46

46.1 LLC Tests

This clause contains the test case requirements for Logical Link Control (LLC) procedures in the General Packet Radio Service (GPRS).

46.1.1 Default Conditions

The default values of LLC layer parameters are as per "Table 9: LLC layer parameter default values" in clause 8.9.8 of GSM 04.64. It is possible that the MS negotiates values different from what is given in the table. In the case where the negotiated value affects the test operation, this is noted in the test.

- The MS default initial condition is that it is GPRS attached and ciphering disabled.

Unless stated otherwise, the default conditions shall apply. N_{MS} denotes the frames sent from the MS and N_{SS} denotes the frames sent from the SS.

For all timers, a measurement tolerance of +/- 10% shall be applied.

The MS may send an XID command any time. The SS shall send an XID response accepting the values proposed by the MS, unless stated otherwise in the test case.

46.1.2 Test cases

46.1.2.1 Unacknowledged data transfer

46.1.2.1.1 Data transmission in protected mode

46.1.2.1.1.1 Conformance requirement

LLC has two modes of operation - acknowledged and unacknowledged. In the unacknowledged mode of operation, layer3 information is transmitted in numbered Unconfirmed Information (UI) frames. The UI frames are not acknowledged at the LLC layer. Neither error recovery nor reordering mechanisms is defined, but transmission and format errors are detected. Duplicate UI frames are discarded.

In the protected mode of unacknowledged operation, the FCS field protects the frame header and the information field.

Unacknowledged mode of operation is defined for all SAPIs that are not reserved.

Reference

GSM 04.64, clause 4.3.

46.1.2.1.1.2 Test purpose

To verify that the MS performs unacknowledged data transfer for SAPIs 3, 5 and 11 in the protected mode to the network

46.1.2.1.1.3 Method of test

Initial conditions

The MS shall be GPRS attached with ciphering enabled.

Related PICS/PIXIT Statement

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Test procedure

During GPRS attach and PDP context activation, the GMM messages are sent and received by the LLC layer at the MS using UI frames in the unacknowledged mode, on SAPI 1. This implicitly verifies bi-directional unacknowledged data transmission on SAPI 1.

After the PDP context is activated, the MS is made to initiate unacknowledged data transfer on SAPI 3. MS shall transmit UI frames with the E and PM bits set to 1, indicating that encryption and protection are on. Transmit 5000 octets from the MS.

Repeat the test case for SAPIs 5 and 11.

Maximum duration of the test

3 minutes.

Expected sequence

Step	Direction	Message	Comments
1		{PDP Context Activation}	Macro. PDP context activation from the MS. The PDP context used here is PDP context 5.
2			Initiate data transfer of 5000 octets from the MS.
3	MS -> SS	UI frame	Verify that the number of octets in the UI frame does not exceed N201-U. Verify that E=1 and PM=1, PD=0, C/R = 0 and the FCS is correct. Check whether the SAPI is 3, 5 or 11 when data is sent from the MS on these SAPIs. Verify that the sequence numbers are correct and that there are no duplicate or missing frames
4			Repeat step 3 until 5000 octets are sent.
5			Repeat the test case for SAPIs 5 and 11.The PDP context used for SAPI 5 is PDP Context 8 and the one for SAPI 11 is PDP Context 9.

46.1.2.1.2   Data transmission in unprotected mode

46.1.2.1.2.1   Conformance requirement

LLC has two modes of operation - acknowledged and unacknowledged. In the unacknowledged mode of operation, layer3 information is transmitted in numbered Unconfirmed Information (UI) frames. The UI frames are not acknowledged at the LLC layer. Neither error recovery nor reordering mechanisms is defined, but transmission and format errors are detected. Duplicate UI frames are discarded.

In the unprotected mode of unacknowledged operation, the FCS field protects the frame header and the first N202 octets of the information field

Unacknowledged mode of operation is defined for all SAPIs that are not reserved.

Reference

GSM 04.64, clause 4.3.

46.1.2.1.2.2 Test purpose

To verify that the MS performs unacknowledged data transfer without protection in the correct manner, on SAPIs 5 and 9.

46.1.2.1.2.3 Method of test

Initial conditions

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Related PICS/PIXIT Statement

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Test procedure

After the PDP context is activated, the MS initiates unacknowledged data transfer on SAPI 5. The MS shall transmit UI frames with the E and PM bits set to 0, indicating that encryption and protection are off.

Repeat the test case for SAPI 9.

Maximum duration of the test

3 minutes.

Expected sequence

Step	Direction	Message	Comments
1		{PDP Context Activation}	Macro.Initiate PDP context activation from the MS. Use PDP context 10.
2			Initiate unacknowledged data transfer for 5000 octets, from the MS.
3	MS -> SS	UI frame	Verify that the number of octets received at the MS in the UI frame does not exceed N201-U. Verify that E=0 and PM=0, PD=0, C/R = 0 and the FCS is correct. Verify that SAPI = 3 for the first run of the test case and SAPI=9 for the second run of the test case. Verify that the sequence numbers are correct and that there are no duplicate frames.
4	MS -> SS		Repeat step 3 until data transfer is complete.
5		.	Repeat the test case with PDP Context 6. This will use SAPI 9.

46.1.2.1.3 Reception of I frame in ADM

46.1.2.1.3.1 Conformance requirement

The DM unnumbered response shall be used by an LLE to report to its peer entity that the LLE is in a state such that ABM operation cannot be performed. An LLE shall transmit a DM response to any valid command received that it cannot action.

No information field is permitted within the DM response.

Reference

GSM 04.64, clause 6.4.1.4

46.1.2.1.3.2   Test purpose

To verify that the MS sends a DM response if an I frame is received while in unacknowledged mode.

46.1.2.1.3.3   Method of test

Initial conditions

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Related PICS/PIXIT Statement

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Test procedure

After sending data to the MS in unacknowledged mode, send an I frame from the SS. The MS shall send a DM response to indicate that it cannot perform an ABM operation.

Maximum duration of the test

3 minutes.

Expected sequence

Step	Direction	Message	Comments
1		{PDP Context Activation}	Macro. Initiate PDP context activation from the MS. Use PDP context 1.
2			Initiate unacknowledged data transfer for 2000 octets, from the SS.
3	SS -> MS	UI frame	
4			Repeat step 3 until 1500 octets are transmitted.
5	SS -> MS	I frame	Send an I frame from the SS
6	MS -> SS	DM response	Verify that the MS sends a DM response with F = 0.
7			Repeat step 3 until all 2000 octets are transmitted. The MS must not send anymore DM frames.

46.1.2.2   Acknowledged data transfer

46.1.2.2.1   Link establishment

46.1.2.2.1.1   Link establishment from MS to SS

46.1.2.2.1.1.1   Conformance requirement

In the acknowledged operation, layer 3 information is transmitted in numbered Information (I) frames. The I frames are acknowledged at the LLC layer. Error recovery and reordering procedures based on retransmission of unacknowledged I frames are specified.

Acknowledged operation requires that ABM operation has been initiated by an establishment procedure using the Set Asynchronous Balanced Mode (SABM) command.

Acknowledged operation is allowed for all SAPIs that are not reserved except SAPIs 1 and 7 for Release 97-98 and 1,2,7 and 8 for Release 99.

Reference

GSM 4.64, clause 4.4, and clause 8.5.2.

46.2.1.1.2 Test purpose

To test the establishment and release of acknowledged mode data transfer from the MS to the SS.

46.1.2.2.1.1.3 Method of test

Initial conditions

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Related PICS/PIXIT Statement

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Test procedure

Initiate acknowledged data transfer from the MS on SAPI 3. Verify that the MS establishes a link before initiating data transfer.

Initiate data transfer from the MS and ensure that the data sent from the MS is received at the SS.

Maximum duration of the test

5 minutes.

Expected sequence

Step	Direction	Message	Comments
1		{PDP Context Activation}	Macro. Initiate PDP context activation from the MS using PDP Context11. Initiate data transfer of 5000 octets from the MS.
2	MS -> SS	SABM	Verify that P/F =1.
3	SS -> MS	UA	Send UA from the SS before T200 can expire at the MS. Verify that the MS does not resend SABM.
4	MS -> SS	I + S	
5	SS -> MS	RR	Acknowledge whenever requested by the MS. Ensure that the MS does not retransmit the data.
6			Repeat steps 4 and 5 until 5000 octets are transferred from the MS.

