ISDN Q.921-User Adaptation Layer Test Specification

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Abstract

This document presents a test specification for RFCXXX which defines the ISDN Q.921-User Adaptation protocol. This test specification can be used to test IUA implementations for conformance to the IUA protocol definition.

Table of Contents

1 Introduction-----------------------------------------------

2 General Principles of IUA Tests-----------------------------

2.1 Terminology-----------------------------------------------

2.2 Presentation of test descriptions-------------------------

1. Introduction

This document provides a test specification for the IUA protocol. The document provides test scenarios for the IUA implementation for Media Gateway Controller (MGC) and the Signaling Gateway (SG). It should be pointed out that IUA Protocol is an asymmetric protocol. The requirements of the IUA on the MGC differ from those on the SG. Thus, the MGC and SG will have different implementations of IUA.

The list of test is an initial proposal and covers almost all the categories of test, and graphical representation of various scenarios help easy understanding of the protocol testing.

2. General Principles of IUA Tests

These tests aim to verify a given implementation of an IUA protocol implementation in accordance with RFCXXXX. This specification is independent of a given implementation and does not generally imply any modification of the endpoint under test. However, it is recognized that certain tests require capabilities of the system that are not explicitly defined in RFCXXXX, and these capabilities may not be present in all implementations. As a consequence, some tests may not apply to all implementations.

2.1 Terminology
The terminology from Section 1.2 of RFCXXXX applies to this document.

2.2 Presentation of test descriptions

2.2.1 Pre Test Condition

Before starting the test we need to get the setup into a condition from where test can be started. These conditions are specified in Pre-Test condition in each test.

3. Test Environment for IUA on MGC Side.

3.1 IUA validation testing

The IUA test environment consists of the following items (see Figure 2)

* a MGC with an IUA Test Interface
* a simulated Signaling Gateway
* the link monitor
3.2 IUA Test Interface

In order to perform an optimum test of the IUA Layer, a Test Interface MAY be used. This Test Interface should cover the simulation of IUA Traffic User, IUA layer Manager (LMG) and SCTP Layer manager (optional).

During the IUA tests, it is necessary to inject messages and indications to and from the IUA endpoint under test.

It is desirable that the IUA user function used is the actual IUA user of the IUA with some additional functions for test purposes or a more controlled user function. The application should also provide means to check the interface interaction with the IUA implementation under test.

3.3 Simulated SG Test Tool

During IUA testing, it will be necessary to inject some abnormal messages (as well as normal messages) to fully test the IUA under test. The Simulated SG should have this function. The generation of certain abnormal sequences of messages should also be a capability of this test tool.

3.4 Link Monitor

During IUA testing, it will be necessary to monitor the various messages being exchanged between the two IUA endpoints. A link monitor, or network sniffer, should have this function. It should also have the capability to show all the parameters of the message.

4. Test Configurations

The set of tests described in this document assumes that the point under test is inserted in a test environment called "test configuration".

4.1 Presentation of test configurations

There should be different configurations for testing the IUA protocol. These configurations and hence test cases can be divided on the basis of IUA at SG and IUA at MGC. This document proposed describes configuration for testing the IUA protocol in the Media Gateway Controller (MGC) side (ASP’s view).

4.2 Configuration for testing the IUA at AS

This subsection describes test scenarios for the IUA protocol in the Media Gateway Controller (MGC) side, so A and B and some other scenarios that could be added in future, refer to ASP’s point of view.

4.2.1 Configuration M1

This simple configuration is used for all the procedures of tests concerning only one SG. Configuration M1 is shown in Figure 1. The ASP is handling the traffic from a list of Interface Identifiers in the SG.
4.2.2 Configuration M2

This configuration is used for all the procedures of tests concerning two SGs connected to the same ASP. In this case, the ASP will be part of two different AS. An AS is modeled at the SG, in practical terms, as an ordered list of one or more related Application Server Processes (e.g., primary, secondary, tertiary), configured to process Q.921-User messages from certain Interface Identifiers.

4.3 Configuration for testing the IUA at SG

This subsection describes test scenarios for the IUA protocol in the Signaling Gateway (SG) side, so Configuration S1 and Configuration S2 and some other scenarios that could be added in future, refer to SG’s point of view.

