the DUT by following the procedure mentioned in Annex A.32 with the following input parameter
    - in *eventBrokerAddress* - event broker address
26. ONVIF Client restores *eventBrokerConfigToRestore* if any.

Test Result:

PASS –

- DUT passes all assertions.

FAIL –

- The DUT did not send **AddEventBrokerResponse** message.

Note: The following fields are compared at step 24:

- TopicPrefix
- UserName
- CertificateID
- PublishFilter
- QoS

5.7.1.4 DELETE EVENT BROKER CONFIGURATION

Test Case ID: EVENT-7-1-4

Specification Coverage: Event Broker, Delete Event Broker, Get Event Brokers (ONVIF Core Specification),

Feature Under Test: DeleteEventBroker, GetEventBrokers (Event Service)

WSDL Reference: event.wsdl

Test Purpose: To verify deleting of an event broker configuration from the device.

Pre-Requisite: Event Service is supported by the DUT. Event Broker feature is supported by the DUT.

Test Configuration: ONVIF Client and DUT

Test Procedure:

1. Start an ONVIF Client.
2. Start the DUT.
3. ONVIF Client retrieves Event Service Capabilities by following the procedure mentioned in Annex A.5 with the following input and output parameters
   - out *cap* - Event Service Capabilities
4. If *cap*.@MaxEventBrokers is not greater than 0, FAIL the test.
5. Set *eventBrokerAddress* := ONVIF Client event broker address where scheme = *cap*.EventBrokerProtocols[0]
6. ONVIF Client configures the DUT to have free space for adding at least one event broker by following the procedure mentioned in Annex A.9 with the following input parameter
   - in *cap*.@MaxEventBrokers - Maxiumum number of event broker configurations that can be added to the device
   - out (Optional) *eventBrokerConfigToRestore* - deleted event broker configuration to restore
7. ONVIF Client invokes **AddEventBroker** request with parameters
   - EventBroker.Address := *eventBrokerAddress*
   - EventBroker.TopicPrefix := "TestDevice"
   - EventBroker.UserName := "TestUserName"
   - EventBroker.Password := "TestPassword"
   - EventBroker.CertificateID skipped
   - EventBroker.PublishFilter skipped
   - EventBroker.QoS := 0

8. DUT responds with **AddEventBrokerResponse** message.
9. ONVIF Client invokes **DeleteEventBroker** request with parameters
   - Address := *eventBrokerAddress*
10. DUT responds with **DeleteEventBrokerResponse** message.
11. ONVIF Client retrieves event broker configurations list by following the procedure mentioned in Annex A.7 with the following input and output parameters
    - out *eventBrokerConfigList* - Event Broker Configurations list
12. If *eventBrokerConfigList* contains configuration with Address = *eventBrokerAddress*, FAIL the test and restore DUT settings.
13. ONVIF Client restores *eventBrokerConfigToRestore* if any.

Test Result:

PASS –

- DUT passes all assertions.

FAIL –

- The DUT did not send **AddEventBrokerResponse** message.
- The DUT did not send **DeleteEventBrokerResponse** message.

5.7.2 MQTT Notification

5.7.2.1 MQTT EVENTS PUBLISHING (MQTT, QoS=0)

Test Case ID: EVENT-7-2-1

Specification Coverage: Event Broker, Topic Structure, JSON Event Payload, Property events (ONVIF Core Specification),

Feature Under Test: AddEventBroker (Event Service), Topic Structure, JSON Event Payload.

WSDL Reference: event.wsdl

Test Purpose: To verify publishing of events to event broker server via mqtt protocol.

Pre-Requisite: Event Service is supported by the DUT. Event Broker feature is supported by the DUT. MQTT protocol is supported by the DUT.

Test Configuration: ONVIF Client, DUT, MQTT Event Broker Server

Test Procedure:

1. Start an ONVIF Client.
2. Start the DUT.
3. ONVIF Client retrieves Event Service Capabilities by following the procedure mentioned in Annex A.5 with the following input and output parameters
   - out *cap* - Event Service Capabilities
4. If *cap*.@MaxEventBrokers is not greater than 0, FAIL the test.
5. Set *eventBrokerAddress* := ONVIF Client event broker address where scheme = "mqtt"
6. ONVIF Client configures the DUT to have free space for adding at least one event broker by following the procedure mentioned in Annex A.9 with the following input parameter
   - in *cap*.@MaxEventBrokers - Maxiumum number of event broker configurations that can be added to the device
   - out (Optional) *eventBrokerConfigToRestore* - deleted event broker configuration to restore
7. Set *topic* := value of the 1st topic specifiled on the Device Test Tool UI.
8. ONVIF Client retrieves supported topic set by following the procedure mentioned in Annex A.10 with the following input and output parameters
   - out *topicSet* - topic set from GetEventPropertiesResponse
9. If *topicSet* does not contain *topic*, FAIL the test and restore the DUT settings.
10. Set *topicDescription* := *topicSet*[0], where *topicSet*[0] has topic = *topic*.
11. ONVIF Client invokes **AddEventBroker** request with parameters
    - EventBroker.Address := *eventBrokerAddress*
    - EventBroker.TopicPrefix := "TestDevice"
    - EventBroker.UserName := "TestUserName"
    - EventBroker.Password := "TestPassword"
    - EventBroker.CertificateID skipped
    - EventBroker.PublishFilter skipped

- EventBroker.QoS := 0

12. DUT responds with **AddEventBrokerResponse** message.
13. DUT sends **MQTT CONNECT** message via mqtt protocol to *eventBrokerAddress*.
14. If **MQTT CONNECT** header does not contain User Name Flag = 1, FAIL the test and restore the DUT settings.
15. If **MQTT CONNECT** header does not contain Password Flag = 1, FAIL the test and restore the DUT settings.
16. If **MQTT CONNECT** Payload does not contain User Name = "TestUserName", FAIL the test and restore the DUT settings.
17. If **MQTT CONNECT** Payload does not contain Password = "TestPassword", FAIL the test and restore the DUT settings.
18. MQTT Event Broker Server responds with **MQTT CONNACK** message.
19. ONVIF Client retrieves MQTT Event coresponds to *topic* by following the procedure mentioned in Annex A.11 with the following input and output parameters
    - in 0 - expected QoS value
    - in "TestDevice" - expected Topic Prefix
    - in *topic* - expected ONVIF topic
    - in *topicDescription*.MessageDescription.@IsProperty value - property flag
    - out *mqttEvent* - MQTT event
    - out *mqttTopicName* - MQTT topic name of event
20. ONVIF Client deletes created event broker configuration from the DUT by following the procedure mentioned in Annex A.32 with the following input parameter
    - in *eventBrokerAddress* - event broker address
21. DUT sends **MQTT DISCONNECT** message via mqtt protocol to *eventBrokerAddress*.
22. ONVIF Client restores *eventBrokerConfigToRestore* if any.

Test Result:

PASS –

- DUT passes all assertions.

FAIL –

- The DUT did not send **AddEventBrokerResponse** message.

5.7.2.2 MQTT EVENTS PUBLISHING (MQTT TLS, QoS=0)

Test Case ID: EVENT-7-2-2

Specification Coverage: Event Broker, Topic Structure, JSON Event Payload, Property events (ONVIF Core Specification),

Feature Under Test: AddEventBroker (Event Service), Topic Structure, JSON Event Payload.

WSDL Reference: event.wsdl

Test Purpose: To verify publishing of events to event broker server via MQTT over TLS protocol.

Pre-Requisite: Event Service is supported by the DUT. Event Broker feature is supported by the DUT. MQTTS protocol is supported by the DUT.

Test Configuration: ONVIF Client, DUT, MQTT Event Broker Server supporting TLS with SSL Certificates for authentication support.

Test Procedure:

1. Start an ONVIF Client.
2. Start the DUT.
3. ONVIF Client retrieves Event Service Capabilities by following the procedure mentioned in Annex A.5 with the following input and output parameters
   - out *cap* - Event Service Capabilities
4. If *cap*.@MaxEventBrokers is not greater than 0, FAIL the test.
5. Set *eventBrokerAddress* := address of ONVIF Client event broker with TLS security where scheme = "mqtts"
6. ONVIF Client configures the DUT to have free space for adding at least one event broker by following the procedure mentioned in Annex A.9 with the following input parameter
   - in *cap*.@MaxEventBrokers - Maxiumum number of event broker configurations that can be added to the device
   - out (Optional) *eventBrokerConfigToRestore* - deleted event broker configuration to restore

7. Set *topic* := value of the 1st topic specifiled on the Device Test Tool UI.
8. ONVIF Client retrieves supported topic set by following the procedure mentioned in Annex A.10 with the following input and output parameters
   - out *topicSet* - topic set from GetEventPropertiesResponse
9. If *topicSet* does not contain *topic*, FAIL the test and restore the DUT settings.
10. Set *topicDescription* := *topicSet*[0], where *topicSet*[0] has topic = *topic*.
11. ONVIF Client invokes **AddEventBroker** request with parameters
    - EventBroker.Address := *eventBrokerAddress*
    - EventBroker.TopicPrefix := "TestDevice"
    - EventBroker.UserName skipped
    - EventBroker.Password skipped
    - EventBroker.CertificateID skipped
    - EventBroker.PublishFilter skipped
    - EventBroker.QoS := 0
12. DUT responds with **AddEventBrokerResponse** message.
13. DUT sends **MQTT CONNECT** message over MQTT TLS protocol to *eventBrokerAddress*.
14. If **MQTT CONNECT** header does not contain User Name Flag = 1, FAIL the test and restore the DUT settings.
15. If **MQTT CONNECT** header does not contain Password Flag = 1, FAIL the test and restore the DUT settings.
16. If **MQTT CONNECT** Payload does not contain User Name = "TestUserName", FAIL the test and restore the DUT settings.
17. If **MQTT CONNECT** Payload does not contain Password = "TestPassword", FAIL the test and restore the DUT settings.
18. MQTT Event Broker Server responds with **MQTT CONNACK** message.
19. ONVIF Client retrieves MQTT Event coresponds to *topic* by following the procedure mentioned in Annex A.11 with the following input and output parameters

- in 0 - expected QoS value
- in "TestDevice" - expected Topic Prefix
- in *topic* - expected ONVIF topic
- in *topicDescription*.MessageDescription.@IsProperty value - property flag
- out *mqttEvent* - MQTT event
- out *mqttTopicName* - MQTT topic name of event

20. ONVIF Client deletes created event broker configuration from the DUT by following the procedure mentioned in Annex A.32 with the following input parameter
    - in *eventBrokerAddress* - event broker address
21. DUT sends **MQTT DISCONNECT** message over MQTT TLS protocol to *eventBrokerAddress*.
22. ONVIF Client restores *eventBrokerConfigToRestore* if any.