46.1.2.2.1.2 Link establishment from SS to MS

46.1.2.2.1.2.1 Conformance requirement

In the acknowledged operation, layer 3 information is transmitted in numbered Information (I) frames. The I frames are acknowledged at the LLC layer. Error recovery and reordering procedures based on retransmission of unacknowledged I frames are specified.

Acknowledged operation requires that ABM operation has been initiated by an establishment procedure using the Set Asynchronous Balanced Mode (SABM) command.

Acknowledged operation is allowed for all SAPIs that are not reserved except SAPIs 1 and 7.

An LLE shall initiate a request for release of the ABM operation by transmitting a DISC command with the P bit set to 1.

An LLE receiving a DISC command while in ABM state shall transmit a UA response with the F bit set to the same binary value as the P bit in the received DISC command.

Reference

GSM 4.64, clause 4.4,, and clause 8.5.2.

46.1.2.2.1.2.2   Test purpose

To test the establishment and release of acknowledged mode data transfer from the SS to the MS.

46.1.2.2.1.2.3   Method of test

Initial conditions

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Related PICS/PIXIT Statement

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Test procedure

Initiate PDP context activation from the MS . Do a PDP context modification from the SS, which will make the SS initiate a link establishment.

Initiate acknowledged data transfer from the SS on SAPI 9. Verify that the MS responds with a UA.

Initiate data transfer from the SS and ensure that the data sent from the SS is received at the MS.

Terminate data transfer from the SS.

Maximum duration of the test

3 minutes.

Expected sequence

Step	Direction	Message	Comments
1		{PDP Context Activation}	Macro. Initiate PDP context activation from the MS using PDP Context 10.
2		{PDP Context Modification}	Macro. Initiate PDP context modification from the SS using PDP Context 12.
3	SS -> MS	SABM	Send SABM with P/F = 1.
4	MS -> SS	UA	Verify that UA is received before the T200 timer at the SS expires.
5			Initiate data transfer of 2000 octets from the SS.
6	SS -> MS	I + S	Set the A bit to 1 in each I+S frame.
A7(option al step)	MS -> SS	RNR	The MS can send an RNR. Stop data transmission until the MS sends an RR.
7	MS -> SS	RR	Verify that the MS sends an RR for each frame.
8			Repeat steps 6 and 7 until 2000 octets are sent.
9	SS -> MS	DISC	Send DISC from the SS.
10	MS -> SS	UA	

46.1.2.2.1.3   Loss of UA frame

46.1.2.2.1.3.1   Conformance requirement

If timer T200 expires before the UA or DM response with the F bit set to 1 is received, the LLE shall:

-     retransmit the SABM command

- set timer T200

- increment the retransmission counter

Reference

GSM 4.64, clause 8.5.1.3

46.1.2.2.1.3.2   Test purpose

To test the MS response to the loss of a UA frame during link establishment.

46.1.2.2.1.3.3   Method of test

Initial conditions

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Related PICS/PIXIT Statement

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Test procedure

Initiate link establishment for acknowledged data transfer from the MS, for SAPI 9. When the SS receives the SABM frame, do not send a response.

After the MS sends another SABM, respond with a UA from the SS and send some frames from the SS to ensure that the link is established.

Maximum duration of the test

3 minutes.

Expected sequence

Step	Direction	Message	Comments
1		{PDP Context Activation}	Macro. Initiate PDP context activation from the MS using PDP context 12.
2	MS -> SS	SABM	Initiate data transfer from the MS. Verify that P/F = 1.
3	MS -> SS	SABM	Do not send UA from the SS. Verify that MS sends another SABM with P/F = 1 after T200 seconds, with the same SAPI that it sent in the first SABM.
4	SS -> MS	UA	Send UA from the SS before T200 for that SAPI expires at the MS.
5			Initiate sending 5 I+S frames from the SS.
6	SS -> MS	I+S	Set the A bit to 1 in all the I+S frames.
A7 (optional step)	MS -> SS	RNR	The MS may send an RNR. If it does, stop transmitting from the SS until the MS sends an RR.
7	MS -> SS	RR	Verify that the MS receives and acknowledges all the frames by sending an RR for each I+S frame received.
8			Repeat steps 6 and 7 until 5 I+S frames are sent from the SS.

46.1.2.2.1.4 Total loss of UA frame

46.1.2.2.1.4.1 Conformance requirement

If timer T200 expires before the UA or DM response with the F bit set to 1 is received, the LLE shall:

- retransmit the SABM command

- set timer T200

- increment the retransmission counter

After retransmission of the SABM command N200 times, the LLE shall enter the ADM state.

Reference

GSM 4.64, clause 8.5.1.3

46.1.2.2.1.4.2 Test purpose

To verify that

- The MS attempts to establish a link N200 times after sending the first SABM.

- The MS shall enter ADM state after N200 retransmissions of SABM.

46.1.2.2.1.4.3 Method of test

Initial conditions

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Related PICS/PIXIT Statement

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Test procedure

Initiate link establishment from the MS by sending a SABM frame, for SAPI 11. At the SS, ignore the SABM from the MS.

The MS shall wait for time-out of timer T200 and then send a new SABM frame.

At the SS, ignore the SABM frame sent by the MS. Wait until the MS sends N200 + 1 SABM frames in all. Wait for 2 * T200 seconds at the SS to ensure that the MS does not send anymore SABM frames.

Send an I+S frame from the SS to the MS with the A bit set. Wait for T201 seconds at the SS to verify that the MS does not send an acknowledgement. Verify that the MS sends a DM response.

Maximum duration of the test

5 minutes.

Expected sequence

Step	Direction	Message	Comments
1		{PDP Context Activation}	Macro. Initiate PDP context activation from the MS, using PDP Context 13.
2	MS -> SS	SABM	Initiate data transfer from the MS. Verify that P/F = 1, SAPI = 11.
3	MS -> SS	SABM	Do not send UA from the SS. Verify that MS sends another SABM with P/F = 1 after T200 seconds, with the same SAPI that it sent in the first SABM.
4			Repeat step 3 N200 times. Wait until the MS sends N200 + 1 SABM frames in all. After this, wait for 2* T200 seconds to verify that the MS does not send anymore SABM frames.
5	SS -> MS	I+S	Send 1 I+S frame from the SS with the A bit set to 1.
6	MS -> SS	DM	Verify that the MS sends a DM response
7			Wait for T201 seconds and verify that the MS does not send an RR frame in response to the I+S frame.

46.1.2.2.1.5   DM response

46.1.2.2.1.5.1   Conformance requirement

The DM unnumbered response shall be used by an LLE to report to its peer that the LLE is in such a state that ABM operation cannot be performed.

Upon reception of the DM response with the F bit set to 1, the originator of the SABM command shall enter the ADM state.

Reference

GSM 4.64, clause 6.4.1.4, clause 8.5.1.2

46.1.2.2.1.5.2   Test purpose

To verify that a link is not established with the MS when a DM response is sent in response to a SABM command.

46.1.2.2.1.5.3   Method of test

Initial conditions

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Related PICS/PIXIT Statement

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Test procedure

Initiate acknowledged data transfer from the MS on SAPI 3. From the SS, send a DM with the F bit set to 1.

Initiate data transfer from the SS and ensure that MS does not acknowledge the data received.

Maximum duration of the test

3 minutes.

Expected sequence

Step	Direction	Message	Comments
1		{PDP Context Activation}	Macro. Initiate PDP context activation using PDP Context 11.
2	MS -> SS	SABM	Initiate data transfer from the MS. Verify that P/F =1 in the SABM sent from the MS.
3	SS -> MS	DM	Send DM with F=1 from the SS before T200 can expire at the MS. Wait for 2 * T200 seconds after the transmission of DM and verify that the MS does not resend SABM in this period.
4	SS -> MS	I + S	Initiate data transfer from the SS for 1 octet with the A bit set to 1. Verify that the MS does not acknowledge the data transferred.
5	MS -> SS	DM response	Verify that the MS sends a DM response.
6			Wait for 2*T201 seconds at the SS after sending the I+S frame and verify that the MS does not send an RR in response to the I+S frame

46.1.2.2.2 MS sends I+S frames

46.1.2.2.2.1 Checking N(S)

46.1.2.2.2.1.1 Conformance requirement

Having either transmitted the UA response to a received SABM command or received the UA response to a transmitted SABM command, I frames and supervisory frames may be transmitted and received. I frames shall be transmitted in ascending N(S) order.