4.3.1 Configuration S1

This simple configuration is used for all the procedures of tests concerning only one ASP (1+0 failover scenario). Configuration S1 is shown in Figure 3. The ASP is handling the traffic from a list of Interface Identifiers in SG.
4.2.2 Configuration S2

This configuration is used for all the procedures of tests concerning a single SG connected to two ASPs representing a single AS (1+1 failover scenario). Only one ASP will be active at a given point in time. This scenario will be useful for testing failover scenarios.

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5. Test Cases for Testing IUA at MGC

5.1 AS management

5.1.1 ASP Transition to Active State

---

TITLE: AS management

SUBTITLE: ASP reaches to Active State

PURPOSE: To check that if LMG sends primitive to send ASP management messages to the SG then the corresponding message is sent to the SG. ASP sends the ASP status primitives messages sequence that transitions the ASP to the Active state. After this sequence a new sequence taking the ASP to the Down State will be sent.

TEST Configuration: M1

PRE-TEST CONDITIONS: SCTP association is established between SG and ASP. ASP is down.

Reference: RFCXXXX Clause 4.3.2

EXPECTED MESSAGE SEQUENCE

<table>
<thead>
<tr>
<th>SG</th>
<th></th>
<th>ASP</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;--------</td>
<td></td>
<td>ASP-Up</td>
</tr>
<tr>
<td></td>
<td>ASPUP</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
ACK(ASP-Up)  ------------>  Status Ind  ---------->
<-------- ASP-Inactive
<--------- ASPAC
ACK(ASP-Active)  ---------->
Status Ind  ---------->
<-------- ASP-Down
<--------- ASPIA
ACK(ASP-Inactive)  ---------->
Status Ind  ---------->
<-------- ASP-DN
<--------- ASPIA
ACK(ASP-DN)  ---------->
Status Ind  ---------->

TEST DESCRIPTION
1. Send ASP-Up Primitive message from ASP to SG.
2. Check A ASPUP message will be received at the SG. SG should send an ACK(ASP-Up) in response to the ASPUP message on stream 0.
3. Check B ASPM messages are sent on stream 0.
4. Repeat the test case for primitives like, ASP-Active and ASP-Down. ASPDN, ASPAC and ASPUP messages will be sent from ASP to SG with parameters passed from LMG (i.e Test Interface LMG functionality).
5. Check C Interface Id Ranges AND/OR Interface Id List can be used indistinctly in ASP-Active, ASP-Inactive, ACK(ASP-Active) and ACK(ASP-Inactive) messages.

5.1.2 SG rejects ASPUP message from ASP

---------------------------------------------
TITLE:     AS management
---------------------------------------------
SUBTITLE:  ASP can not reach Up state; SG rejects ASPUP message
---------------------------------------------
PURPOSE:   To check that if an ASPUP msg is acknowledged with a
            ACK(ASP-Down), ASP remains in Down State.
---------------------------------------------
TEST Configuration:  M1
---------------------------------------------
PRE-TEST CONDITIONS:  SCTP association is established between SG and
            ASP. ASP is down.
---------------------------------------------
Reference:  RFCXXXX Clause 4.3.2
---------------------------------------------

EXPECTED MESSAGE SEQUENCE

SG            ASP            LMG
1. Send ASP-Up Primitive message from ASP to SG.
2. Check a ASPUP message will be received at the SG. SG should send an ACK(ASP-Down) in response to the ASPUP message on stream 0.
3. ASPUP will be sent from ASP to SG with parameters passed from LMG (i.e. Test Interface LMG functionality).
4. SG Simulator responds ACK(ASP-Down) with reason parameter set to Management Blocking.

5.1.3 Notify Alternate ASP Active

---

**TITLE:** AS management

**SUBTITLE:** Notify Alternate ASP Active

**PURPOSE:** To check that if an ASP in Active State is informed by SG that an alternate ASP has overridden it, the ASP will be moved to Inactive State.