Test Result:

PASS –

- DUT passes all assertions.

FAIL –

- The DUT did not send **AddEventBrokerResponse** message.
- SSL Certificate authentication of the DUT on the Broker Server was failed.

5.7.2.3 MQTT EVENTS PUBLISHING (MQTT OVER WEBSOCKET, QoS=0)

Test Case ID: EVENT-7-2-3

Specification Coverage: Event Broker, Topic Structure, JSON Event Payload, Property events (ONVIF Core Specification),

Feature Under Test: AddEventBroker (Event Service), Topic Structure, JSON Event Payload.

WSDL Reference: event.wsdl

Test Purpose: To verify publishing of events to event broker server via WebSocket protocol.

Pre-Requisite: Event Service is supported by the DUT. Event Broker feature is supported by the DUT. WS protocol is supported by the DUT.

Test Configuration: ONVIF Client, DUT, MQTT Event Broker Server with WebSocket supporting.

Test Procedure:

1. Start an ONVIF Client.
2. Start the DUT.
3. ONVIF Client retrieves Event Service Capabilities by following the procedure mentioned in Annex A.5 with the following input and output parameters
   - out *cap* - Event Service Capabilities
4. If *cap*.@MaxEventBrokers is not greater than 0, FAIL the test.
5. Set *eventBrokerAddress* := ONVIF Client event broker WebSocket address where scheme = "ws"
6. ONVIF Client configures the DUT to have free space for adding at least one event broker by following the procedure mentioned in Annex A.9 with the following input parameter
   - in *cap*.@MaxEventBrokers - Maxiumum number of event broker configurations that can be added to the device
   - out (Optional) *eventBrokerConfigToRestore* - deleted event broker configuration to restore
7. Set *topic* := value of the 1st topic specifiled on the Device Test Tool UI.
8. ONVIF Client retrieves supported topic set by following the procedure mentioned in Annex A.10 with the following input and output parameters
   - out *topicSet* - topic set from GetEventPropertiesResponse
9. If *topicSet* does not contain *topic*, FAIL the test and restore the DUT settings.
10. Set *topicDescription* := *topicSet*[0], where *topicSet*[0] has topic = *topic*.
11. ONVIF Client invokes **AddEventBroker** request with parameters
    - EventBroker.Address := *eventBrokerAddress*
    - EventBroker.TopicPrefix := "TestDevice"
    - EventBroker.UserName := "TestUserName"
    - EventBroker.Password := "TestPassword"

- EventBroker.CertificateID skipped
- EventBroker.PublishFilter skipped
- EventBroker.QoS := 0

12. DUT responds with **AddEventBrokerResponse** message.
13. DUT sends **MQTT CONNECT** message over websocket protocol to *eventBrokerAddress*.
14. If **MQTT CONNECT** header does not contain User Name Flag = 1, FAIL the test and restore the DUT settings.
15. If **MQTT CONNECT** header does not contain Password Flag = 1, FAIL the test and restore the DUT settings.
16. If **MQTT CONNECT** Payload does not contain User Name = "TestUserName", FAIL the test and restore the DUT settings.
17. If **MQTT CONNECT** Payload does not contain Password = "TestPassword", FAIL the test and restore the DUT settings.
18. MQTT Event Broker Server responds with **MQTT CONNACK** message.
19. ONVIF Client retrieves MQTT Event coresponds to *topic* by following the procedure mentioned in Annex A.11 with the following input and output parameters
    - in 0 - expected QoS value
    - in "TestDevice" - expected Topic Prefix
    - in *topic* - expected ONVIF topic
    - in *topicDescription*.MessageDescription.@IsProperty value - property flag
    - out *mqttEvent* - MQTT event
    - out *mqttTopicName* - MQTT topic name of event
20. ONVIF Client deletes created event broker configuration from the DUT by following the procedure mentioned in Annex A.32 with the following input parameter
    - in *eventBrokerAddress* - event broker address
21. DUT sends **MQTT DISCONNECT** message over websocket protocol to *eventBrokerAddress*.
22. ONVIF Client restores *eventBrokerConfigToRestore* if any.

Test Result:

PASS –

- DUT passes all assertions.

FAIL –

- The DUT did not send **AddEventBrokerResponse** message.

5.7.2.4 MQTT EVENTS PUBLISHING (MQTT TLS OVER WEBSOCKET, QoS=0)

Test Case ID: EVENT-7-2-4

Specification Coverage: Event Broker, Topic Structure, JSON Event Payload, Property events (ONVIF Core Specification),

Feature Under Test: AddEventBroker (Event Service), Topic Structure, JSON Event Payload.

WSDL Reference: event.wsdl

Test Purpose: To verify publishing of events to event broker server via websocket over TLS protocol.

Pre-Requisite: Event Service is supported by the DUT. Event Broker feature is supported by the DUT. MQTTS protocol is supported by the DUT.

Test Configuration: ONVIF Client, DUT, MQTT Event Broker Server supporting TLS with SSL Certificates for authentication support.

Test Procedure:

1. Start an ONVIF Client.
2. Start the DUT.
3. ONVIF Client retrieves Event Service Capabilities by following the procedure mentioned in Annex A.5 with the following input and output parameters
   - out *cap* - Event Service Capabilities
4. If *cap*.@MaxEventBrokers is not greater than 0, FAIL the test.
5. Set *eventBrokerAddress* := address of ONVIF Client event broker with TLS security where scheme = "wss"

6. ONVIF Client configures the DUT to have free space for adding at least one event broker by following the procedure mentioned in Annex A.9 with the following input parameter
   - in *cap*.@MaxEventBrokers - Maxiumum number of event broker configurations that can be added to the device
   - out (Optional) *eventBrokerConfigToRestore* - deleted event broker configuration to restore
7. Set *topic* := value of the 1st topic specifiled on the Device Test Tool UI.
8. ONVIF Client retrieves supported topic set by following the procedure mentioned in Annex A.10 with the following input and output parameters
   - out *topicSet* - topic set from GetEventPropertiesResponse
9. If *topicSet* does not contain *topic*, FAIL the test and restore the DUT settings.
10. Set *topicDescription* := *topicSet*[0], where *topicSet*[0] has topic = *topic*.
11. ONVIF Client invokes **AddEventBroker** request with parameters
    - EventBroker.Address := *eventBrokerAddress*
    - EventBroker.TopicPrefix := "TestDevice"
    - EventBroker.UserName skipped
    - EventBroker.Password skipped
    - EventBroker.CertificateID skipped
    - EventBroker.PublishFilter skipped
    - EventBroker.QoS := 0
12. DUT responds with **AddEventBrokerResponse** message.
13. DUT sends **MQTT CONNECT** message over websocket protocol with TLS to *eventBrokerAddress*.
14. If **MQTT CONNECT** header does not contain User Name Flag = 1, FAIL the test and restore the DUT settings.
15. If **MQTT CONNECT** header does not contain Password Flag = 1, FAIL the test and restore the DUT settings.
16. If **MQTT CONNECT** Payload does not contain User Name = "TestUserName", FAIL the test and restore the DUT settings.

17. If **MQTT CONNECT** Payload does not contain Password = "TestPassword", FAIL the test and restore the DUT settings.
18. MQTT Event Broker Server responds with **MQTT CONNACK** message.
19. ONVIF Client retrieves MQTT Event coresponds to *topic* by following the procedure mentioned in Annex A.11 with the following input and output parameters
    - in 0 - expected QoS value
    - in "TestDevice" - expected Topic Prefix
    - in *topic* - expected ONVIF topic
    - in *topicDescription*.MessageDescription.@IsProperty value - property flag
    - out *mqttEvent* - MQTT event
    - out *mqttTopicName* - MQTT topic name of event
20. ONVIF Client deletes created event broker configuration from the DUT by following the procedure mentioned in Annex A.32 with the following input parameter
    - in *eventBrokerAddress* - event broker address
21. DUT sends **MQTT DISCONNECT** message over websocket protocol with TLS to *eventBrokerAddress*.
22. ONVIF Client restores *eventBrokerConfigToRestore* if any.

Test Result:

PASS –

- DUT passes all assertions.

FAIL –

- The DUT did not send **AddEventBrokerResponse** message.
- SSL Certificate authentication of the DUT on the Broker Server was failed.

5.7.2.5 MQTT EVENTS PUBLISHING (MQTT, QoS=1)

Test Case ID: EVENT-7-2-5

Specification Coverage: Event Broker, Topic Structure, JSON Event Payload, Property events (ONVIF Core Specification),

Feature Under Test: AddEventBroker (Event Service), Topic Structure, JSON Event Payload.

WSDL Reference: event.wsdl

Test Purpose: To verify publishing of events to event broker server via mqtt protocol.

Pre-Requisite: Event Service is supported by the DUT. Event Broker feature is supported by the DUT. MQTT protocol is supported by the DUT.