When there is an opportunity to transmit a frame, then the LLE shall do one of the following in the order of priority:

- If there are any I frames marked for retransmission and if the LLE is not in the peer receive busy condition, then the LLE shall increment by 1 the retransmission count variable for the I frame with lowest send sequence number N(S). If the retransmission count variable does not exceed the value of N200, then the LLE shall retransmit the frame.

- If the LLE has a new frame to retransmit, if V(S) < V(A) + k and if the LLE is not in the peer receiver busy condition, then the new I frame shall be transmitted.

- If the LLE has an acknowledgement to transmit, then the LLE shall transmit an S frame.

Reference

GSM 4.64, clause 8.6, clause 8.6.1.

46.1.2.2.2.1.2 Test purpose

To verify that the MS handles the send sequence number N(S) correctly.

46.1.2.2.2.1.3 Method of test

Initial conditions

Related PICS/PIXIT Statement

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Test procedure

Initiate data transfer from the MS on SAPI 3. Send 3000 K octets continuously. The value of N(S) shall begin from 0 and increment by 1 mod (512) for each frame.

Acknowledge each I frame by sending an RR frame to the MS, in sequence.

Maximum duration of the test

30 minutes.

Expected sequence

Step	Direction	Message	Comments
1		{PDP Context Activation}	Macro. Initiate a PDP context activation using PDP Context 11, from the MS.
2			Initiate data transfer of 3000K octets, from the MS.
3	MS -> SS	I+S frame	N(S) = 0 for the first frame.
4	SS -> MS	S frame with RR	Respond whenever acknowledgement is requested.
5			Repeat steps 3 and 4 until all 3000K octets have been transmitted from the MS. Verify that : the MS does not retransmit any frame. N(S) begins with 0 and is incremented by 1 mod (512).

Note: The application will resend data until all data have been sent.

46.1.2.2.2.2 Busy condition at the peer, with RR sent for resumption of transmission

46.1.2.2.2.2.1 Conformance requirement

The receive not ready (RNR) command shall be used by an LLE to indicate a busy condition. The value of N(R) in the RNR frame acknowledges I frames numbered up to and including N(R) - 1 . Subsequent frames, if any, shall not be considered confirmed.

After receiving a valid RNR frame, the LLE shall:

- set a peer receiver busy condition

- not transmit or retransmit any frames to the peer LLE

- treat the N(R) contained in the received RNR as an acknowledgement for all the I frames that have been (re-)transmitted, up to and including N(R)- 1 and set its V(A) to the value of N(R) contained in the RNR frame

- set T201 to initiate the inquiry process and

- reset the retransmission count variable

If timer T201 expires, the LLE shall:

- if the value of the retransmission count variable is less than N200:

- transmit an appropriate supervisory frame with an A bit set to 1;

- set timer T201; and

- add one to its retransmission count variable;

The LLE receiving the supervisory frame with the A bit set to 1 shall respond, at the earliest opportunity, with an appropriate supervisory frame (see subclause 8.6.4.1) to indicate whether or not its own receiver busy condition still exists.

Upon receipt of the supervisory frame, the LLE shall reset timer T201, and:

- if the frame is an RR, ACK or SACK frame:

- the peer receiver busy condition shall be cleared;

- if timer T201 was active before the peer receiver busy condition was set, and if the associated I frame is still not acknowledged, then timer T201 shall be set and associated with the same I frame; and

- - the LLE may transmit new I frames or retransmit I frames as defined in subclauses 8.6.1 or 8.6.3, respectively;

The busy peer shall respond at the earliest opportunity, with an appropriate supervisory frame.

- If the highest numbered I frame was received with N(S)=V(R), the appropriate supervisory frame is the RR frame.

Reference

GSM 4.64, clause 6.4.3.4, clause 8.6.4.

46.1.2.2.2.2.2 Test purpose

To verify that the MS

- Handles busy condition when an RNR is sent from the SS

- Resumes transmission upon reception of an RR.

46.1.2.2.2.2.3 Method of test

Initial conditions

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Related PICS/PIXIT Statement

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Test procedure

The MS is made to send 1 I+S frame on SAPI 9. The SS acknowledges the received I+S frame with a supervisory RNR frame.

Immediately after the first RNR frame, the MS shall stop sending I+S frames and start the retransmission timer T201.

After T201 seconds, send an RR frame from the SS.

Immediately after the first RR frame, the MS shall restart the transmission of I+S frames from the point at which it ceased to receive acknowledgement.

Maximum duration of the test

5 minutes.

Expected sequence

Step	Direction	Message	Comments
1		{PDP Context Activation}	Macro. Initiate PDP context activation from the MS using PDP Context 12. Negotiate a value of at least 1 minute for T201 and a value of 15 for N200.
2			Initiate data transfer of 1 octet of data in acknowledged mode from the MS.
3	MS -> SS	I+S frame	Send 1 octet of data. N(S) = 0 for the first frame
4	SS -> MS	RNR frame	Acknowledge the I+S frame by sending an RNR frame. After sending an RNR frame with N(R) = 1 verify that the MS does not send any I + S frames during the next T201 seconds .
5	MS -> SS	RR frame	MS sends an RR frame after T201 times out.
6	SS -> MS	RNR frame	
7			Initiate data transmission from the MS within 1 minute. Verify that the MS does not send this data to the SS.
8	MS -> SS	RR frame	MS sends an RR frame after T201 times out.
9	SS -> MS	RNR frame	
10	SS -> MS	RR	Send an RR from the SS with N(R) = 1
11	MS -> SS	I + S	Verify that the MS starts sending I+S frames from the point at which it had stopped sending, that is, from N(S) = 1
12	SS -> MS	RR	Acknowledge all the frames transmitted by the MS so far, if acknowledgement is requested by the MS.
13			Repeat steps 11 and 12 until 1000 octets of data are transmitted from the MS.

46.1.2.2.2.3   Busy condition at the peer, with ACK sent for resumption of transmission

46.1.2.2.2.3.1   Conformance requirement

The receive not ready (RNR) command shall be used by an LLE to indicate a busy condition. The value of N(R) in the RNR frame acknowledges I frames numbered up to and including N(R) - 1 . Subsequent frames, if any, shall not be considered confirmed.

After receiving a valid RNR frame, the LLE shall:

- set a peer receiver busy condition

- not transmit or retransmit any frames to the peer LLE

- treat the N(R) contained in the received RNR as an acknowledgement for all the I frames that have been (re-)transmitted, up to and including N(R)- 1 and set its V(A) to the value of N(R) contained in the RNR frame

- set T201 to initiate the inquiry process and

- reset the retransmission count variable

If timer T201 expires, the LLE shall:

- if the value of the retransmission count variable is less than N200:

- transmit an appropriate supervisory frame with an A bit set to 1;

- set timer T201; and

- add one to its retransmission count variable;

The LLE receiving the supervisory frame with the A bit set to 1 shall respond, at the earliest opportunity, with an appropriate supervisory frame (see subclause 8.6.4.1) to indicate whether or not its own receiver busy condition still exists.

Upon receipt of the supervisory frame, the LLE shall reset timer T201, and:

- if the frame is an RR, ACK or SACK frame:

- the peer receiver busy condition shall be cleared;

- if timer T201 was active before the peer receiver busy condition was set, and if the associated I frame is still

not acknowledged, then timer T201 shall be set and associated with the same I frame; and

- the LLE may transmit new I frames or retransmit I frames as defined in subclauses 8.6.1 or 8.6.3, respectively;

The busy peer shall respond at the earliest opportunity, with an appropriate supervisory frame.

- If the highest numbered frame was received with N(S) = V(R) +1, the appropriate frame is the ACK frame.

Reference

GSM 4.64, clause 6.4.3.4, clause 8.6.4.

46.1.2.2.2.3.2 Test purpose

To verify that the MS

- Handles busy condition when an RNR is sent from the SS

- Resumes transmission upon reception of an ACK.

46.1.2.2.2.3.3 Method of test

Initial conditions

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Related PICS/PIXIT Statement

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Test procedure

The MS is made to send I+S frames continuously on SAPI 11. The SS acknowledges the received I+S frames with supervisory RR frames. After 1 second, it acknowledges the received I+S frames with a supervisory RNR frame.

Immediately after the first RNR frame, the MS shall stop sending I+S frames and start the retransmission timer T201. The RNR frame will indicate that all frames except the one before the last one has been received.

After T201 seconds, send an ACK frame from the SS.