**TEST Configuration:** M1

**PRE-TEST CONDITIONS:** SCTP association is established between SG and ASP. ASP is down.

**Reference:** RFCXXXX Clause 4.3.2

---

**EXPECTED MESSAGE SEQUENCE**

<table>
<thead>
<tr>
<th>SG</th>
<th>ASP</th>
<th>LMG</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;--------- ASP-Up</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;--------- ASPUP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACK(ASP-Up)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Status Ind</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;--------- ASP-Active</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;--------- ASPAC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACK(ASP-Active)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Status Ind</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NTFY(ASP-Alternate)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ASP Active</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Status Ind</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
TEST DESCRIPTION
1. ASP become to Active State.
2. A NTFY(ASP-Alternate ASP Active) msg is received from SG.
3. Check A ASPM messages are sent on stream 0.
4. Check B ASP is moved to Inactive State.
5. Check C Interface Id Ranges AND/OR Interface Id List can be used indistinctly in ASP-Active and ACK(ASP-Active) messages.

5.1.4 SCTP Communication Down Indication

TITLE: AS management

SUBTITLE: SCTP Communication Down Indication

PURPOSE: To check that if the local SCTP sends this indication due to the loss of connectivity to the ASP’s peer, ASP will be moved to Down State.
SCTP CDI is understood as either a SHUTDOWN COMPLETE notification and COMMUNICATION LOST notification from the SCTP.

TEST Configuration: M1

PRE-TEST CONDITIONS: SCTP association is established between SG and ASP. ASP is Up.

Reference: RFCXXXX Clause 4.3.2

EXPECTED MESSAGE SEQUENCE

<table>
<thead>
<tr>
<th>SG</th>
<th>ASP</th>
<th>LMG</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;------- ASP-Active</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt;-------- ASPAC</td>
<td></td>
</tr>
</tbody>
</table>
| ACK(ASP-Active) | -------->
| Status Ind ------>
| -----X X-----SCTP COMMLOST====>

ASP moves to Down State
Status Ind ------>

TEST DESCRIPTION
1. ASP become to Active State.
2. A loss of connectivity (SCTP Association) happens.
3. Check A ASPM messages are sent on stream 0.
4. Check B ASP is moved to Down State.
5. Check C Interface Id Ranges AND/OR Interface Id List can be used indistinctly in ASP-Active and ACK(ASP-Active) messages.

[KAM] - should add to test. SCTP communication restored. ASP should go back to Active state without input from Test Interface?

5.2 ERROR management
5.2.1 Invalid Version Error

TITLE: ERROR management
SUBTITLE: Invalid Version Error
PURPOSE: To check that if any message with Invalid version is received at the ASP then ASP responds with ERROR message containing cause "Invalid Version" and diagnostic information filled with the version that the SG supports.

TEST Configuration: M1

PRE-TEST CONDITIONS: SCTP association is established between SG and ASP. ASP is Active (The same Test Case could be done with ASP being Up).

Reference: RFCXXXX Clause 4.3.2

EXPECTED MESSAGE SEQUENCE

SG                              ASP                SM
ASP is Active

Message XXXX  ------------>  (Version = 2)

<----------  ERROR
Cause = Invalid Version

TEST DESCRIPTION
1. A message is received from SG with an invalid version in the Common Message Header.
2. Check A ASP sends an Invalid Version Error message to SG.

5.2.2 Unsupported Message Type

TITLE: ERROR management
SUBTITLE: Unsupported Message Type
PURPOSE: To check that if a message with an undefined message type is received at AS, AS responds with ERROR message containing cause "Unsupported Message Type". To check that if an error is received then this error is reported to the User. Further action at the MGC are implementation dependent.

TEST Configuration: M1

PRE-TEST CONDITIONS: SCTP association is established between SG and ASP. ASP is Active (The same Test Case could be done with ASP being Up).

Reference: RFCXXXX Clause 4.3.2

EXPECTED MESSAGE SEQUENCE
1. A message with an undefined message type is received at ASP from SG.
2. Check A AS responds with ERROR message containing cause
   "Unsupported Message Type"
3. Check B Error is reported to the User

5.2.3 Unsupported Message Class

TITLE: ERROR management

SUBTITLE: Unsupported Message Class

PURPOSE: To check that if a message with message class not defined
         is received at AS, AS responds with ERROR message containing cause
         "Unsupported Message Class". To check that if an error is received
         then this error is reported to the User. Further action at the MGC
         are implementation dependent.

TEST Configuration: M1

PRE-TEST CONDITIONS: SCTP association is established between SG and
                       ASP. ASP is Active (The same Test Case could be done with ASP being
                       Up).