Test Configuration: ONVIF Client, DUT, MQTT Event Broker Server

Test Procedure:

1. Start an ONVIF Client.
2. Start the DUT.
3. ONVIF Client retrieves Event Service Capabilities by following the procedure mentioned in Annex A.5 with the following input and output parameters
   - out *cap* - Event Service Capabilities
4. If *cap*.@MaxEventBrokers is not greater than 0, FAIL the test.
5. Set *eventBrokerAddress* := ONVIF Client event broker address where scheme = "mqtt"
6. ONVIF Client configures the DUT to have free space for adding at least one event broker by following the procedure mentioned in Annex A.9 with the following input parameter
   - in *cap*.@MaxEventBrokers - Maxiumum number of event broker configurations that can be added to the device
   - out (Optional) *eventBrokerConfigToRestore* - deleted event broker configuration to restore
7. Set *topic* := value of the 1st topic specifiled on the Device Test Tool UI.
8. ONVIF Client retrieves supported topic set by following the procedure mentioned in Annex A.10 with the following input and output parameters
   - out *topicSet* - topic set from GetEventPropertiesResponse
9. If *topicSet* does not contain *topic*, FAIL the test and restore the DUT settings.
10. Set *topicDescription* := *topicSet*[0], where *topicSet*[0] has topic = *topic*.
11. ONVIF Client invokes **AddEventBroker** request with parameters
    - EventBroker.Address := *eventBrokerAddress*

- EventBroker.TopicPrefix := "TestDevice"
- EventBroker.UserName := "TestUserName"
- EventBroker.Password := "TestPassword"
- EventBroker.CertificateID skipped
- EventBroker.PublishFilter skipped
- EventBroker.QoS := 1

12. DUT responds with **AddEventBrokerResponse** message.
13. DUT sends **MQTT CONNECT** message via mqtt protocol to *eventBrokerAddress*.
14. If **MQTT CONNECT** header does not contain User Name Flag = 1, FAIL the test and restore the DUT settings.
15. If **MQTT CONNECT** header does not contain Password Flag = 1, FAIL the test and restore the DUT settings.
16. If **MQTT CONNECT** Payload does not contain User Name = "TestUserName", FAIL the test and restore the DUT settings.
17. If **MQTT CONNECT** Payload does not contain Password = "TestPassword", FAIL the test and restore the DUT settings.
18. MQTT Event Broker Server responds with **MQTT CONNACK** message.
19. ONVIF Client retrieves MQTT Event coresponds to *topic* by following the procedure mentioned in Annex A.11 with the following input and output parameters
    - in 1 - expected QoS value
    - in "TestDevice" - expected Topic Prefix
    - in *topic* - expected ONVIF topic
    - in *topicDescription*.MessageDescription.@IsProperty value - property flag
    - out *mqttEvent* - MQTT event
    - out *mqttTopicName* - MQTT topic name of event
20. ONVIF Client deletes created event broker configuration from the DUT by following the procedure mentioned in Annex A.32 with the following input parameter

- in *eventBrokerAddress* - event broker address

21. DUT sends **MQTT DISCONNECT** message via mqtt protocol to *eventBrokerAddress*.
22. ONVIF Client restores *eventBrokerConfigToRestore* if any.

Test Result:

PASS –

- DUT passes all assertions.

FAIL –

- The DUT did not send **AddEventBrokerResponse** message.

5.7.2.6 MQTT EVENTS PUBLISHING (MQTT, QoS=2)

Test Case ID: EVENT-7-2-6

Specification Coverage: Event Broker, Topic Structure, JSON Event Payload, Property events (ONVIF Core Specification),

Feature Under Test: AddEventBroker (Event Service), Topic Structure, JSON Event Payload.

WSDL Reference: event.wsdl

Test Purpose: To verify publishing of events to event broker server via mqtt protocol.

Pre-Requisite: Event Service is supported by the DUT. Event Broker feature is supported by the DUT. MQTT protocol is supported by the DUT.

Test Configuration: ONVIF Client, DUT, MQTT Event Broker Server

Test Procedure:

1. Start an ONVIF Client.
2. Start the DUT.
3. ONVIF Client retrieves Event Service Capabilities by following the procedure mentioned in Annex A.5 with the following input and output parameters
   - out *cap* - Event Service Capabilities
4. If *cap*.@MaxEventBrokers is not greater than 0, FAIL the test.

5. Set *eventBrokerAddress* := ONVIF Client event broker address where scheme = "mqtt"
6. ONVIF Client configures the DUT to have free space for adding at least one event broker by following the procedure mentioned in Annex A.9 with the following input parameter
   - in *cap*.@MaxEventBrokers - Maxiumum number of event broker configurations that can be added to the device
   - out (Optional) *eventBrokerConfigToRestore* - deleted event broker configuration to restore
7. Set *topic* := value of the 1st topic specifiled on the Device Test Tool UI.
8. ONVIF Client retrieves supported topic set by following the procedure mentioned in Annex A.10 with the following input and output parameters
   - out *topicSet* - topic set from GetEventPropertiesResponse
9. If *topicSet* does not contain *topic*, FAIL the test and restore the DUT settings.
10. Set *topicDescription* := *topicSet*[0], where *topicSet*[0] has topic = *topic*.
11. ONVIF Client invokes **AddEventBroker** request with parameters
    - EventBroker.Address := *eventBrokerAddress*
    - EventBroker.TopicPrefix := "TestDevice"
    - EventBroker.UserName := "TestUserName"
    - EventBroker.Password := "TestPassword"
    - EventBroker.CertificateID skipped
    - EventBroker.PublishFilter skipped
    - EventBroker.QoS := 2
12. DUT responds with **AddEventBrokerResponse** message.
13. DUT sends **MQTT CONNECT** message via mqtt protocol to *eventBrokerAddress*.
14. If **MQTT CONNECT** header does not contain User Name Flag = 1, FAIL the test and restore the DUT settings.
15. If **MQTT CONNECT** header does not contain Password Flag = 1, FAIL the test and restore the DUT settings.
16. If **MQTT CONNECT** Payload does not contain User Name = "TestUserName", FAIL the test and restore the DUT settings.

17. If **MQTT CONNECT** Payload does not contain Password = "TestPassword", FAIL the test and restore the DUT settings.
18. MQTT Event Broker Server responds with **MQTT CONNACK** message.
19. ONVIF Client retrieves MQTT Event coresponds to *topic* by following the procedure mentioned in Annex A.11 with the following input and output parameters
    - in 2 - expected QoS value
    - in "TestDevice" - expected Topic Prefix
    - in *topic* - expected ONVIF topic
    - in *topicDescription*.MessageDescription.@IsProperty value - property flag
    - out *mqttEvent* - MQTT event
    - out *mqttTopicName* - MQTT topic name of event
20. ONVIF Client deletes created event broker configuration from the DUT by following the procedure mentioned in Annex A.32 with the following input parameter
    - in *eventBrokerAddress* - event broker address
21. DUT sends **MQTT DISCONNECT** message via mqtt protocol to *eventBrokerAddress*.
22. ONVIF Client restores *eventBrokerConfigToRestore* if any.

Test Result:

PASS –

- DUT passes all assertions.

FAIL –

- The DUT did not send **AddEventBrokerResponse** message.

5.7.2.7 MQTT EVENTS PUBLISHING - PUBLISH FILTER (MQTT, QoS=0)

Test Case ID: EVENT-7-2-7

Specification Coverage: Event Broker, Topic Structure, JSON Event Payload, Property events (ONVIF Core Specification),

Feature Under Test: AddEventBroker (Event Service), Topic Structure, JSON Event Payload.

WSDL Reference: event.wsdl

Test Purpose: To verify publishing of events to event broker server via mqtt protocol. To verify if the DUT handles event filtering in a correct way.

Pre-Requisite: Event Service is supported by the DUT. Event Broker feature is supported by the DUT. MQTT protocol is supported by the DUT.

Test Configuration: ONVIF Client, DUT, MQTT Event Broker Server

Test Procedure:

1. Start an ONVIF Client.
2. Start the DUT.
3. ONVIF Client retrieves Event Service Capabilities by following the procedure mentioned in Annex A.5 with the following input and output parameters
   - out *cap* - Event Service Capabilities
4. If *cap*.@MaxEventBrokers is not greater than 0, FAIL the test.
5. Set *eventBrokerAddress* := ONVIF Client event broker address where scheme = "mqtt"
6. ONVIF Client configures the DUT to have free space for adding at least one event broker by following the procedure mentioned in Annex A.9 with the following input parameter
   - in *cap*.@MaxEventBrokers - Maxiumum number of event broker configurations that can be added to the device
   - out (Optional) *eventBrokerConfigToRestore* - deleted event broker configuration to restore
7. Set *topic* := value of the 1st topic specifiled on the Device Test Tool UI.
8. ONVIF Client retrieves supported topic set by following the procedure mentioned in Annex A.10 with the following input and output parameters
   - out *topicSet* - topic set from GetEventPropertiesResponse
9. If *topicSet* does not contain *topic*, FAIL the test and restore the DUT settings.
10. Set *topicDescription* := *topicSet*[0], where *topicSet*[0] has topic = *topic*.
11. ONVIF Client invokes **AddEventBroker** request with parameters
    - EventBroker.Address := *eventBrokerAddress*

- EventBroker.TopicPrefix := "TestDevice"
- EventBroker.UserName := "TestUserName"
- EventBroker.Password := "TestPassword"
- EventBroker.CertificateID skipped
- EventBroker.PublishFilter.TopicExpression := *topic*
- EventBroker.PublishFilter.@Dialect = "http://www.onvif.org/ver10/tev/topicExpression/ConcreteSet"
- EventBroker.QoS := 0

12. DUT responds with **AddEventBrokerResponse** message.
13. DUT sends **MQTT CONNECT** message via mqtt protocol to *eventBrokerAddress*.
14. If **MQTT CONNECT** header does not contain User Name Flag = 1, FAIL the test and restore the DUT settings.
15. If **MQTT CONNECT** header does not contain Password Flag = 1, FAIL the test and restore the DUT settings.
16. If **MQTT CONNECT** Payload does not contain User Name = "TestUserName", FAIL the test and restore the DUT settings.
17. If **MQTT CONNECT** Payload does not contain Password = "TestPassword", FAIL the test and restore the DUT settings.
18. MQTT Event Broker Server responds with **MQTT CONNACK** message.
19. ONVIF Client retrieves MQTT Event coresponds to *topic* by following the procedure mentioned in Annex A.12 with the following input and output parameters
    - in 0 - expected QoS value
    - in "TestDevice" - expected Topic Prefix
    - in *topic* - expected ONVIF topic
    - in *topicDescription*.MessageDescription.@IsProperty value - property flag
    - out *mqttEvent* - MQTT event
    - out *mqttTopicName* - MQTT topic name of event

20. ONVIF Client deletes created event broker configuration from the DUT by following the procedure mentioned in Annex A.32 with the following input parameter
    - in *eventBrokerAddress* - event broker address
21. DUT sends **MQTT DISCONNECT** message via mqtt protocol to *eventBrokerAddress*.
22. ONVIF Client restores *eventBrokerConfigToRestore* if any.

Test Result:

PASS –

- DUT passes all assertions.

FAIL –

- The DUT did not send **AddEventBrokerResponse** message.

Annex A Helper Procedures and Additional Notes

A.1 Subscribe and CreatePullPointSubscription for Receiving All Events

When subscribing for events an ONVIF Client might be interested in receiving all or some of the Events produced by the DUT.

If an ONVIF Client is interested in receiving some events it includes a filter tag in the CreatePullPointSubscription or Subscribe requests describing the events which the ONVIF Client is interested in (see examples in the [ONVIF Core Specs]).

If an ONVIF Client is interested in receiving all events from a device it does not include the Filter sub tag in the Subscribe or CreatePullPointSubscription request.