Immediately after the first ACK frame, the MS shall restart the transmission of I+S frames from the point at which it ceased to receive acknowledgement. The frame before the last one shall be transmitted first from the MS.

Maximum duration of the test

5 minutes.

Expected sequence

Step	Direction	Message	Comments
1		{PDP Context Activation}	Macro. PDP context activation from the MS with PDP Context 13.
2			Initiate acknowledged mode data transmission from the MS.
3	MS -> SS	I+S frame	N(S)=0 for the first frame
4	SS -> MS	RR frame	Acknowledge when requested
5			Repeat steps 3 and 4. The N(S) of the frames shall range from N(S) = 0 until N(S) = $N_{MS} + i$ mod 512. The last RR frame sent from the SS shall have its N(R) = $N_{MS} + i - 2$ mod 512
6	SS -> MS	RNR frame	After sending RNR frame with N(R) = $N_{MS} + i - 2$ mod 512, wait for T201 seconds at the SS. The SS may receive some I+S frames that the MS had sent before it received the RNR.
7	MS -> SS	RR frame	MS sends an RR frame after T201 times out.
8	SS -> MS	RNR frame	
9	SS -> MS	ACK	Send an ACK from the SS with N(R) = $N_{MS} + i - 1$ mod 512.
10	MS -> SS	I + S	Verify that the MS starts sending I+S frames with N(S) = $N_{MS} + i - 1$ mod 512, N(S) = $N_{MS} + i + 1$ mod 512, $N_{MS} + i + 2$ mod 512 …
11	SS -> MS	RR	Acknowledge all the frames transmitted by the MS so far.
12	MS -> SS	I + S	Verify that the MS sends the remaining I frames with the correct sequence numbers.
13	SS -> MS	RR	Acknowledge all the frames transmitted by the MS.

46.1.2.2.2.4 SACK frame

46.1.2.2.2.4.1 Conformance requirement

On receipt of a valid SACK frame, the LLE shall consider all I frames with the corresponding bit set to 1 in the SACK bitmap as acknowledged.

Reference

GSM 04.64, clause 8.6.3.2

46.1.2.2.2.4.2 Test purpose

To verify that the MS considers only the frames as indicated by the SACK bitmap have been received correctly and that it retransmits the frames that have not been acknowledged.

46.1.2.2.2.4.3 Method of test

Initial conditions

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Related PICS/PIXIT Statement

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Test procedure

Initiate data transfer from the MS and send frames from N(S) = 0 to N(S) = N_{MS}, where N_{MS} is less than kU. Acknowledge all frames until N_{MS} - 6. Do not acknowledge the frames N_{MS} - 6, N_{MS} - 3, N_{MS} - 2 and N_{MS} − 1. Acknowledge the other frames (N_{MS} - 5, N_{MS} - 4, N_{MS}) by using SACK. Verify that the MS retransmits the frames N_{MS} - 6, N_{MS} −3, N_{MS} −2 and N_{MS} - 1. Acknowledge the retransmitted frames.

Maximum duration of the test

3 minutes.

Expected sequence

Step	Direction	Message	Comments
1		{PDP Context Activation}	Macro. PDP context activation from the MS with PDP Context 11.
2			Initiate acknowledged mode data transfer from the MS. If the mobile negotiates a window size less than 6, this test shall end at this step.
3	MS -> SS	I+S frame	N(S) = 0 for the first frame
4			Repeat steps 3, with the N(S) incremented by 1 for each step. These must be repeated until an I+S frame with the A bit set to 1 is received at the SS.
5	SS -> MS	RR frame	The N(S) for the last frame sent from the MS shall be N_{MS}. The last RR frame sent from the SS shall have its N(R) $= N_{MS} - 6$.
6	SS -> MS	SACK	Do not acknowledge the frames N_{MS} - 6, N_{MS} - 3, N_{MS} - 2 and N_{MS} - 1. Acknowledge the other frames (N_{MS} - 5, N_{MS} - 4, $N_{MS)}$ by using SACK.
7	MS -> SS	I+S frame	Verify that the MS retransmits the frames N_{MS} - 6, N_{MS} - 3, N_{MS} - 2 and N_{MS} - 1.
8	SS -> MS	RR	Acknowledge all the frames.

46.1.2.2.3   Reception of I + S frames at the MS

46.1.2.2.3.1   Checking N(R)

46.1.2.2.3.1.1   Conformance requirement

Whenever an LLE receives a frame with the A bit set to 1, it shall transmit an I+S or S frame.

In ABM mode, all I frames and Supervisory frames contain N(R), the expected send sequence number of the next in-sequence received I frame. At the time that a frame of the above type is designated for transmission, the value of N(R) is equal to the value of the receive state variable V(R). N(R) indicates that the LLE transmitting the N(R) has correctly received all I frames numbered up to and including N(R) - 1.

Reference

GSM 4.64, clause 6.3.5.4.5, clause 8.6.3.1

46.1.2.2.3.1.2   Test purpose

To verify that the MS transmits acknowledgements with the correct N(R).

46.1.2.2.3.1.3   Method of test

Initial conditions

-

Related PICS/PIXIT Statement

-

Test procedure

Send I+S frames continuously from the SS. Send more than 512 frames. The delay between two I+S frames should be less than T201.

Do not send any data from the MS.

When the MS sends RR frames, check the value of N(R) to verify that it indicates that all frames sent from the SS has been acknowledged.

Maximum duration of the test

30 minutes.

Expected sequence

Step	Direction	Message	Comments
1		{PDP Context Activation}	Macro. Initiate PDP context activation from the MS using PDP Context 11.
2			Initiate acknowledged mode data transfer from the SS.
3	SS -> MS	I+S frame	
4	SS -> MS	I+S frame	The last I+S frame shall have its N(S) = N_{SS} + i mod 512. Set the A bit to 1 in the last frame of each window and the last frame sent from the SS.
A5 (optional step)	MS -> SS	RR	Verify whether the RR frames received from the MS have the correct N(R) values. Verify whether all the I+S frames sent from the SS have been acknowledged.
B5(optional step)	MS -> SS	RNR	The SS shall wait for an ACK, SACK or RR frame before it sends the next I+S frame.
C5 (optional step)	MS -> SS	SACK	The SS shall retransmit the unacknowledged frames.
D5 (optional step)	MS -> SS	ACK	The SS shall retransmit the unacknowledged frame.
			The MS may not send an RR if the A bit is not set in step 4.
6			Repeat from step 4 515 times.
7			At the end of the test, all the frames sent shall have been acknowledged.

46.1.2.2.3.2 MS handling busy condition during bi-directional data transfer

46.1.2.2.3.2.1 Conformance requirement

The receive not ready (RNR) command shall be used by an LLE to indicate a busy condition. The value of N(R) in the RNR frame acknowledges I frames numbered up to and including N(R) - 1. Subsequent frames, if any, shall not be considered confirmed.

After receiving a valid RNR frame, the LLE shall:

- set a peer receiver busy condition

- not transmit or retransmit any frames to the peer LLE

- treat the N(R) contained in the received RNR as an acknowledgement for all the I frames that have been (re-)transmitted, up to and including N(R)- 1 and set its V(A) to the value of N(R) contained in the RNR frame

- set T201 to initiate the inquiry process and

- reset the retransmission count variable

The busy peer shall respond at the earliest opportunity, with an appropriate supervisory frame.

-   If the highest numbered frame was received with N(S) = V(R) +1, the appropriate frame is the ACK frame.

Reference

GSM 4.64, clause 6.4.3.4, clause 8.6.4.

46.1.2.2.3.2.2   Test purpose

To verify that the MS handles peer receiver busy condition when it is transmitting to the SS and receiving data from the SS.

46.1.2.2.3.2.3   Method of test

Initial conditions

-

Related PICS/PIXIT Statement

-

Test procedure

Send 1 I+S frame from the SS. Verify that the MS acknowledges this frame.

Send 1 octet of data from the MS. Acknowledge this from the SS.

Send an RNR from the SS to indicate receiver busy condition, after 1 frame (N(S) = 0) has been received at the SS. The N(R) value that is sent in the RNR frame is 0.

Verify that the MS stops transmission of I+S frames.

T201 seconds after sending the RNR frame, send an RR frame from the SS with N(R) = 0 to request the MS to resume transmission.

Initiate data transmission from the MS and verify that the MS resumes transmission. The first frame sent from the MS should have its N(S) = 0.