Reference: RFCXXXX Clause 4.3.2

EXPECTED MESSAGE SEQUENCE

Message XXXX "" ->
Msg Class=199
Msg Type= any valid value

<------------------------  ERROR
                   Cause =
                       Unsupported
                       Message Class

Error "" ->
TEST DESCRIPTION
1. A message with message type not defined is received at ASP is received from SG.
2. Check A AS responds with ERROR message containing cause "Unsupported Message Type"
3. Check B Error is reported to the User

5.2.4 Unexpected QPTM message

Title: ERROR management
Subtitle: Unexpected QPTM message

Purpose: To check that if a QPTM message from an SG is received while ASP was in the Inactive state, the "Unexpected Message" error would be sent by the ASP. (the ASP could optionally drop the message and not send an Error)

Test Configuration: M1

Pre-Test Conditions: SCTP association is established between SG and ASP. ASP is Inactive.

Reference: RFCXXX Clause 3.3.3.1

Expected Message Sequence

<table>
<thead>
<tr>
<th>SG</th>
<th>ASP</th>
<th>LMG</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ASP is Inactive

Data

<----------------- ERROR
Unexpected Message

Error

TEST DESCRIPTION
1. A QPTM message from an SG is received. ASP is in Inactive State
2. Check A ERROR messages are sent.

5.3 ASP configuration

5.3.1 ASP configured to handle traffic for more than one AS

Title: ASP configuration
Subtitle: ASP configured to handle traffic for more than one AS

Purpose: To check that if an ASP has been configured to handle traffic for more than one AS. The IUA layer at the SG maintains the availability state of all dynamically registered remote ASPs, in order to manage the SCTP Associations and the traffic between the SG and ASPs. As well, the active/inactive state of remote ASP(s)
are also maintained. Active ASPs are those currently receiving traffic from the SG.

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**TEST Configuration:** M2

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**PRE-TEST CONDITIONS:** An SCTP association is established between each SG and ASP. ASP has been configured to handle traffic from two SG.

ASP is Down for AS1 and AS2.

---

**Reference:** RFCXXXX Clause 1.3.3

---

**EXPECTED MESSAGE SEQUENCE (ASP’s view)**

<table>
<thead>
<tr>
<th>SG1 (AS1= ASP1,ASP3,...,ASPn)</th>
<th>SG2 (AS1= ASP1,ASP2,...,ASPm)</th>
<th>ASP1</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;--------ASP Up</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt;-------ASP Up Ack-------------&gt;</td>
<td></td>
</tr>
<tr>
<td>&lt;--------------------------------ASP Up----------------&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;-------------------------ASP Up Ack-----------&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt;---------------------ASP Active------------&gt;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt;--------ASP Active Ack--------&gt;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt;---------------------ASP Active Ack------------&gt;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt;----------ASP Inactive--------&gt;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt;--------ASP Inactive Ack------&gt;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt;---------------------ASP Inactive Ack-------------------&gt;</td>
<td></td>
</tr>
</tbody>
</table>

---

**TEST DESCRIPTION**

1. Send ASP-Up primitive from LMG to ASP. ASPUP message will be sent from ASP to SG1. Send ACK(ASP-Up) from the SG.
2. Repeat the above test case for SG2.
3. Repeat the test case for primitives like, ASP-Active and ASP-Inactive. ASPAC and ASPIA messages will be sent from ASP to SGs with parameters passed from LMG (i.e Test Tool LMG functionality).
4. Check A ASPAC message is received at the SG containing a list of Interface Identifiers that the sending ASP is configured/registered to receive from that SG. If no Interface Identifiers are included, the message is for all provisioned Interface Identifiers within the AS(s) in which the ASP is provisioned.

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**5.4 Q.921/Q.931 primitives backhaul**

**5.4.1 Send and Receive Q.921/Q.931 primitives**

---

**TITLE:** Q.921/Q.931 primitives backhaul
SUBTITLE: Establishing of a Data Link on a Signaling Channel.

PURPOSE: To check that a Data Link on a Signaling Channel is established and Traffic User PDUs can be exchanged.

TEST Configuration: M1

PRE-TEST CONDITIONS: SCTP association is established between SG and ASP. ASP is in ASP-Active state.