Example:

The following Subscribe and CreatePullPointSubscription requests can be used if an ONVIF Client is interested in receiving all events.

1. Subscribe request:

```
<m:Subscribe xmlns:m="http://docs.oasis-open.org/wsn/b-2"
 xmlns:m0="http://www.w3.org/2005/08/addressing">
 <m:ConsumerReference>
 <m0:Address>
  http://192.168.0.1/events
 </m0:Address>
 </m:ConsumerReference>
</m:Subscribe>
```

2. CreatePullPointSubscription request

```
<m:CreatePullPointSubscription
 xmlns:m="http://www.onvif.org/ver10/events/wsdl"/>
```

A.2 Example of Requests for Namespaces Test Cases

For the execution of namespaces test cases, ONVIF Client shall send a request with specific namespaces definition. Examples of how this request shall look like are the following.

1. Defaults Namespaces Definition in Each Tag Examples

   Subscribe request example:

```
<Envelope xmlns="http://www.w3.org/2003/05/soap-envelope">
 <Header xmlns="http://www.w3.org/2003/05/soap-envelope">
 <Action u:shallUnderstand="1" xmlns:u="http://www.w3.org/2003/
  05/soap-envelope" xmlns="http://www.w3.org/2005/08/
  addressing">
  http://docs.oasis-open.org/wsn/bw-2/NotificationProducer/
  SubscribeRequest</Action>
 <MessageID xmlns="http://www.w3.org/2005/08/addressing">
  urn:uuid:9f2a12de-3a76-461b-a421-e472517bcc7e</MessageID>
 <ReplyTo xmlns="http://www.w3.org/2005/08/addressing">
  <Address xmlns="http://www.w3.org/2005/08/addressing">
  http://www.w3.org/2005/08/addressing/anonymous</Address>
 </ReplyTo>
 <Security xmlns="http://docs.oasis-open.org/wss/2004/
 01/oasis-200401-wss-wssecurity-secext-1.0.xsd">
  <UsernameToken xmlns="http://docs.oasis-open.org/wss/2004/01/
  oasis-200401-wss-wssecurity-secext-1.0.xsd">
  <Username xmlns="http://docs.oasis-open.org/wss/2004/01/
   oasis-200401-wss-wssecurity-secext-1.0.xsd">
   user</Username>
  <Password xmlns="http://docs.oasis-open.org/wss/2004/01/
   oasis-200401-wss-wssecurity-secext-1.0.xsd" Type=
   "http://docs.oasis-open.org/wss/2004/01/oasis-200401-
   wss-username-token-profile-1.0#PasswordDigest">
   5zjIbmvWxVevGlpqg6Qnt9h8Fmo=</Password>
  <Nonce xmlns="http://docs.oasis-open.org/wss/2004/01/
   oasis-200401-wss-wssecurity-secext-1.0.xsd">
   ikcoiK+AmJvA5UpfxTzG8Q==</Nonce>
  <Created xmlns="http://docs.oasis-open.org/wss/2004/01/
   oasis-200401-wss-wssecurity-utility-1.0.xsd">
   2011-04-25T09:27:48Z</Created>
```

```
 </UsernameToken>
</Security>
<To t:shallUnderstand="1"
 xmlns:t="http://www.w3.org/2003/05/soap-envelope"
 xmlns="http://www.w3.org/2005/08/addressing">
 http://169.254.141.200/onvif/services</To>
</Header>
<Body xmlns="http://www.w3.org/2003/05/soap-envelope">
<Subscribe xmlns="http://docs.oasis-open.org/wsn/b-2">
 <ConsumerReference
 xmlns="http://docs.oasis-open.org/wsn/b-2">
 <Address xmlns="http://www.w3.org/2005/08/addressing">
  http://192.168.10.66/onvif_notify_server</Address>
 </ConsumerReference>
 <InitialTerminationTime>PT10S</InitialTerminationTime>
</Subscribe>
</Body>
</Envelope>
```

2. Defaults Namespaces Definition in Parent Tag Examples

   Subscribe request example:

```
<Envelope xmlns="http://www.w3.org/2003/05/soap-envelope">
 <Header>
 <Action u:shallUnderstand="1" xmlns:u="http://www.w3.org/2003/
  05/soap-envelope"
  xmlns="http://www.w3.org/2005/08/addressing">
  http://docs.oasis-open.org/wsn/bw-2/NotificationProducer/
  SubscribeRequest</Action>
 <MessageID xmlns="http://www.w3.org/2005/08/addressing">
  urn:uuid:9f2a12de-3a76-461b-a421-e472517bcc7e</MessageID>
 <ReplyTo xmlns="http://www.w3.org/2005/08/addressing">
  <Address>http://www.w3.org/2005/08/addressing/
  anonymous</Address>
 </ReplyTo>
 <Security xmlns="http://docs.oasis-open.org/wss/2004/
  01/oasis-200401-wss-wssecurity-secext-1.0.xsd">
  <UsernameToken>
```

```
 <Username>user</Username>
 <Password Type="http://docs.oasis-open.org/wss/2004/01/
  oasis-200401-wss-username-token-profile-1.0
  #PasswordDigest">5zjIbmvWxVevGlpqg6Qnt9h8Fmo=</Password>
 <Nonce>ikcoiK+AmJvA5UpfxTzG8Q==</Nonce>
 <Created xmlns="http://docs.oasis-open.org/wss/2004/01/
  oasis-200401-wss-wssecurity-utility-1.0.xsd">
  2011-04-25T09:27:48Z</Created>
 </UsernameToken>
</Security>
<To t:shallUnderstand="1"
 xmlns:t="http://www.w3.org/2003/05/soap-envelope"
 xmlns="http://www.w3.org/2005/08/addressing">
 http://169.254.141.200/onvif/services</To>
</Header>
<Body>
<Subscribe xmlns="http://docs.oasis-open.org/wsn/b-2">
 <ConsumerReference
 xmlns="http://docs.oasis-open.org/wsn/b-2">
 <Address xmlns="http://www.w3.org/2005/08/addressing">
  http://192.168.10.66/onvif_notify_server</Address>
 </ConsumerReference>
 <InitialTerminationTime xmlns="http://docs.oasis-open.org/
 wsn/b-2">PT10S</InitialTerminationTime>
</Subscribe>
</Body>
</Envelope>
```

3. Namespaces Definition with non-Standard Prefixes Examples

   Subscribe request example:

```
<prefix0:Envelope
 xmlns:prefix0="http://www.w3.org/2003/05/soap-envelope"
 xmlns:prefix1="http://www.w3.org/2003/05/soap-envelope"
 xmlns:prefix2="http://www.w3.org/2005/08/addressing"
 xmlns:prefix3="http://docs.oasis-open.org/wss/2004/01/
 oasis-200401-wss-wssecurity-utility-1.0.xsd"
 xmlns:prefix4="http://docs.oasis-open.org/wss/2004/01/
```

```
oasis-200401-wss-wssecurity-secext-1.0.xsd"
xmlns:prefix5="http://docs.oasis-open.org/wsn/b-2">
<prefix0:Header>
<prefix2:Action prefix1:shallUnderstand="1">
 http://docs.oasis-open.org/wsn/bw-2/NotificationProducer/
 SubscribeRequest</prefix2:Action>
<prefix2:MessageID>urn:uuid:9f2a12de-3a76-461b-a421-
 e472517bcc7e</prefix2:MessageID>
<prefix2:ReplyTo>
 <prefix2:Address>http://www.w3.org/2005/08/addressing/
 anonymous</prefix2:Address>
</prefix2:ReplyTo>
<prefix4:Security>
 <prefix4:UsernameToken>
 <prefix4:Username>service</prefix4:Username>
 <prefix4:Password Type="http://docs.oasis-open.org/wss/
  2004/01/oasis-200401-wss-username-token-profile-1.0
  #PasswordDigest">tg6EnHtyMWW8eUfntHO6XpPjOsg=
  </prefix4:Password>
 <prefix4:Nonce>iBIGpSuHtNPbdSWGzG48ng==</prefix4:Nonce>
 <prefix3:Created>2011-04-25T10:54:34Z</prefix3:Created>
 </prefix4:UsernameToken>
</prefix4:Security>
<prefix2:To prefix1:shallUnderstand="1">
 http://169.254.141.200/onvif/services</prefix2:To>
</prefix0:Header>
<prefix0:Body>
<prefix5:Subscribe>
 <prefix5:ConsumerReference>
 <prefix2:Address xmlns="http://www.w3.org/2005/08/
  addressing">http://192.168.10.66/onvif_notify_server
  </prefix2:Address>
 </prefix5:ConsumerReference>
 <prefix5:InitialTerminationTime>PT10S
 </prefix5:InitialTerminationTime>
</prefix5:Subscribe>
</prefix0:Body>
</prefix0:Envelope>
```

4. Namespaces Definition with Different Prefixes for the Same Namespace Examples

Subscribe request example:

```
<e1:Envelope xmlns:e1="http://www.w3.org/2003/05/soap-envelope">
 <e2:Header xmlns:e2="http://www.w3.org/2003/05/soap-envelope">
 <e3:Action u:shallUnderstand="1" xmlns:u="http://www.w3.org/
  2003/05/soap-envelope" xmlns:e3="http://www.w3.org/2005/08/
  addressing">http://docs.oasis-open.org/wsn/bw-2/
  NotificationProducer/SubscribeRequest</e3:Action>
 <e4:MessageID xmlns:e4="http://www.w3.org/2005/08/addressing">
  urn:uuid:9f2a12de-3a76-461b-a421-e472517bcc7e</e4:MessageID>
 <e5:ReplyTo xmlns:e5="http://www.w3.org/2005/08/addressing">
  <e6:Address xmlns:e6="http://www.w3.org/2005/08/addressing">
  http://www.w3.org/2005/08/addressing/anonymous</e6:Address>
 </e5:ReplyTo>
 <e7:Security xmlns:e7="http://docs.oasis-open.org/wss/2004/
  01/oasis-200401-wss-wssecurity-secext-1.0.xsd">
  <e8:UsernameToken xmlns:e8="http://docs.oasis-open.org/wss/
  2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd">
  <e9:Username xmlns:e9="http://docs.oasis-open.org/wss/
   2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd">
   user</e9:Username>
  <e10:Password xmlns:e10="http://docs.oasis-open.org/wss/
   2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd" Type
   ="http://docs.oasis-open.org/wss/2004/01/oasis-200401-
   wss-username-token-profile-1.0#PasswordDigest">
   5zjIbmvWxVevGlpqg6Qnt9h8Fmo=</e10:Password>
  <e11:Nonce xmlns:e11="http://docs.oasis-open.org/wss/
   2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd">
   ikcoiK+AmJvA5UpfxTzG8Q==</e11:Nonce>
  <e12:Created xmlns:e12="http://docs.oasis-open.org/wss/
   2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd">
   2011-04-25T09:27:48Z</e12:Created>
  </e8:UsernameToken>
 </e7:Security>
 <e13:To t:shallUnderstand="1"
  xmlns:t="http://www.w3.org/2003/05/soap-envelope"
  xmlns:e13="http://www.w3.org/2005/08/addressing">
  http://169.254.141.200/onvif/services</e13:To>
```

```
 </e2:Header>
 <e1:Body>
 <e14:Subscribe
  xmlns:e14="http://docs.oasis-open.org/wsn/b-2">
  <e15:ConsumerReference
  xmlns:e15="http://docs.oasis-open.org/wsn/b-2">
  <e16:Address
   xmlns:e16="http://www.w3.org/2005/08/addressing">
   http://192.168.10.66/onvif_notify_server</e16:Address>
  </e15:ConsumerReference>
  <e14:InitialTerminationTime>PT10S
  </e14:InitialTerminationTime>
 </e14:Subscribe>
 </e1:Body>
</e1:Envelope>
```