Verify that the MS sends acknowledgements for all the I+S frames transmitted from the SS.

Maximum duration of the test

10 minutes.

Expected sequence

Step	Direction	Message	Comments
1		{PDP Context Activation}	Macro.Initiate PDP context activation from the MS using PDP Context 12.
2			Initiate acknowledged mode data transfer of 1 octet from the MS and the SS.
3	MS -> SS	I+S frame	N(S) =0 for the first frame
4	SS -> MS	I+S frame	A bit set to 1.
5	SS -> MS	RNR frame	Do not acknowledge the first I+S frame received at the SS. N(R) = 0.
A6 (optional step)	MS -> SS	RNR frame	The MS may repeat this step In this case, the MS shall send an RR frame for resumption of transmission.
6	MS -> SS	RR	Acknowledgement to the I+S frame sent in step 4.
7	MS -> SS	RR	Verify that the MS sends this after T201 seconds after step 5. The MS shall not resend the I+S frame sent in step 3.
8	SS -> MS	RR	N(R) = 0. Send this to resume transmission from the MS.
9	MS -> SS	I+S	Verify that the MS - resends the I+S frame sent in step 3.
10	SS -> MS	RR	Acknowledge the frame transmitted by the MS.

46.1.2.2.3.3 SACK frame

46.1.2.2.3.3.1 Conformance requirement

The SACK supervisory frame shall be used by an LLE to acknowledge single or multiple frames. Frames up to and including $N(R) - 1$, and frames indicated by the SACK bitmap, have been received correctly.

If the LLE is in the own receiver busy condition, the appropriate supervisory frame is the RNR frame. Otherwise, if the highest numbered frame was received with $N(S) = V(R)$, the appropriate supervisory frame is the RR frame. Otherwise, if the highest numbered I frame was received with $N(S) = V(R) + 1$, the appropriate supervisory frame is the ACK frame. Otherwise, the appropriate supervisory frame is the SACK frame.

Reference

GSM 4.64, clause 6.4.3.3 and clause 8.6.4.1

46.1.2.2.3.3.2 Test purpose

To verify whether the MS sends a SACK frame when it is required and that the SACK frame has the correct bits set.

46.1.2.2.3.3.3 Method of test

Initial conditions

-

Related PICS/PIXIT Statement

-

Test procedure

$N_{MS} = 20$, for this test case.

Initiate data transfer from the SS and send frames from $N(S) = 0$ to $N(S) = N_{MS}$ - 3. The A bit shall be set to 1 for all frames sent. Wait till all the frames are acknowledged. Send the frame with $N(S) = N_{MS}$ with the A bit set to 1..Verify that the MS acknowledges all the frames until N_{MS} - 3 using RR and negatively acknowledges the other frames (N_{MS} -2 and N_{MS}-1) by using SACK. Retransmit the frames N_{MS} −2 and N_{MS} - 1 with A bit set to 1. Verify that the MS acknowledges the retransmitted frames.

Maximum duration of the test

3 minutes.

Expected sequence

Step	Direction	Message	Comments
1		{PDP Context Activation}	Macro. Initiate PDP context activation with PDP Context 13. If the negotiated window size is less than 3, the test shall end at this step.
2			Initiate acknowledged mode data transfer from the SS.
3 -	SS -> MS -	I+S frame -	$N(S) = 0$ for the first frame, A bit = 1.
A4 (Optional step)	MS -> SS	RNR frame	The MS can optionally send an RNR frame. If it does, do not send data until the MS sends an RR.
4	MS -> SS	RR frame	$N(R) = 1$ for the first frame
5			Repeat steps 3 and 4 with the N(S) and N(R) values incremented by 1 for each step and with A =1 for the I+S frame . The last RR frame shall have its $N(R) = N_{MS} - 2$.
6	SS -> MS	I+S frame	Send with $N(S) = N_{MS}$, A bit = 1.
A7 (Optional step)	MS -> SS	RNR	$N(R) = N_{MS} -2$. In this case the SS shall not transmit anything until the MS sends a SACK.
7	MS -> SS	SACK	Verify that the MS does not acknowledge the frames N_{MS} - 2 and $N_{MS} - 1$ and acknowledges the other frames (N_{MS}) using SACK.
8	SS -> MS	I+S frame	Retransmit the frame N_{MS} - 2 with A bit = 1.
A9 (Optional step)	MS -> SS	RNR	In this case, the SS shall not transmit anything until the MS sends an ACK.
9	MS -> SS	ACK	
10	SS -> MS	I+S	$N(S) = N_{MS} - 1$, A bit = 1.
A11	MS -> SS	RR	
B11	MS -> SS	RNR	The RNR shall indicate that the MS has received all the frames sent from the SS.

46.1.2.2.3.4   ACK frame

46.1.2.2.3.4.1   Conformance requirement

Whenever an LLE receives a frame with the A bit set to 1, it shall transmit an I+S or S frame.

The ACK supervisory frame shall be used by an LLE to acknowledge a single or multiple I frames. Frames up to and including $N(R) – 1$, and frame $N(R) + 1$, have been received correctly.

Reference

GSM 4.64, clause 6.4.3.2, clause 8.6.3.1

46.1.2.2.3.4.2 Test purpose

To verify that the MS transmits an ACK frame when frames up to and including $N(R) - 1$ and frame $N(R) + 1$ have been received correctly.

46.1.2.2.3.4.3 Method of test

Initial conditions

-

Related PICS/PIXIT Statement

-

Test procedure

For this test case, $N_{SS} = 20$.

Send I+S frames with $N(S) = 0$ to $N(S) = N_{SS} - 2$ from the SS. The delay between two I+S frames should be less than T201. Set the A bit to 1 in frames 0 to $N_{SS} - 2$. Verify that the MS sends an RR frame as acknowledgement for these frames. Send the frame with A=1. Do not send frame $N_{SS} - 1$. Verify that the MS sends an ACK frame, indicating that N_{SS} and $N_{SS} - 2$ have been received and that $N_{SS} - 1$ has not been received. Now send a frame from the SS with $N(S) = N_{SS} - 1$, with A=1. Verify that the MS acknowledges all the frames received so far, including this frame, with an RR.

Maximum duration of the test

5 minutes.

Expected sequence

Step	Direction	Message	Comments
1		{PDP Context Activation}	Macro. Initiate PDP context activation with PDP Context 13.
2			Initiate acknowledged mode data transmission from the SS.
3	SS -> MS	I+S frame	A = 1
A4 (Optional step)	MS -> SS	RNR	If the MS sends an RNR, do not transmit data until it has sent an RR.
4	MS -> SS	RR	
5			Repeat steps 3 to 5 until frames 0 to $N_{SS} - 2$ have been sent. Verify that RR frames are sent to acknowledge frames from $N(S) = 0$ until $N(S) = N_{SS} - 2$.
6	SS -> MS	I+S frame	Send the frame N_{SS} with A=1. Do not send the frame with $N(S) = N_{SS} - 1$.
A7 (Optional step)	MS -> SS	RNR	$N(R) = NSS - 2$. If the MS sends an RNR, do not transmit data until it sends an ACK.
7	MS -> SS	ACK	Verify that an ACK frame is sent to acknowledge the frames $N_{SS} - 2$ and N_{SS}, with $N(R) = N_{SS} - 1$
8	SS -> MS	I+S frame	$N(S) = N_{SS} - 1$, with A=1.
A9 (Optional step)	MS -> SS	RNR	Verify that $N(R) = N_{SS} + 1$
9	MS -> SS	RR	Verify that an RR frame is received to acknowledge frame $N_{SS} - 1$ with $N(R) = N_{SS} + 1$

46.1.2.2.4 Link Reestablishment

46.1.2.2.4.1 Reestablishment due to reception of SABM

46.1.2.2.4.1.1 Conformance requirement

The criteria for re-establishing the ABM mode of operation are defined in this clause by the following conditions:

- the receipt, while in the ABM state, of a SABM;

- the receipt of an LL-ESTABLISH-REQ primitive from layer3

- the occurrence of N200 retransmission failures

- the occurrence of a frame rejection condition; and

- the receipt of an unsolicited DM response with F bit set to 0 while in ABM state.

In Asynchronous Balanced Mode, only I frames contain N(S), the send sequence number of transmitted I frames. At the time that an in-sequence I frame is designated for transmission, the value of N(S) is set equal to the value of the send state variable V(S).