Reference: RFCXXXX Clause 4.1.2

EXPECTED MESSAGE SEQUENCE (ASP’s view)

<table>
<thead>
<tr>
<th>SG</th>
<th>ASP</th>
<th>Traffic User</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(Q.931)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ASP is Active</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>DL-Establish Req</td>
</tr>
<tr>
<td></td>
<td>Establish Request</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Establish Confirm</td>
<td>DL-Establish Conf</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DL-Data Req</td>
</tr>
<tr>
<td></td>
<td>Data Request</td>
<td>DL-Data Req</td>
</tr>
<tr>
<td></td>
<td>Data Indication</td>
<td>DL-Data Ind</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DL-Data Req</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DL-Data Req</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DL-Data Req</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DL-Data Ind</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DL-Release Req</td>
</tr>
<tr>
<td></td>
<td>Release Request</td>
<td>DL-Release Conf</td>
</tr>
</tbody>
</table>

TEST DESCRIPTION

1. MGC desires the D channel to be in-service, it will send the Establish Request message to establish a data link to the SG on the signalling channel. DL-Establish Req Primitive is invoked at ASP to send Establish Request message to the SG. This message should be acknowledged by Establish Confirm message.
2. Check A The message is sent on the SCTP stream that corresponds to the D channel (Interface Identifier).
3. Now (Q.931) DATA message from MGC and SG containing Protocol Data can be transmitted or received by the Data link.
4. Check B DATA message is received at MGC and SG containing the data passed by the Traffic User
5. Invoke DL-Release Req Primitive from the LMG at ASP to send Release Request message to the SG. This message should be acknowledged by Release Confirm message. The Data Link is now released.

6. Test Cases for Testing IUA at SG

6.1 AS management

6.1.1 ASP Transition to Active State

TITLE: AS management

SUBTITLE: ASP reaches to Active State

PURPOSE: To check that if LMG sends primitive to send ASP management messages to the SG then the corresponding message is sent to the SG. ASP sends the ASP status primitives messages sequence that transitions the ASP to the Active state. After this sequence a new sequence taking the ASP to the Down State will be sent.

TEST Configuration: S1

PRE-TEST CONDITIONS: SCTP association is established between SG and ASP. ASP is down.

Reference: RFCXXXX Clause 4.3.2

EXPECTED MESSAGE SEQUENCE

<table>
<thead>
<tr>
<th>SG</th>
<th>ASP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;----------</td>
<td>ASPUP</td>
</tr>
<tr>
<td>ACK(ASP-Up)</td>
<td>-----------</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;----------</td>
<td>ASPAC</td>
</tr>
<tr>
<td>ACK(ASP-Active)</td>
<td>-----------</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;----------</td>
<td>ASPIA</td>
</tr>
<tr>
<td>ACK(ASP-Inactive)</td>
<td>-----------</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;----------</td>
<td>ASPDN</td>
</tr>
<tr>
<td>ACK(ASP-Down)</td>
<td>-----------</td>
</tr>
</tbody>
</table>
TEST DESCRIPTION
1. Send ASP-Up Primitive message from ASP to SG.
2. SG should send an ACK(ASP-Up) in response to the ASPUP.
3. Check B ASPM messages are sent on stream 0.
4. Repeat the test case for primitives like, ASP-Active and ASP-Down. ASPDN, ASPAC and ASPUP messages will be sent from ASP to SG.
5. Check C Interface Id Ranges AND/OR Interface Id List can be used indistinctly in ASP-Active, ASP-Inactive, ACK(ASP-Active) and ACK(ASP-Inactive) messages.

6.1.2 ASP Active Before ASP Up

___________________________________________________________
TITLE: AS management
SUBTITLE: ASP Active sent Before ASP Up
PURPOSE: To check that ASP Active is rejected if ASP not in Up state.
___________________________________________________________
TEST Configuration: S1
PRE-TEST CONDITIONS: SCTP association is established between SG and ASP. ASP is down.
Reference: RFCXXXX Clause 4.3.2
___________________________________________________________
EXPECTED MESSAGE SEQUENCE

<table>
<thead>
<tr>
<th>SG</th>
<th>ASP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;--</td>
</tr>
<tr>
<td>ACK(ASP-Down)</td>
<td>-----&gt;</td>
</tr>
</tbody>
</table>

TEST DESCRIPTION
1. Send ASPAC message from ASP to SG.
2. SG should send an ACK(ASP-Down) in response to the ASPAC message on stream 0.