5. Namespaces Definition with the Same Prefixes for Different Namespaces Examples

   Subscribe request example:

```
<p1:Envelope xmlns:p1="http://www.w3.org/2003/05/soap-envelope">
 <p1:Header>
 <p1:Action u:shallUnderstand="1" xmlns:u="http://www.w3.org/
  2003/05/soap-envelope" xmlns:p1="http://www.w3.org/2005/08/
  addressing">http://docs.oasis-open.org/wsn/bw-2/
  NotificationProducer/SubscribeRequest</p1:Action>
 <p1:MessageID xmlns:p1="http://www.w3.org/2005/08/addressing">
  urn:uuid:9f2a12de-3a76-461b-a421-e472517bcc7e</p1:MessageID>
 <p1:ReplyTo xmlns:p1="http://www.w3.org/2005/08/addressing">
  <p1:Address>http://www.w3.org/2005/08/addressing/anonymous
  </p1:Address>
 </p1:ReplyTo>
 <p1:Security xmlns:p1="http://docs.oasis-open.org/wss/2004/
  01/oasis-200401-wss-wssecurity-secext-1.0.xsd">
  <p1:UsernameToken>
  <p1:Username>user</p1:Username>
  <p1:Password Type="http://docs.oasis-open.org/wss/
   2004/01/oasis-200401-wss-username-token-profile-1.0
   #PasswordDigest">5zjIbmvWxVevGlpqg6Qnt9h8Fmo=
```

```
  </p1:Password>
 <p1:Nonce>ikcoiK+AmJvA5UpfxTzG8Q==</p1:Nonce>
 <p1:Created xmlns:p1="http://docs.oasis-open.org/wss/
  2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd">
  2011-04-25T09:27:48Z</p1:Created>
 </p1:UsernameToken>
</p1:Security>
<p1:To t:shallUnderstand="1"
 xmlns:t="http://www.w3.org/2003/05/soap-envelope"
 xmlns:p1="http://www.w3.org/2005/08/addressing">
 http://169.254.141.200/onvif/services</p1:To>
</p1:Header>
<p1:Body>
<p1:Subscribe xmlns:p1="http://docs.oasis-open.org/wsn/b-2">
 <p1:ConsumerReference
 xmlns:p1="http://docs.oasis-open.org/wsn/b-2">
 <p1:Address
  xmlns:p1="http://www.w3.org/2005/08/addressing">
  http://192.168.10.66/onvif_notify_server</p1:Address>
 </p1:ConsumerReference>
 <p1:InitialTerminationTime xmlns:p1=
 "http://docs.oasis-open.org/wsn/b-2">PT10S
 </p1:InitialTerminationTime>
</p1:Subscribe>
 </p1:Body>
</p1:Envelope>
```

A.3 Action URI"s for Event Service Messages

The following Action URI"s shall be used for Event Service:

Table A.1. Action URI"s for Event Service Messages

Message	Action URI of WS-Addressing
Notify	http://docs.oasis-open.org/wsn/bw-2/NotificationConsumer/Notify
SubscribeRequest	http://docs.oasis-open.org/wsn/bw-2/NotificationProducer/SubscribeRequest
SubscribeResponse	http://docs.oasis-open.org/wsn/bw-2/NotificationProducer/SubscribeResponse

Message	Action URI of WS-Addressing
RenewRequest	http://docs.oasis-open.org/wsn/bw-2/SubscriptionManager/RenewRequest
RenewResponse	http://docs.oasis-open.org/wsn/bw-2/SubscriptionManager/RenewResponse
UnsubscribeRequest	http://docs.oasis-open.org/wsn/bw-2/SubscriptionManager/UnsubscribeRequest
UnsubscribeResponse	http://docs.oasis-open.org/wsn/bw-2/SubscriptionManager/UnsubscribeResponse
GetEventPropertiesRequest	http://www.onvif.org/ver10/events/wsdl/EventPortType/GetEventPropertiesRequest
GetEventPropertiesResponse	http://www.onvif.org/ver10/events/wsdl/EventPortType/GetEventPropertiesResponse
CreatePullPointSubscriptionRequest	http://www.onvif.org/ver10/events/wsdl/EventPortType/CreatePullPointSubscriptionRequest
CreatePullPointSubscriptionResponse	http://www.onvif.org/ver10/events/wsdl/EventPortType/CreatePullPointSubscriptionResponse
PullMessagesRequest	http://www.onvif.org/ver10/events/wsdl/PullPointSubscription/PullMessagesRequest
PullMessagesResponse	http://www.onvif.org/ver10/events/wsdl/PullPointSubscription/PullMessagesResponse
SetSynchronizationPointRequest	http://www.onvif.org/ver10/events/wsdl/PullPointSubscription/SetSynchronizationPointRequest
SetSynchronizationPointResponse	http://www.onvif.org/ver10/events/wsdl/PullPointSubscription/SetSynchronizationPointResponse
GetServiceCapabilitiesResponse	http://www.onvif.org/ver10/events/wsdl/EventPortType/GetServiceCapabilities
GetServiceCapabilitiesRequest	http://www.onvif.org/ver10/events/wsdl/EventPortType/GetServiceCapabilitiesRequest
SeekRequest	http://www.onvif.org/ver10/events/wsdl/PullPointSubscription/SeekRequest
SeekResponse	http://www.onvif.org/ver10/events/wsdl/PullPointSubscription/SeekResponse

Message	Action URI of WS-Addressing
All faults	http://www.w3.org/2005/08/addressing/soap/fault

A.4 Find begin of buffer time

The following algorithm will be used to get a current begin of buffer time:

1. ONVIF Client will invoke **CreatePullPointSubscription** request with TopicFilter = tns1:EventBuffer/Begin.
2. Verify that the DUT sends a **CreatePullPointSubscriptionResponse** message. Validate that correct values for CurrentTime and TerminationTime and SubscriptionReference are returned.
3. ONVIF Client will invoke **Seek** request (UtcTime = [Current UTC Time], Reverse = true) to start a reverse seek.
4. Verify that the DUT sends a **SeekResponse** message.
5. ONVIF Client will invoke **PullMessages** command with a PullMessagesTimeout of 20s and a MessageLimit of 1.
6. Verify that the DUT sends a **PullMessagesResponse** that contains one NotificationMessage.
7. Verify that the received event is event with Topic = tns1:EventBuffer/Begin.

Note: Message.UtcTime from Notification message with Topic = tns1:EventBuffer/Begin will be used as BeginOfBufferTime1.

Note: if PullMessagesResponse will be empty or there will be no Notification message with Topic = tns1:EventBuffer/Begin, test cases shall be failed.

Note: The Subscription Manager has to be deleted at the end of the test either by calling unsubscribe or through a timeout.

A.5 Get Event Service Capabilities

Name: HelperGetServiceCapabilities

Procedure Purpose: Helper procedure to get Event Service Capabilities from the DUT.

Pre-requisite: Event Service is supported by the DUT.

Input: None

Returns: The service capabilities (*cap*).

Procedure:

1. ONVIF Client invokes **GetServiceCapabilities** request.
2. The DUT responds with **GetServiceCapabilitiesResponse** message with parameters
   - Capabilities =: *cap*

Procedure Result:

PASS –

- DUT passes all assertions.

FAIL –

- DUT did not send **GetServiceCapabilitiesResponse** message.

A.6 Generate Message Content Filter

Name: HelperGenerateMessageContentFilter

Procedure Purpose: Helper procedure to generate message content filter for subscription.

Pre-requisite: Event Service is supported by the DUT.

Input: Notification message (*notificationMessage*)

Returns: Message content filter (*messageContentFilter*), SimpleItem Name *name*, SimpleItem Value *value*.

Procedure:

1. If *notificationMessage* does not contain Message.Message.Source item, FAIL the test and skip other steps.
2. Set *name* := *notificationMessage*.Message.Message.Source.SimpleItem[0].Name
3. Set *value* := *notificationMessage*.Message.Message.Source.SimpleItem[0].Value
4. Set *messageContentFilter* := "boolean(//tt:SimpleItem[@Name="{0}"and @Value="{1}"])", whre {0} = *name* and {1} = *value*.

Procedure Result:

PASS –

- DUT passes all assertions.

FAIL –

- None.

A.7 Get Event Brokers List

Name: HelperGetEventBrokers

Procedure Purpose: Helper procedure to retrieve full list of event broker configurations from the DUT.

Pre-requisite: Event Service is supported by the DUT. Event Broker feature is supported by the DUT.

Input: None.

Returns: Event Broker Configurations list (*eventBrokerConfigList*).

Procedure:

1. ONVIF Client invokes **GetEventBrokers** request with parameters
   - Address skipped
2. DUT responds with **GetEventBrokersResponse** message with parameters
   - EventBroker list =: *eventBrokerConfigList*

Procedure Result:

PASS –

- DUT passes all assertions.

FAIL –

- DUT did not send **GetEventBrokersResponse** message.

A.8 Get Event Broker

Name: HelperGetEventBroker

Procedure Purpose: Helper procedure to retrieve requested event broker configurations from the DUT.

Pre-requisite: Event Service is supported by the DUT. Event Broker feature is supported by the DUT.