An LLE receiving a SABM command, if it is able to enter the ABM state, shall:

- inform layer 3 using the LL-ESTABLISH-IND primitive;

- if the received SABM command contains a Layer-3 Parameters XID parameter, wait for the receipt of an LL-ESTABLISH-RES primitive from layer 3;

- respond with a UA response with the F bit set to the same binary value as the P bit in the received SABM command (i.e., F=1);

- reset timer T200 if active;

- set V(S), V(R), V(A), and B to 0;

- enter the ABM state;

- clear all existing exception conditions; and

- clear any existing peer receiver busy condition.

Reference

GSM 04.64, clause 8.7.1, clause 6.3.5.4.3, clause 8.5.1.2.

46.1.2.2.4.1.2 Test purpose

To verify whether the MS initiates reestablishment of the link if it receives a SABM while in ABM state.

46.1.2.2.4.1.3 Method of test

Initial conditions

-

Related PICS/PIXIT Statement

-

Test procedure

After establishing a link, initiate data transfer from the MS . After receiving 1frame from the MS, send a SABM from the SS and verify whether the MS responds with a UA. After the link is re-established, verify that the MS resumes data transmission.

Maximum duration of the test

5 minutes.

Expected sequence

Step	Direction	Message	Comments
1		{PDP Context Activation}	Macro. Initiate PDP context establishment from the MS, using PDP Context 12.
2			Initiate acknowledged mode data transfer from the MS.
3	MS -> SS	I + S	Initiate data transfer of 2000 octets from the MS.
4	SS -> MS	RR	Acknowledge one frame.
5	SS -> MS	SABM	After receiving 1 frame from the MS, send a SABM from the SS to re-establish the link.
			Discard all the I+S frames received.
6	MS -> SS	UA	Verify that the MS responds with a UA.
7	MS -> SS	I+S	Verify that that N(S) begins from 0.
8	SS -> MS	RR	Acknowledge the frame sent from the MS.
9			Repeat steps 7 and 8 until all the frames from the MS are transmitted.

46.1.2.2.4.2 Reestablishment due to N200 failures

46.1.2.2.4.2.1 Conformance requirement

The criteria for re-establishing the ABM mode of operation are defined in this clause by the following conditions:

- the receipt, while in the ABM state, of a SABM;

- the receipt of an LL-ESTABLISH-REQ primitive from layer3

- the occurrence of N200 retransmission failures

- the occurrence of a frame rejection condition; and

- the receipt of an unsolicited DM response with F bit set to 0 while in ABM state.

In case of a re-establishment, all NSAPIs mapped to the affected SAPI shall enter the recovery state and all buffered N-PDUs (i.e. the ones whose complete reception has not been acknowledged and the ones that have not been transmitted yet) shall be transmitted starting with the oldest N-PDU when the link is re-established

Reference

GSM 04.64, clause 8.7.1

GSM 04.65, clauses 5.1.2.3, 5.1.2.5, 6.2.1.2

46.1.2.2.4.2.2 Test purpose

To verify whether the MS initiates reestablishment of the link when there is an N200 retransmission failure.

46.1.2.2.4.2.3   Method of test

Initial conditions

-

Related PICS/PIXIT Statement

-

Test procedure

After establishing a link, initiate data transfer from the MS, to send 1 octet of data. Do not acknowledge the data frame sent from the SS. The MS shall retransmit the frame N200 times. Wait for (N200 * T201) seconds and see if the MS initiates link reestablishment by sending a SABM. After the link is re-established verify that the MS resumes data transmission.

Maximum duration of the test

5 minutes.

Expected sequence

Step	Direction	Message	Comments
1		{PDP Context Activation}	Macro.Initiate PDP context activation from the MS using PDP context 11.
2			Initiate acknowledged mode data transfer from the MS.
3	MS -> SS	I + S	Send 1 octet of data. Do not acknowledge this frame from the SS.
4	MS -> SS	I + S	Verify that the MS retransmits the I+S frame N200 times and that it does not send any SABM frames during retransmission. SS does not acknowledge any of these frames.
5	MS -> SS	SABM	Verify that the MS sends a SABM and that it stops sending anymore data to the SS. Verify that this occurs after T201 seconds after the last I+S frame in step 4.
6	SS -> MS	UA	
7	MS -> SS	I+S	Verify that the MS resumes transmission of data from step 2.
8	SS -> MS	RR	Acknowledge the frame transmitted from the MS.

46.1.2.2.4.3   Reestablishment due to reception of DM

46.1.2.2.4.3.1   Conformance requirement

The criteria for re-establishing the ABM mode of operation are defined in this clause by the following conditions:

-   the receipt, while in the ABM state, of a SABM;

-   the receipt of an LL-ESTABLISH-REQ primitive from layer3

-   the occurrence of N200 retransmission failures

-   the occurrence of a frame rejection condition; and

-   the receipt of an unsolicited DM response with F bit set to 0 while in ABM state.

In case of a re-establishment, all NSAPIs mapped to the affected SAPI shall enter the recovery state and all buffered N-PDUs (i.e. the ones whose complete reception has not been acknowledged and the ones that have not been transmitted yet) shall be transmitted starting with the oldest N-PDU when the link is re-established.

Reference

GSM 04.64, clause 8.7.1

GSM 04.65, clauses 5.1.2.3, 5.1.2.5, 6.2.1.2

46.1.2.2.4.3.2   Test purpose

To verify whether the MS initiates reestablishment of the link if it receives a DM while in ABM state.

46.1.2.2.4.3.3   Method of test

Initial conditions

Related PICS/PIXIT Statement

-

Test procedure

After establishing a link, initiate data transfer from the MS . After receiving 1 frame from the MS, send a DM with F=0 from the SS and verify whether the MS responds with a SABM. After the link is re-established, verify that the MS resumes data transmission.

Maximum duration of the test

5 minutes.

Expected sequence

Step	Direction	Message	Comments
1		{PDP Context Activation}	Macro. Initiate PDP context activation from the MS, using PDP context 12.
2			Initiate acknowledged mode data transfer of 8000 octets from the MS.
3	MS -> SS	I + S	
4	SS -> MS	RR	Send RR frames as acknowledgements from the SS.
5			Repeat steps 3 and 4 once.
6	MS -> SS	I+S	
7	SS -> MS	DM	Send a DM with the F bit set to 0 from the SS.
			Discard all the I+S frames received at the SS.
8	MS -> SS	SABM	Verify that the MS re-establishes the link with a SABM
9	SS -> MS	UA	Respond with a UA
10	MS -> SS	I+S	Verify that the MS resumes data transmission , with N(S) set to 0, only for the first frame sent after resumption of transmission.
11	SS -> MS	RR	Acknowledge all frames sent from the MS.
12			Repeat steps 10 and 11 until all the frames from the MS are transmitted.

46.1.2.3 Collision of commands and responses

46.1.2.3.1 Collision of SABM

46.1.2.3.2 Conformance requirement

If the transmitted and received unnumbered commands are SABM commands and a Layer-3 Parameters XID parameter is present in both or in neither, then the SABM command transmitted by the SGSN shall be ignored and treated as not transmitted. The LLE in the SGSN shall send the UA response at the earliest possible opportunity if it is able to enter ABM.

Reference

GSM 04.64 clause 8.5.5.1

46.1.2.3.3 Test purpose

To verify that the MS ignores a SABM command received from the SS when it (the MS) is waiting for a UA response, when a Layer-3 Parameters XID parameter is present in both.

46.1.2.3.3 Method of test

Initial conditions

-

Related PICS/PIXIT Statement

-

Test procedure

Initiate link establishment from the MS by sending a SABM with Layer-3 Parameters XID parameter present. Upon reception of the SABM at the SS, send a SABM with Layer-3 Parameters XID parameter present. Verify that the MS ignores the SABM sent by the SS. Wait for T200 seconds at the SS after receiving the SABM from the MS see if the MS resends the SABM. After reception of the SABM, respond with a UA. Initiate data transmission from the MS. Acknowledge all the frames sent from the MS.

Maximum duration of the test

3 minutes.