6.1.3 Notify AS Pending

___________________________________________________________
TITLE: AS management
SUBTITLE: Notify AS Pending
PURPOSE: To check that Notify (AS-Pending) will be sent if Active ASP transitions to Inactive.
___________________________________________________________
TEST Configuration: S2
PRE-TEST CONDITIONS: SCTP associations are established between SG and both ASPs. ASPs are down.
EXPECTED MESSAGE SEQUENCE

SG        ASP1        ASP2
<----------  ASPUP

ACK(ASP-Up)  ---------->

<----------------------  ASPUP

ACK(ASP-Up)  ---------------------->

<-------  ASPAC

ACK(ASP-Active)  ---------->

<--------  ASPIA

ACK(ASP-Inactive)  ---------->

Notify (AS-Pending)  ---------------------->

<----------------------  ASPAC

ACK(ASP-Active)  ---------------------->

TEST DESCRIPTION
1. ASP Up sent from both ASPs.
2. ASP1 sends ASP Active to transition to Active State.
3. ASP1 sends ASP Inactive to transition to Inactive State.
4. SG sends a NTFY(AS-Pending) message to ASP2.
5. ASP2 sends ASP Active (if and when it is willing to transition to Active state).

6.1.4 Notify Alternate ASP Active

TITLE:     AS management

SUBTITLE:  Notify Alternate ASP Active

PURPOSE:   To check that SG will send Notify (Alternate ASP Active)
           if one ASP overrides another ASP.

TEST Configuration:  S2

PRE-TEST CONDITIONS:  SCTP associations are established between SG and both ASPs. ASPs are Down.

Reference:  RFCXXXX Clause 4.3.2
EXPECTED MESSAGE SEQUENCE

SG              ASP1              ASP2
<----------------- ASPUP
ACK(ASP-Up)  ------------->
<-------------------------------  ASPUP
ACK(ASP-Up)  ------------------------->
<-------------- ASPAC
ACK(ASP-Active)  ------------->
<-------------------------------  ASPAC
ACK(ASP-Active)  ---------------------->

Notify (Alt ASP Active) ----->

TEST DESCRIPTION
1. Both ASPs transition to Up state.
2. ASP1 transitions to Active state.
3. ASP2 transitions to Active state.
4. SG sends a NTFY(Alternate ASP Active) to ASP1 to notify it that ASP2 has overridden it.

6.1.5 SCTP Communication Down Indication

---------------------------------------------------------------------
TITLE:     AS management
SUBTITLE:  SCTP Communication Down Indication
PURPOSE:   To check that if the local SCTP sends this indication due to the loss of connectivity to the ASP’s peer, ASP will be moved to Down State.
SCTP CDI is understood as either a SHUTDOWN COMPLETE notification and COMMUNICATION LOST notification from the SCTP.
---------------------------------------------------------------------
TEST Configuration:  S1
PRE-TEST CONDITIONS:  SCTP association is established between SG and ASP. ASP is Up.
Reference:  RFCXXXX Clause 4.3.2
---------------------------------------------------------------------
EXPECTED MESSAGE SEQUENCE

SG              ASP
<----------------- ASPAC
ACK(ASP-Active)  ------------->
Establish Request
Establish Confirm
Establish Confirm
Establish Confirm
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<--------       ASP Up
             (Version = 2)
Error       -------->
(Invalid Version)

TEST DESCRIPTION
1. A message is received by SG with an invalid version in the Common
   Message Header.
2. Check A SG sends an Invalid Version Error message to ASP.

6.2.2 Unsupported Message Type

TITLE: ERROR management
SUBTITLE: Unsupported Message Type
PURPOSE: To check that if a message with an undefined message type is
   received at SG, SG responds with ERROR message containing cause
   "Unsupported Message Type".
TEST Configuration: S1
PRE-TEST CONDITIONS: SCTP association is established between SG and
   ASP. ASP is Active (The same Test Case could be done with ASP being
   Up).
Reference: RFCXXXX Clause 4.3.2
EXPECTED MESSAGE SEQUENCE

<table>
<thead>
<tr>
<th>SG</th>
<th>ASP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ASP is Active</td>
</tr>
<tr>
<td></td>
<td>Message XXXX</td>
</tr>
<tr>
<td></td>
<td>(Msg Class = any valid value, Msg Type = 199)</td>
</tr>
<tr>
<td>Error</td>
<td>-------------&gt;</td>
</tr>
<tr>
<td>(Unsupported Message Type)</td>
<td></td>
</tr>
</tbody>
</table>

TEST DESCRIPTION
1. A message with an undefined message type is sent from ASP to SG.
2. Check A SG responds with ERROR message containing cause
   "Unsupported Message Type".