Input: Event broker address *eventBrokerAddress*.

Returns: Event Broker Configurations list (*eventBrokerConfigList*).

Procedure:

1. ONVIF Client invokes **GetEventBrokers** request with parameters
   - Address := *eventBrokerAddress*
2. DUT responds with **GetEventBrokersResponse** message with parameters
   - EventBroker list =: *eventBrokerConfigList*
3. If *eventBrokerConfigList* does not have exactly one item, FAIL the test and restore DUT settings.

Procedure Result:

PASS –

- DUT passes all assertions.

FAIL –

- DUT did not send **GetEventBrokersResponse** message.

A.9 Free Space Configuration for Adding of Event Broker

Name: HelperFreeSpaceConfigurationForEventBroker

Procedure Purpose: Helper procedure to configure the DUT to have free space for adding at least one event broker.

Pre-requisite: Event Service is supported by the DUT. Event Broker feature is supported by the DUT.

Input: Max Event Brokers (*maxEventBrokers*).

Returns: Event Broker Config to restore (optional) (*eventBrokerConfigToRestore*).

Procedure:

1. ONVIF Client retrieves event broker configurations list by following the procedure mentioned in Annex A.7 with the following input and output parameters
   - out *eventBrokerConfigList* - Event Broker Configurations list
2. If amount of items in *eventBrokerConfigList* >= *maxEventBrokers*
   2.1. ONVIF Client deletes event broker configuration from the DUT by following the procedure mentioned in Annex A.32 with the following input parameter
      - in *eventBrokerConfigList*[0].Address - Event Broker Address
   2.2. Set *eventBrokerConfigToRestore* := *eventBrokerConfigList*[0]

Procedure Result:

PASS –

- DUT passes all assertions.

FAIL –

- None.

A.10 Get Event Properties

Name: HelperGetEventProperties

Procedure Purpose: Helper procedure to get event properties from the DUT.

Pre-requisite: Event Service is supported by the DUT.

Input: None

Returns: Topic set (*topicSet*).

Procedure:

1. ONVIF Client invokes **GetEventProperties** request.
2. The DUT responds with **GetEventPropertiesResponse** message with parameters
   - TopicNamespaceLocation
   - FixedTopicSet
   - TopicSet =: *topicSet*

- TopicExpressionDialect
- MessageContentFilterDialect
- ProducerPropertiesFilterDialect
- MessageContentSchemaLocation

Procedure Result:

PASS –

- DUT passes all assertions.

FAIL –

- DUT did not send **GetServiceCapabilitiesResponse** message.

A.11 Retrieve MQTT Event (No Filter)

Name: HelperRetrieveMQTTEventNoFilter

Procedure Purpose: Helper procedure to check MQTT PUBLISH sent by the DUT during MQTT subscription without filter and to find event corresponds to requested topic.

Pre-requisite: None.

Input: Expected QoS value *QoS*, expected Topic Prefix *topicPrefix*, expected ONVIF topic (*topic*), property flag (*isProperty*).

Returns: None.

Procedure:

1. Set *localTopic* := (*topic* - XML namespace prefix for ONVIF topic)
2. Until *timeout1* timeout expires:
   2.1. DUT sends **MQTT PUBLISH** message to *eventBrokerAddress*.
   2.2. Set *publishMessage* := **MQTT PUBLISH** message.
   2.3. ONVIF Client validates **MQTT PUBLISH** message by following the procedure mentioned in Annex A.30 with the following input and output parameters
      - in (*publishMessage*) - MQTT PUBLISH message

- in (*QoS*) - expected QoS value
- in (*topicPrefix*) - expected Topic Prefix value
- out (optional) *packetIdentifier* Packet Identifier.

2.4. If *QoS* > 0 MQTT Event Broker Server responds with MQTT messages correspond to QoS value by following the procedure mentioned in Annex A.29 with the following input and output parameters

- in *QoS* - QoS value
- in *packetIdentifier* - PacketIdentifier field value of **MQTT PUBLISH**

2.5. If PayloadPrefix part of Topic Name in *publishMessage* = "onvif-ej" and LocalTopic part of Topic Name in *publishMessage* = *localTopic*:

2.5.1. If *isProperty* = "true" and RETAIN flag in the header != 1, FAIL the test and restore the DUT settings.

2.5.2. Set *mqttEvent* := Payload of **MQTT PUBLISH**.

2.5.3. Set *mqttTopicName* := value of Topic Name header field.

2.5.4. Go to step 3.

2.6. If *timeout1* timeout expires, FAIL the test and restore DUT settings.

3. ONVIF Client validates *mqttEvent* by following the procedure mentioned in Annex A.13 with the following input and output parameters

- in *mqttEvent* - MQTT event
- in *mqttTopicName* - MQTT topic name of event
- in *topicPrefix* - MQTT Topic prefix
- in *topicDescription* - topic description

Procedure Result:

PASS –

- DUT passes all assertions.

FAIL –

- None.

Note: *timeout1* will be taken from Operation Delay field of ONVIF Device Test Tool.

Note: See Annex A.31 for instructions on publish topic structure.

A.12 Retrieve MQTT Event (With Filter)

Name: HelperRetrieveMQTTEventWithFilter

Procedure Purpose: Helper procedure to check MQTT PUBLISH sent by the DUT during MQTT subscription with filter and to find event corresponds to requested topic.

Pre-requisite: None.

Input: Expected QoS value *QoS*, expected Topic Prefix *topicPrefix*, expected ONVIF topic (*topic*), property flag (*isProperty*).

Returns: None.

Procedure:

1. Set *localTopic* := (*topic* - XML namespace prefix for ONVIF topic)
2. Until *timeout1* timeout expires:
   2.1. DUT sends **MQTT PUBLISH** message to MQTT Event Broker Address.
   2.2. Set *publishMessage* := **MQTT PUBLISH** message.
   2.3. ONVIF Client validates **MQTT PUBLISH** message by following the procedure mentioned in Annex A.30 with the following input and output parameters
      - in (*publishMessage*) - MQTT PUBLISH message
      - in (*QoS*) - expected QoS value
      - in (*topicPrefix*) - expected Topic Prefix value
      - out (optional) *packetIdentifier* Packet Identifier.
   2.4. If *QoS* > 0, MQTT Event Broker Server responds with MQTT messages correspond to QoS value by following the procedure mentioned in Annex A.29 with the following input and output parameters
      - in *QoS* - QoS value
      - in *packetIdentifier* - PacketIdentifier field value
   2.5. ONVIF Client checks that *publishMessage* corresponds to filter:

2.5.1. If PayloadPrefix part of Topic Name != "onvif-ej", FAIL the test and restore the DUT settings.

2.5.2. If LocalTopic part of Topic Name != *localTopic*, FAIL the test and restore the DUT settings.

2.5.3. If *isProperty* = "true" and RETAIN flag in the header != 1, FAIL the test and restore the DUT settings.

2.5.4. Set *mqttEvent* := Payload of *publishMessage*.

2.5.5. Set *mqttTopicName* := value of Topic Name header field of *publishMessage*.

2.5.6. Go to step 3.

2.6. If *timeout1* timeout expires, FAIL the test and restore DUT settings.

3. ONVIF Client validates *mqttEvent* by following the procedure mentioned in Annex A.13 with the following input and output parameters

- in *mqttEvent* - MQTT event
- in *mqttTopicName* - MQTT topic name of event
- in *topicPrefix* - MQTT Topic prefix
- in *topicDescription* - topic description

Procedure Result:

PASS –

- DUT passes all assertions.

FAIL –

- DUT did not send any **MQTT PUBLISH** during *timeout1* timeout.

Note: *timeout1* will be taken from Operation Delay field of ONVIF Device Test Tool.

Note: See Annex A.31 for instructions on publish topic structure.

A.13 MQTT Event Validation

Name: HelperValidateMQTTEvent

Procedure Purpose: Helper procedure to validate MQTT event.

Pre-requisite: None.

Input: MQTT event (*mqttEvent*), MQTT Topic Name of event *mqttTopicName*, MQTT Topic prefix *topicPrefix*, topic description *topicDescription*.

Returns: None.

Procedure:

1. If *mqttEvent* does not contain UtcTime element with value type corrsponds to xs:dateTime, FAIL the test and restore DUT settings.
2. Set *expectedMQTTtopic* := *topicPrefix* + "onvif-ej" + (topic of *topicDescription* - XML namespace prefix for ONVIF topic)
3. If *mqttTopicName* != *expectedMQTTtopic*, FAIL test test and restore DUT settings.

Procedure Result:

PASS –

- DUT passes all assertions.

FAIL –

- None.

A.14 Certificate Upload

Name: HelperCertificateUpload

Procedure Purpose: Helper procedure to upload a certificate to the DUT keystore.

Pre-requisite: Security Configuration Service is received from the DUT.

Input: Security Configuration Service capabilities (*cap*)

Returns: Certificate ID*certificateID*.

Procedure:

1. If *cap*.KeystoreCapabilities.RSAKeyPairGeneration = true AND *cap*.KeystoreCapabilities.PKCS10ExternalCertificationWithRSA = true:
    1.1. ONVIF Client uploads CA sertificate to the DUT keystore by following the procedure mentioned in Annex A.16 with the following input and output parameters

- out (*certID*) - certificate

2. ELSE If *cap*.KeystoreCapabilities.PKCS8RSAKeyPairUpload = true:

   2.1. ONVIF Client uploads CA sertificate to the DUT keystore by following the procedure mentioned in Annex A.21 with the following input and output parameters

   - out (*certID*) - certificate

3. ELSE If *cap*.KeystoreCapabilities.PKCS12CertificateWithRSAPrivateKeyUpload = true:

   3.1. ONVIF Client uploads CA sertificate to the DUT keystore by following the procedure mentioned in Annex A.25 with the following input and output parameters

   - out (*certID*) - certificate

4. If no *certID* was received, FAIL the test and restore the DUT settings.

Procedure Result:

PASS –

- DUT passes all assertions.

FAIL –

- None.

A.15 Get Security Configuration Service Capabilities

Name: HelperGetSecurityConfigurationServiceCapabilities

Procedure Purpose: Helper procedure to get service capabilities.

Pre-requisite: Security Configuration Service is received from the DUT.

Input: None

Returns: The security configuration service capabilities (*cap*).

Procedure:

1. ONVIF Client invokes **GetServiceCapabilities**

2. The DUT responds with **GetServiceCapabilitiesResponse** message with parameters

- Capabilities =: *cap*

Procedure Result:

PASS –

- DUT passes all assertions.