Expected sequence

Step	Direction	Message	Comments
1		{PDP Context Activation}	Macro. Initiate PDP context activation from the MS with PDP Context 11.
2	MS -> SS	SABM	Verify that P/F = 1. A layer-3 XID parameter shall be present in the SABM received from the MS.
3	SS -> MS	SABM	Send a SABM with P/F =1 to simulate collision. Send the SABM from the SS with a layer 3 XID parameter.
4	MS -> SS	SABM	Wait for T200 seconds after the reception of SABM at the SS to ensure that the MS resends the SABM.
5	SS -> MS	UA	Send UA from the SS before T200 can expire at the MS.
6	MS -> SS	I + S	Initiate data transfer from the MS.
7	SS -> MS	RR	Send a supervisory frame as acknowledgement. Wait for T201 seconds to ensure that the MS does not retransmit the data.

46.1.2.3.2 Collision of SABM and DISC

46.1.2.3.2.1 Conformance requirement

If the transmitted and received unnumbered commands are a SABM and DISC command, the LLEs shall issue a DM response at the earliest possible opportunity. Upon receipt of a DM response with the F bit set to 1, the LLE shall enter the ADM state and notify layer3 by means of the appropriate primitive.

Reference

GSM 04.64, clause 8.5.5.2

46.1.2.3.2.2 Test purpose

To verify that when the MS receives a DISC after sending a SABM, it shall send a DM response to the SS. Upon reception of a DM response, it shall enter the ADM state.

46.1.2.3.2.3 Method of test

Initial conditions

-

Related PICS/PIXIT Statement

-

Test procedure

Initiate link establishment from the MS by sending a SABM command. Send a DISC command in response to this from the SS. Verify that the MS sends a DM and upon reception of a DM from the SS, it enters the ADM state. Send numbered frames from the SS and verify that the MS does not acknowledge them.

Maximum duration of the test

3 minutes

Expected sequence

Step	Direction	Message	Comments
1		{PDP Context Activation}	Macro. Initiate PDP context activation from the MS using PDP Context 12.
2	MS -> SS	SABM	Verify that P/F = 1.
3	SS -> MS	DISC	Send DISC from the SS before T200 can expire at the MS.
4	MS -> SS	DM	
5	SS -> MS	DM	Send DM with F=1
6	SS -> MS	I+S	Send an I+S frame from the SS.
7	MS -> SS	DM	Verify that the MS does not send an acknowledgement for the I+S frame transmitted and that it sends a DM response

46.1.2.3.3 Collision of SABM and XID commands

46.1.2.3.3.1 Conformance requirement

If the transmitted unnumbered command is a SABM command and the received unnumbered command is an XID command, then the LLE shall ignore the received XID command.

Reference

GSM 04.64 clause 8.5.5.2

46.1.2.3.3.2 Test purpose

To verify that the MS ignores the XID command if it collides with a SABM command.

46.1.2.3.3.3 Method of test

Initial conditions

-

Related PICS/PIXIT Statement

-

Test procedure

When the MS initiates link establishment using a SABM, send an XID command. Verify that the XID command is ignored.

Maximum duration of the test

3 minutes.

Expected sequence

Step	Direction	Message	Comments
1		{PDP Context Activation}	Macro. Initiate PDP context activation from the MS using PDP Context 12.
2	MS -> SS	SABM	Verify that P/F = 1.
3	SS -> MS	XID	Send an XID command without layer3 parameters.
4	MS -> SS	SABM	Wait for T200 seconds at the SS to ensure that the MS does not send an XID response and resends the SABM.
5	SS -> MS	UA	Send UA from the SS before T200 can expire at the MS. Wait for T200 seconds after the transmission of UA to ensure that the MS does not send an XID response.

46.1.2.4 Unsolicited response frames

46.1.2.4.1 Unsolicited DM

46.1.2.4.1.1 Conformance requirement

When a DM response with the F bit set to 0 is received by an LLE, a collision between a transmitted SABM or DISC command and the unsolicited DM response may have occurred.

A DM response with the F bit set to 0 colliding with a SABM or DISC shall be ignored.

An LLE shall ignore a DM response received with F=0 when it is in the Local Establishment state.

Reference

GSM 04.64 clauses 8.5.6 and 8.8.4.

46.1.2.4.1.2 Test purpose

To verify that the MS ignores a DM response sent with F=0 when LLC is in the Local Establishment state.

46.1.2.4.1.3 Method of test

Initial conditions

-

Related PICS/PIXIT Statement

-

Test procedure

Send SABM with P/F =1 from the MS to establish a link. Send a DM response with F=0 from the SS, in response to this. Verify that the MS ignores this DM response and sends SABM after expiry of T200. Respond with UA from the SS after receiving SABM. Send 1 I+S frame from the SS and verify that the MS acknowledges it.

Maximum duration of the test

3 minutes.

Expected sequence

Step	Direction	Message	Comments
1		{PDP Context Activation}	Macro. Initiate PDP context activation from the MS with PDP Context 11.
2	MS -> SS	SABM	Initiate data transfer from the MS. Verify that P/F = 1.
3	SS -> MS	DM	Send a DM response with F=0
4	MS -> SS	SABM	Ensure that the second SABM is sent after T200 seconds.
5	SS -> MS	UA	Send UA from the SS before T200 expires at the MS.
6	SS -> MS	I+S frame	Send one I+S frame from the SS.
A7 (Optional step)	MS -> SS	RNR	Verify that the RNR acknowledges the frame transmitted in step 6.
7	MS -> SS	RR frame	Verify that the MS acknowledges the I+S frame transmitted from the SS.

46.1.2.5 FRMR frames

46.1.2.5.1 Sending FRMR due to undefined command control field

46.1.2.5.1.1 Conformance requirement

The FRMR unnumbered response may be received by an LLE as a report of a frame rejection condition not recoverable by retransmission of the identical frame:

- receipt of a command or response control field that is undefined or not implemented

- receipt of a supervisory or unnumbered frame with incorrect length; or

- receipt of an I frame with an information field that exceeds the maximum established length.

Upon occurrence of a frame rejection condition, the LLME shall issue an LLGMM-STATUS-IND primitive; and the LLE shall:

- discard the frame causing the frame rejection condition;

- transmit a FRMR response frame; and

- if the LLE is in ABM operation, initiate re-establishment

Reference

GSM 04.64, clause 6.4.1.5 and clause 8.8.2

46.1.2.5.1.2 Test purpose

To verify that if the MS receives a frame with a command control field that is not implemented, it sends an FRMR frame and re-establishes the link.

46.1.2.5.1.3 Method of test

Initial conditions

-

Related PICS/PIXIT Statement

-

Test procedure

After establishing a link, initiate data transfer from the MS . After receiving the first frame, send a supervisory frame from the SS to acknowledge the last I+S frame received. In this set the first byte of the S frame control field to 1110 0000. Verify whether the MS sends an FRMR. After the link is re-established, verify that the MS resumes data transmission.

Maximum duration of the test

5 minutes.

Expected sequence

Step	Direction	Message	Comments
1		{PDP Context Activation}	Macro. Initiate PDP context activation from the MS with PDP context 11.
2			Initiate acknowledged mode data transfer of 1 octet from the MS.
3	MS -> SS	I + S	
4	SS -> MS		After receiving the first I+S frame, send a frame, with the contents of the control field as 1110 0000.
5	MS -> SS	FRMR	Verify that the control field of the frame sent in step 4 is sent back in the FRMR response.Verify that the value of V(S) received is 1 . W3 and C/R field shall be set to 1 . W1 and W2 shall be set to 0. W4 shall be set to 1.
6	MS -> SS	SABM	Verify that the MS re-establishes the link with a SABM and that it stops sending anymore data to the SS.
7	SS -> MS	UA	Respond with a UA
8	MS -> SS	I+S	Verify that the MS resumes data transmission, with N(S)=0, for the first frame transmitted
9	SS -> MS	RR	Acknowledge all frames sent from the MS.

46.1.2.5.2   Sending FRMR due to reception of an S frame with incorrect length

46.1.2.5.2.1   Conformance requirement

The FRMR unnumbered response may be received by an LLE as a report of a frame rejection condition not recoverable by retransmission of the identical frame:

-   receipt of a command or response control field that is undefined or not implemented

-   receipt of a supervisory or unnumbered frame with incorrect length; or

-   receipt of an I frame with an information field that exceeds the maximum established length.

Upon occurrence of a frame rejection condition whilst in ABM operation, the LLME shall issue an LLGMM-STATUS-IND primitive; and the LLE shall initiate re-establishment.

Reference

GSM 04.64, clause 6.4.1.5 and clause 8.8.2

46.1.2.5.2.2   Test purpose

To verify that if the MS receives an S frame with incorrect length, it sends an FRMR frame and re-establishes the link.