6.2.3 Unsupported Message Class

TITLE: ERROR management
SUBTITLE: Unsupported Message Class
PURPOSE: To check that if a message with message class not defined
   is received at SG, SG responds with ERROR message containing cause
   "Unsupported Message Class".
TEST Configuration:  S1

PRE-TEST CONDITIONS:  SCTP association is established between SG and ASP. ASP is Active (The same Test Case could be done with ASP being Up).

Reference:  RFCXXXX  Clause 4.3.2

EXPECTED MESSAGE SEQUENCE

<table>
<thead>
<tr>
<th>SG</th>
<th>ASP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ASP is Active</td>
</tr>
<tr>
<td></td>
<td>&lt;-________ Message XXXX (Msg Class = 199, Msg Type = any valid value)</td>
</tr>
<tr>
<td>Error</td>
<td>-------------&gt;</td>
</tr>
<tr>
<td></td>
<td>(Unsupported Message Class)</td>
</tr>
</tbody>
</table>

TEST DESCRIPTION
1. A message with message class that is not defined is received by SG.
2. Check A SG responds with ERROR message containing cause "Unsupported Message Type".

6.2.4 Invalid Interface Identifier

TITLE:  ERROR Management
SUBTITLE:  Invalid Interface Identifier
PURPOSE:  To check that the SG will respond with Error (Invalid Interface Identifier) if the ASP sends a message for an Invalid Interface Identifier (one that is not configured on SG).

TEST Configuration:  S1
PRE-TEST CONDITIONS:  SCTP association is established between SG and ASP. ASP is Active (The same Test Case could be done with ASP being Up).
Reference:  RFCXXXX  Clause 4.3.2

EXPECTED MESSAGE SEQUENCE

<table>
<thead>
<tr>
<th>SG</th>
<th>ASP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ASP is Active</td>
</tr>
<tr>
<td></td>
<td>&lt;-________ Establish Request ( with invalid Interface Identifier)</td>
</tr>
<tr>
<td>Error</td>
<td>-------------&gt;</td>
</tr>
<tr>
<td></td>
<td>(Invalid Interface Identifier)</td>
</tr>
</tbody>
</table>

TEST DESCRIPTION
1. ASP sends Establish Request with an invalid Interface Identifier.
2. Check A SG responds with ERROR message containing cause
"Invalid Interface Identifier".

6.2.5 Unexpected QPTM message

---

TITLE:     ERROR management
---

SUBTITLE:  Unexpected QPTM message
---

PURPOSE: To check that if a QPTM message is sent from ASP while ASP is not Active, the SG will send "Unexpected Message" error in response.
---

TEST Configuration:  S1
---

PRE-TEST CONDITIONS:  SCTP association is established between SG and ASP.
---

Reference:  RFCXXXX  Clause 3.3.3.1
---

EXPECTED MESSAGE SEQUENCE

SG                                ASP

<-----------       ASPUP
ACK(ASP-Up)     ------------>

<-----------   Establish Request
Error (Unexpected Msg) ----->

TEST DESCRIPTION
1. Send ASP-Up Primitive message from ASP to SG.
2. Check A ASPUP message will be received at the SG.
3. Send a QPTM (i.e. Establish Request) message from the MGC.
4. Check A ERROR message with Unexpected Message is sent.

6.3 ASP configuration

6.3.1 SG supports more than one ASP (optional)

---

TITLE:     ASP configuration
---

SUBTITLE:  SG configured to support >1 ASP
---

PURPOSE: To check that if an SG can support more than one ASP. In this case, one ASP will support a number of Interface Identifiers and the other ASP will support other Interface Identifiers.
Note:  The Interface Identifiers must not overlap between ASPs.
---

TEST Configuration:  S2 (ASPs are independent, not in failover
PRE-TEST CONDITIONS: An SCTP association is established between each SG and ASP. Both ASPs are Down.