FAIL –

- DUT did not send **GetServiceCapabilitiesResponse** message.

A.16 Add CA certificate and RSA key pair

Name: HelperAddServerCertAssign_CACertificate

Procedure Purpose: Helper Procedure to configure HTTPS using Security Configuration Service.

Pre-requisite: Security Configuration Service is received from the DUT. TLS Server is supported by the DUT. Create PCKS#10 supported by the DUT. RSA key pair generation is supported by the DUT. The DUT shall have enough free storage capacity for one additional RSA key pair. The DUT shall have enough free storage capacity for one additional certificate.

Input: None

Returns: certificate (*certID*).

Procedure:

1. ONVIF Client creates an RSA key pair by following the procedure mentioned in Annex A.20 with the following input and output parameters
   - out *keyID* - RSA key pair
2. ONVIF Client invokes **CreatePKCS10CSR** with parameter
   - Subject := subject (see Annex A.17)
   - KeyID := *keyID*
   - CSRAttribute skipped
   - SignatureAlgorithm.algorithm := 1.2.840.113549.1.1.5 (OID of SHA-1 with RSA Encryption algorithm)
3. The DUT responds with **CreatePKCS10CSRResponse** message with parameters

- PKCS10CSR =: *pkcs10*

4. ONVIF Client creates an CA certificate by following the procedure mentioned in Annex A.18 with the following input and output parameters
   - out *CAcert* - CA certificate
   - out *privateKey* - private key for the CA certificate
   - out *publicKey* - public key for the CA certificate
5. Create an [RFC5280] compliant X.509 certificate (*cert*) from the PKCS#10 request (*pkcs10*) with the following properties:
   - version:= v3
   - signature := sha1-WithRSAEncryption
   - subject := subject from the PKCS#10 request (*pkcs10*)
   - subject public key := subject public key in the PKCS#10 request (*pkcs10*)
   - validity := not before 19700101000000Z and not after 99991231235959Z
   - certificate signature is generated with the private key (*privateKey*) in the CA certificate (*CAcert*)
   - certificate extensions := the X.509v3 extensions from the PKCS#10 request (*pkcs10*)
6. ONVIF Client invokes **UploadCertificate** with parameters
   - Certificate := *cert*
   - Alias := "ONVIF_Test1"
   - PrivateKeyRequired := true
7. The DUT responds with an **UploadCertificateResponse** message with parameters
   - CertificateID =: *certID*
   - KeyID =: *keyID*

Procedure Result:

PASS –

- DUT passes all assertions.

FAIL –

- DUT did not send **CreatePKCS10CSRResponse** message.
- DUT did not send **UploadCertificateResponse** message.

Note: *operationDelay* will be taken from Operation Delay field of ONVIF Device Test Tool.

A.17 Subject for a server certificate

Use the following subject for test cases:

- Subject.Country := "US"
- Subject.CommonName := DUT IP-address

A.18 Provide CA certificate

Name: HelperCreateCACertificate

Procedure Purpose: Helper procedure to create an X.509 CA certificate.

Pre-requisite: None

Input: The subject (*subject*) of certificate(optional input parameter, could be skipped).

Returns: An X.509 CA certificate (*CAcert*) that is compliant to [RFC5280] and a corresponding private key (*privateKey*) and public key (*publicKey*).

Procedure:

1. ONVIF Client determines the length of the key to generate by following the procedure mentioned in Annex A.19 with the following input and output parameters
   - out *length* -the length of the key to generate
2. If *subject* is skipped set:
   - *subject* := "CN=ONVIF TT,C=US"
3. ONVIF Client creates an X.509 self-signed CA certificate that is compliant to [RFC5280] and has the following properties:
   - version := v3
   - signature := sha1-WithRSAEncryption

- validity := not before 19700101000000Z and not after 99991231235959Z
- subject := *subject*
- length of the key to be used := *length*

Procedure Result:

PASS –

- None.

FAIL –

- None.

Note: ONVIF Client may return the same CA certificate in subsequent invocations of this procedure for the same subject.

A.19 Determine RSA key length

Name: HelperDetermineRSAKeyLength

Procedure Purpose: Helper procedure to determine the RSA key length to use during testing.

Pre-requisite: Security Configuration Service is received from the DUT. On-board RSA key pair generation is supported by the DUT as indicated by the RSAKeyPairGeneration capability.

Input: None

Returns: The smallest supported RSA key length (*keyLength*).

Procedure:

1. ONVIF Client gets the Security Configuration service capabilities by the following the procedure mentioned in Annex A.15 with the following input and output parameters
   - out *cap*
2. ONVIF Client loops through the supported Key length list (*cap*.RSAKeyLengths) and selects the smallest supported key length (*keyLength*).

Procedure Result:

PASS –

- DUT passes all assertions.

FAIL –

- No supported key length was found at step 2.

A.20 Create an RSA key pair

Name: HelperCreateRSAKeyPair

Procedure Purpose: Helper procedure to create an RSA key pair.

Pre-requisite: Security Configuration Service is received from the DUT. RSA key pair generation is supported by the DUT. The DUT shall have enough free storage capacity for one additional RSA key pair.

Input: None

Returns: The identifier of the new and RSA key pair (*keyID*).

Procedure:

1. ONVIF Client gets the Security Configuration service capabilities by the following the procedure mentioned in Annex A.15 with the following input and output parameters
   - out *cap*
2. Set *keyLength* := the smallest supported key length at *cap*.RSAKeyLengths.
3. ONVIF Client invokes **CreateRSAKeyPair** with parameter
   - KeyLength := *length*
4. The DUT responds with **CreateRSAKeyPairResponse** message with parameters
   - KeyID =: *keyID*
   - EstimatedCreationTime =: *duration*
5. Until *duration* + *operationDelay* expires repeat the following steps:
   5.1. ONVIF Client waits for 5 seconds.
   5.2. ONVIF Client invokes **GetKeyStatus** with parameters
      - KeyID := *keyID*
   5.3. The DUT responds with **GetKeyStatusResponse** message with parameters

- KeyStatus =: *keyStatus*

5.4. If *keyStatus* is equal to "ok", skip other steps of the procedure.

5.5. If *keyStatus* is equal to "corrupt", FAIL the test and skip other steps.

6. If *duration* + *operationDelay* expires for step 5 and the last *keyStatus* is other than "ok", FAIL the test and skip other steps.

Procedure Result:

PASS –

- DUT passes all assertions.

FAIL –

- DUT did not send **GetKeyStatusResponse** message.
- DUT did not send **CreateRSAKeyPairResponse** message.
- DUT did not send **GetServiceCapabilitiesResponse** message.

Note: *operationDelay* will be taken from Operation Delay field of ONVIF Device Test Tool.

A.21 Add CA certificate and RSA key pair

Name: HelperAddCACertificateWithUploadKeyPairInPKCS8

Procedure Purpose: Helper Procedure to upload key pair in PKCS8 and upload sertificate.

Pre-requisite: Security Configuration Service is received from the DUT. TLS Server is supported by the DUT. Create PCKS#10 supported by the DUT. The DUT shall have enough free storage capacity for one additional RSA key pair. The DUT shall have enough free storage capacity for one additional certificate. Current time of the DUT shall be at least Jan 01, 1970.

Input: None

Returns: certificate (*certID*).

Procedure:

1. ONVIF Client on the Broker Server generates a PKCS#8 data structure with new RSA key pair by following the procedure mentioned in Annex A.22 with the following input and output parameters

- out *keyPairInPKCS8* - PKCS#8 data structure with new RSA key pair
- out *publicKey* - pubic key
- out *privateKey* - private key

2. ONVIF Client invokes **UploadKeyPairInPKCS8** with parameters
   - KeyPair := *keyPairInPKCS8*
   - Alias := "ONVIF_Test"
   - EncryptionPassphraseID skipped
3. The DUT responds with a **UploadKeyPairInPKCS8Response** message with parameters
   - KeyID =: *keyID*
4. ONVIF Client on the Broker Server creates an CA certificate by following the procedure mentioned in Annex A.18 with the following input and output parameters
   - out *CAcert* - CA certificate
   - out *privateKey* - private key for the CA certificate
   - out *publicKey* - public key for the CA certificate
5. Create an [RFC5280] compliant X.509 certificate (*cert*) from the PKCS#10 request (*pkcs10*) with the following properties:
   - version:= v3
   - signature := sha1-WithRSAEncryption
   - subject := subject from the PKCS#10 request (*pkcs10*)
   - subject public key := subject public key in the PKCS#10 request (*pkcs10*)
   - validity := not before 19700101000000Z and not after 99991231235959Z
   - certificate signature is generated with the private key (*privateKey*) in the CA certificate (*CAcert*)
   - certificate extensions := the X.509v3 extensions from the PKCS#10 request (*pkcs10*)
6. ONVIF Client invokes **UploadCertificate** with parameters
   - Certificate := *cert*

- Alias := "ONVIF_Test1"
- PrivateKeyRequired := true

7. The DUT responds with an **UploadCertificateResponse** message with parameters
   - CertificateID =: *certID*
   - KeyID =: *keyID*

Procedure Result:

PASS –

- DUT passes all assertions.

FAIL –

- DUT did not send **CreatePKCS10CSRResponse** message.
- DUT did not send **UploadCertificateResponse** message.

Note: *operationDelay* will be taken from Operation Delay field of ONVIF Device Test Tool.

A.22 Creating a PKCS#8 data structure with new public key and private key without passphrase

Name: HelperCreatePKCS8WithNewKeyPair

Procedure Purpose: Helper procedure to create a PKCS#8 data structure with new public key and private key without passphrase.

Pre-requisite: None.

Input: None.

Returns: A [RFC 5958, RFC 5959] compliant PKCS#8 data structure (*keyPairInPKCS8*) with new public key (*publicKey*) and private key (*privateKey*).

Procedure:

1. ONVIF Client on the Broker Server generates RSA key pair with public key and private key by following the procedure mentioned in Annex A.24 with the following input and output parameters

- out *publicKey* - public key
- out *privateKey* - private key

2. ONVIF Client generates a PKCS#8 data structure with existing pubic key and private key by following the procedure mentioned in Annex A.23 with the following input and output parameters
   - in *publicKey* - public key
   - in *privateKey* - private key
   - out *keyPairInPKCS8* - PKCS#8 data structure

A.23 Creating a PKCS#8 data structure with existing public key and private key without passphrase

Name: HelperCreatePKCS8WithExistingKeyPair

Procedure Purpose: Helper procedure to create a PKCS#8 data structure with existing public key and private key without passphrase.