Reference: RFCXXXX Clause 1.3.3

EXPECTED MESSAGE SEQUENCE

<table>
<thead>
<tr>
<th>SG</th>
<th>ASP1</th>
<th>ASP2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;----------</td>
<td>ASPUP</td>
</tr>
<tr>
<td>ACK(ASP-Up)</td>
<td>-------------------------</td>
<td>ASPUP</td>
</tr>
<tr>
<td></td>
<td>&lt;--------------------------</td>
<td>ASPAC</td>
</tr>
<tr>
<td>ACK(ASP-Up)</td>
<td>&lt;--------------------------</td>
<td>ASPAC</td>
</tr>
<tr>
<td>ACK(ASP-Active)</td>
<td>&lt;--------------------------</td>
<td>Establish Request</td>
</tr>
<tr>
<td>Establish Confirm</td>
<td>&lt;--------------------------</td>
<td>Establish Request</td>
</tr>
<tr>
<td></td>
<td>Establish Confirm</td>
<td></td>
</tr>
</tbody>
</table>

TEST DESCRIPTION
1. Both ASPs transition to Active state.
2. Both ASPs bring a D channel in-service.

6.4 Q.921/Q.931 primitives backhaul

6.4.1 Send and Receive Q.921/Q.931 primitives

TITLE: Q.921/Q.931 primitives backhaul

SUBTITLE: Establishing of a Data Link on a Signaling Channel.

PURPOSE: To check that a Data Link on a Signaling Channel is established and Traffic User PDUs can be exchanged.

TEST Configuration: S1

PRE-TEST CONDITIONS: SCTP association is established between SG and ASP. ASP is in ASP-Active state.

Reference: RFCXXXX Clause 4.1.2
EXPECTED MESSAGE SEQUENCE  (ASP’s view)

SG                                    ASP
ASP is Active

<----------------------------- Establish Request
Establish Confirm  ------------------>

<----------------------------- Data Request
Data Indication ------------------>

<----------------------------- Data Request
Data Indication ------------------>

<----------------------------- Data Request
Data Indication ------------------>

<----------------------------- Data Request
Data Indication ------------------>

<----------------------------- Release Request
Release Confirm  ------------------>

TEST DESCRIPTION
1. MGC desires the D channel to be in-service,
   it will send the Establish Request message to establish a
data link to the SG on the signalling channel. DL-Establish
Req Primitive is invoked at ASP to send Establish Request message
to the SG. This message should be acknowledged by Establish Confirm
message.
2. Check A The message is sent on the SCTP stream that corresponds to the
   D channel (Interface Identifier).
3. Now (Q.931) DATA message from MGC and SG containing Protocol Data can
   be transmitted or received by the Data link.
4. Check B DATA message is received at MGC and SG containing the
data passed by the Traffic User
5. Invoke DL-Release Req Primitive from the LMG at ASP to send
   Release Request message to the SG. This message should be
   acknowledged by Release Confirm message. The Data Link is now
   released.

6.4.2 Send Release Indication

TITLE:     Release Indication
SUBTITLE:  Release Indication Sent when Upon failure of Data Link
PURPOSE:   To check that a SG will send Release Indication when
           Data Link fails.
TEST Configuration:  S1
PRE-TEST CONDITIONS: SCTP association is established between SG and
ASP. ASP is in ASP-Active state.
EXPECTED MESSAGE SEQUENCE

SG                                    ASP

ASP is Active

<----------------------------- Establish Request
Establish Confirm ------------------------>

<----------------------------- Data Request
Data Indication ------------------------>

<----------------------------- Data Request
Data Indication ------------------------>

<----------------------------- Data Request
<----------------------------- Data Request
Data Indication ------------------------>

<==== Data Link Disconnected ====>

------------------------> Release Indication

TEST DESCRIPTION
1. MGC desires the D channel to be in-service, it will send the Establish Request message to establish a data link to the SG on the signalling channel. DL-Establish Req Primitive is invoked at ASP to send Establish Request message to the SG. This message should be acknowledged by Establish Confirm message.
2. Check A The message is sent on the SCTP stream that corresponds to the D channel (Interface Identifier).
3. Now (Q.931) DATA message from MGC and SG containing Protocol Data can be transmitted or received by the Data link.
4. Check B DATA message is received at MGC and SG containing the data passed by the Traffic User
5. Disconnect D channel physical interface. SG should generate Release Indication message.

NEED TO ADD HEARTBEAT FAILURE

7. Acknowledgement

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8. Author Address
9. References