Pre-requisite: None.

Input: A [RFC 3447] compliant RSA key pair with public key (*publicKey*) and private key (*privateKey*).

Returns: A [RFC 5958, RFC 5959] compliant PKCS#8 data structure (*keyPairInPKCS8*) for provided RSA key pair.

Procedure:

1. Create an [RFC 5958, RFC 5959] compliant PKCS#8 data structure (*keyPairInPKCS8*) with the following properties:
   - PrivateKeyInfo
     - version:= v2
     - privateKeyAlgorithm := rsaEncryption
     - privateKey := *privateKey*
     - attributes
       - publicKey := *publicKey*

A.24 Generating an RSA key pair

Name: HelperGenerateRSAKeyPair

Procedure Purpose: Helper procedure to generate an RSA key pair.

Pre-requisite: None.

Input: None.

Returns: A [RFC 3447] compliant RSA key pair with new public key (*publicKey*) and private key (*privateKey*).

Procedure:

1. ONVIF Client determines the length of the key to generate by following the procedure mentioned in Annex A.19 with the following input and output parameters
   - out *length* - the length of the key to generate
2. Create an [RFC 3447] compliant RSA key pair with new public key with the following properties:
   - KeyLength := *length*
   - out *publicKey*
   - out *privateKey*

A.25 Upload Certificate With Private Key In PKCS12

Name: HelperUploadCertificateWithPrivateKeyInPKCS12

Procedure Purpose: Helper procedure to generate an certificate on Event Broker and upload it on the DUT.

Pre-requisite: None.

Input: None.

Returns: Certificate *certID*).

Procedure:

1. ONVIF Client creates a CA certificate (out *CAcert*) and a corresponding public key (out *publicKey*) in the certificate along with the corresponding private key (out *privateKey*) in the form of a PKCS#12 file (out *PKCS12data*) and uploads it with certification path ID (out

certificationPathID) and key pair ID (out *keyID*) by following the procedure described in Annex A.28.

2. ONVIF Client invokes **GetCertificationPath** message with parameters
   - CertificationPathID =: *certificationPathID*
3. The DUT responds with a **GetCertificationPathResponse** message with parameters
   - CertificationPath.CertificateID[0] =: *certID*
   - CertificationPath.Alias

A.26 Creating a PKCS#12 data structure with new CA-signed certificate signed by new public key and private key without passphrase

Name: HelperCreatePKCS12WithNewCACert

Procedure Purpose: Helper procedure to create CA certificate and a corresponding public key in the certificate along with the corresponding private key in the form of a PKCS#12 file.

Pre-requisite: None.

Input: The subject (*subject*) of certificate (optional input parameter, could be skipped).

Returns: A [PKCS#12] compliant PKCS#12 data structure (*PKCS12data*) with CA certificate (*CAcert*) and a corresponding public key (*publicKey*) in the certificate along with the corresponding private key (*privateKey*).

Procedure:

1. If *subject* is skipped, set:
   - *subject* := "CN=ONVIF TT,C=US"
2. ONVIF Client on the Event Broker Server creates a CA certificate (out *CAcert*) with subject (in *subject*) and a corresponding public key (out *publicKey*) in the certificate along with the corresponding private key (out *privateKey*) by following the procedure described in Annex A.18.
3. ONVIF Client on the Event Broker Server creates a CA certificate (in *CAcert*) and a corresponding public key (in *publicKey*) in the certificate along with the corresponding private key (in *privateKey*) in the form of a PKCS#12 file (out *PKCS12data*) by following the procedure described in Annex A.27.

A.27 Creating a PKCS#12 data structure with existing CA-signed certificate and a corresponding public key and private key without passphrase

Name: HelperCreatePKCS12WithExistingCACert

Procedure Purpose: Helper procedure to create a PKCS#12 data structure with existing CA-signed certificate and a corresponding public key and private key without passphrase.

Pre-requisite: None.

Input: An X.509 CA certificate (*CAcert*) that is compliant to [RFC 5280] and a corresponding private key (*privateKey*) and public key (*publicKey*).

Returns: A [PKCS#12] compliant PKCS#12 data structure (*PKCS12data*).

Procedure:

1. Use the current PrivateKeyInfo data:
   - PrivateKeyInfo
     - version := v2
     - privateKeyAlgorithm := rsaEncryption
     - privateKey := *privateKey*
     - publicKey := *publicKey*
2. Create an [PKCS#12] compliant PKCS#12 data structure *PKCS12data*) with the following properties:
   - EncryptedPrivateKeyInfo
     - PrivateKeyInfo
       - version := v3
       - authSafe
         - SafeBag
           - Pkcs-12-KeyBag := PrivateKeyInfo
           - PKCS12AttrSet

- friendlyName := "testAlias"

- SafeBag
  - Pkcs-12-CertBag := *CAcert*
  - PKCS12AttrSet
    - friendlyName := "testAlias"

A.28 Upload PKCS#12 – no key pair exists

Name: HelperUploadPKCS12

Procedure Purpose: Helper procedure to create and upload PKCS#12 data structure with new public key and private key.

Pre-requisite: Security Configuration Service is received from the DUT. Certificate along with an RSA private key in a PKCS#12 data structure upload is supported by the DUT as indicated by the PKCS12CertificateWithRSAPrivateKeyUpload capability. The DUT shall have enough free storage capacity for one additional RSA key pair. The DUT shall have enough free storage capacity for one additional certificate. The DUT shall have enough free storage capacity for one additional certification path.

Input: None

Returns: A [PKCS#12] compliant PKCS#12 data structure (*PKCS12data*) with CA certificate (*CAcert*) and a corresponding public key (*publicKey*) in the certificate along with the corresponding private key (*privateKey*) and certification path ID (*certificationPathID*) with corresponding key pair ID (*keyID*) for uploaded PKCS#12 data structure.

Procedure:

1. ONVIF Client creates a CA certificate (out *CAcert*) and a corresponding public key (out *publicKey*) in the certificate along with the corresponding private key (out *privateKey*) in the form of a PKCS#12 file (out *PKCS12data*) by following the procedure described in Annex A.26.

2. ONVIF Client invokes **UploadCertificateWithPrivateKeyInPKCS12** with parameters
   - CertWithPrivateKey := *PKCS12data*
   - CertificationPathAlias := "ONVIF_Certification_Path_Test"
   - KeyAlias := "ONVIF_Key_Test"

- IgnoreAdditionalCertificates := false
- IntegrityPassphraseID skipped
- EncryptionPassphraseID skipped

3. The DUT responds with a **UploadCertificateWithPrivateKeyInPKCS12Response** message with parameters
   - CertificationPathID =: *certificationPathID*
   - KeyID =: *keyID*

Procedure Result:

PASS –

- DUT passes all assertions.

FAIL –

- DUT did not send **UploadCertificateWithPrivateKeyInPKCS12Response** message.

A.29 Publish Packet Response

Name: HelperPublishPacketResponse

Procedure Purpose: Helper procedure to finalize publish procedure on the Broker Server.

Pre-requisite: None.

Input: QoS value (*QoS*), PacketIdentifier field value (*packetIdentifier*)

Returns: None.

Procedure:

1. If *QoS* = 1:
   1.1. MQTT Event Broker Server responds with **MQTT PUBACK** message with parameters
      - PacketIdentifier header := *packetIdentifier*
2. If *QoS* = 2:
   2.1. MQTT Event Broker Server sends **MQTT PUBREC** message with parameters
      - PacketIdentifier header := *packetIdentifier*

2.2. The DUT responds with **MQTT PUBREL** message with parameters

- PacketIdentifier header := *packetIdentifier*

2.3. MQTT Event Broker Server sends **MQTT PUBCOMP** message with parameters

- PacketIdentifier header := *packetIdentifier*

Procedure Result:

PASS –

- DUT passes all assertions.

FAIL –

- DUT did not send **MQTT PUBREL** message.

A.30 Publish Message Validation

Name: HelperPublishMessageValidation

Procedure Purpose: Helper procedure validate MQTT PUBLISH sent by the DUT on the Event Broker Server.

Pre-requisite: None.

Input: MQTT PUBLISH message (*publishMessage*), expected QoS value (*QoS*), expected Topic Prefix (*topicPrefix*).

Returns: Packet Identifier (optional) (*packetIdentifier*).

Procedure:

1. If QoS header of **publishMessage** != *QoS*, FAIL the test and restore the DUT settings.
2. If *QoS* = 0 and **publishMessage** header contains PacketIdentifier field, FAIL the test and restore the DUT settings.
3. If (*QoS* = 1 or *QoS*= 2) and **publishMessage** header does not contain PacketIdentifier field (*packetIdentifier*), FAIL the test and restore the DUT settings.
4. If TopicPrefix part of Topic Name in *publishMessage* != *topicPrefix*, FAIL the test and restore the DUT settings.
5. Return *packetIdentifier* if any.

Procedure Result:

PASS –

- DUT passes all assertions.

FAIL –

- None.

A.31 Topic Name Structure

Published Topic Name of ONVIF event has the following structure:

- <TopicPrefix>/<PayloadPrefix>/<LocalTopic>[/<Source>[/<Key>]], where:
  - TopicPrefix - value configured through the AddEventBroker command
  - PayloadPrefix = "onvif-ej"
  - LocalTopic = ONVIF topic with namespace prefix excluded
  - Source = value of Source.SimpleItem taken from the payload
  - Key = value of Key.SimpleItem taken from the payload
- Example of topic transformation from ONVIF topic format to MQTT ONVIF topic format:
  - Original ONVIF Topic:
    - tns1:/RuleEngine/Recognition/Face
  - Reformatted MQTT ONVIF topic:
    - TestPrefix/onvif-ej/RuleEngine/Recognition/Face/0/1

A.32 Delete Event Broker

Name: HelperDeleteEventBroker

Procedure Purpose: Helper procedure to delete event broker configuration from the DUT.

Pre-requisite: Event Service is supported by the DUT. Event Broker feature is supported by the DUT.

Input: Event broker address *eventBrokerAddress*.

Returns: None.

Procedure:

1. ONVIF Client invokes **DeleteEventBroker** request with parameters
   - Address := *eventBrokerAddress*
2. DUT responds with **DeleteEventBrokerResponse** message.

Procedure Result:

PASS –

- DUT passes all assertions.

FAIL –

- DUT did not send **DeleteEventBrokerResponse** message.