46.1.2.5.2.3 Method of test

Initial conditions

Related PICS/PIXIT Statement

-

Test procedure

After establishing a link, initiate data transfer from the MS . After receiving 2 frames at the SS, send an RR with incorrect length, from the SS, when an I+S frame with the A bit set is received. Verify whether the MS sends an FRMR. After the link is re-established, verify that the MS resumes data transmission.

Maximum duration of the test

5 minutes.

Expected sequence

Step	Direction	Message	Comments
1		{PDP Context Activation}	Macro. Initiate PDP context activation from the MS with PDP context 12.
2			Initiate acknowledged mode data transfer from the MS.
3	MS -> SS	I + S	Initiate data transfer of 5000 octets from the MS.
4	SS -> MS	RR	Send RR frames as acknowledgements from the SS.
5			Repeat steps 3 and 4 until 2 frames are transmitted.
6	SS -> MS	RR	For one of the I+S frames with an A bit set received at the SS, send an RR from the SS. There shall be an extra octet in this RR frame, before the FCS. The RR frame shall appear as follows: Address field (1 octet) Control field (2 octets) Extra field (1 octet) FCS (3 octets)
7	MS -> SS	FRMR	Verify that the control field of the RR message is sent back in the FRMR response. C/R field shall be set to 0 . W1, W3 and W4 shall be set to 1. The content of W2 shall not be checked.
8	MS -> SS	SABM	Verify that the MS re-establishes the link with a SABM and that it stops sending anymore data to the SS.
9	SS -> MS	UA	Respond with a UA
10	MS -> SS	I+S	Verify that the MS resumes transmission of data.
11	SS -> MS	RR	Acknowledge all frames sent from the MS.
12			Repeat 10 and 11 until all the frames from the MS are transmitted and acknowledged.

46.1.2.5.3 Sending FRMR due to reception of an I frame information field exceeding the maximum length

46.1.2.5.3.1 Conformance requirement

The FRMR unnumbered response may be received by an LLE as a report of a frame rejection condition not recoverable by retransmission of the identical frame:

- receipt of a command or response control field that is undefined or not implemented

- receipt of a supervisory or unnumbered frame with incorrect length; or

- receipt of an I frame with an information field that exceeds the maximum established length.

Upon occurrence of a frame rejection condition whilst in ABM operation, the LLME shall issue an LLGMM-STATUS-IND primitive; and the LLE shall initiate re-establishment.

Reference

GSM 04.64, clause 6.4.15 and clause 8.8.2

46.1.2.5.3.2 Test purpose

To verify that if the MS receives an I frame with an information field that exceeds the maximum established length, it sends an FRMR frame and re-establishes the link.

46.1.2.5.3.3 Method of test

Initial conditions

-

Related PICS/PIXIT Statement

-

Test procedure

After establishing a link, initiate data transfer from the SS . After sending 10 frames from the SS, send an I+S frame with length greater than N201-I, from the SS. Verify whether the MS sends an FRMR. After the link is re- established, send frames from the SS with N(S) = 0 until N(S) = 100. Verify that the MS acknowledges all the data sent.

Maximum duration of the test

5 minutes.

Expected sequence

Step	Direction	Message	Comments
1		{PDP Context Activation}	Macro. Initiate PDP context activation from the MS using PDP context 11,
2			Initiate acknowledged mode data transfer from the SS.
3	SS -> MS	I + S	A = 1
A4 (Optional step)	MS -> SS	RNR	If the MS sends an RNR, do not transmit data until it sends an RR.
4	MS -> SS	RR	Send RR frames as acknowledgements from the MS.
5			Repeat steps 3 and 4 until 10 frames are sent from the SS.
6	SS -> MS	I + S	Send an I+S frame with the information field length greater than N201-I, from the SS .
7	MS -> SS	FRMR	Verify that the control field of the I+S message is sent back in the FRMR response. Also verify that the value of V(R) indicates all the frames sent so far except the erroneous I+S frame have been received. W2 and W4 shall be set to 1. W1, W3 and the C/R field shall be set to 0.
8	MS -> SS	SABM	Verify that the MS re-establishes the link with a SABM .
9	SS -> MS	UA	Respond with a UA
10	SS -> MS	I+S	Send data from the SS.
A11 (Optional step)	MS -> SS	RNR	If the MS sends an RNR , do not transmit data until it has sent an RR.
B11 (Optional step)	MS -> SS	RR	Verify that all the frames sent from the SS are acknowledged.
12			Repeat 10 and 11 until all the frames from the SS are transmitted and acknowledged.

46.1.2.5.4 Frame reject condition during establishment of ABM

46.1.2.5.4.1   Conformance requirement

The FRMR unnumbered response may be received by an LLE as a report of a frame rejection condition not recoverable by retransmission of the identical frame:

- receipt of a command or response control field that is undefined or not implemented

- receipt of a supervisory or unnumbered frame with incorrect length; or

- receipt of an I frame with an information field that exceeds the maximum established length.

Upon occurrence of a frame rejection condition whilst in ABM operation, the LLME shall issue an LLGMM-STATUS-IND primitive; and the LLE shall initiate re-establishment.

Upon occurrence of a frame rejection condition during establishment of or release from ABM operation, or whilst in ADM state, the LLE shall discard the frame.

Reference

GSM 04.64, clause 6.4.15 and clause 8.8.2

46.1.2.5.4.2   Test purpose

To verify that if the MS receives a U frame with its frame type not implemented during ABM establishment, it shall ignore the message.

46.1.2.5.4.3 Method of test

Initial conditions

-

Related PICS/PIXIT Statement

-

Test procedure

Initiate link establishment from the MS by sending a SABM. Send an invalid U frame as response. Wait for T200 seconds and check if the MS resends the SABM. Respond with a UA. Initiate data transfer from the MS and acknowledge all the frames sent from the MS.

Maximum duration of the test

5 minutes.

Expected sequence

Step	Direction	Message	Comments
1		{PDP Context Activation}	Macro. Initiate PDP context activation from the MS using PDP Context 13.
2	MS -> SS	SABM	Initiate acknowledged mode data transfer from the MS. Verify that P/F = 1.
3	SS -> MS	Invalid U frame	Send a U frame with its control field M4 M3 M2 M1 = 0010
4	MS -> SS	FRMR	
5	MS -> SS	SABM	Wait for T200 seconds after the reception of the first SABM, to ensure that the MS resends SABM
6	SS -> MS	UA	
7	MS -> SS	I + S	Initiate data transfer from the MS.
8	SS -> MS	RR	Acknowledge all frames sent from the MS.

46.1.2.6 Multiple Connections

46.1.2.6.1 Simultaneous acknowledged and unacknowledged data transfer on the same SAPI

Applicability

This test is applicable to mobiles which support more than one PDP context simultaneously on the same SAPI.

46.1.2.6.1.1 Conformance requirement

The purpose of LLC is to convey information between layer-3 entities in the MS and SGSN. Specifically, LLC shall support:

- multiple MSs, at the Um interface,

- multiple layer-3 entities within the MS.

Reference

GSM 4.64, clause 4.2.

46.1.2.6.1.2   Test purpose

To verify that LLC supports simultaneous acknowledged and unacknowledged data transfer in the same direction on the same SAPI.

46.1.2.6.1.3   Method of test

Initial conditions

-

Related PICS/PIXIT Statement

-

Test procedure

Initiate acknowledged data transfer from the MS on SAPI 3. Send 1500 K octets continuously. The value of N(S) shall begin from 0 and increment by 1 mod (512) for each frame. Initiate unacknowledged data transfer from the MS on the same SAPI within 1 minute from initiation of the acknowleged data transfer.

Acknowledge all the I frames sent from the SS by sending RR frames to the MS.

Maximum duration of the test

20 minutes.

Expected sequence

Step	Direction	Message	Comments
1		{PDP Context Activation}	Macro. Initiate the first PDP context using PDP context 11.
2			Initiate acknowledged mode data transfer from the MS.
3	MS -> SS	I+S frame	N(S) = 0 for the first frame
A4	SS -> MS	S frame with RR	Send RR only when A bit = 1.
5		{PDP Context Activation}	Macro. Initiate the second PDP context using PDP context 1
6			Initiate unacknowledged mode data transfer of 1000 K octets (using PDP context 1) from the MS within 1 minute from step2.
A7	MS -> SS	I+S frame	
A8	SS -> MS	RR	Send RR only when A bit = 1.
B7	MS -> SS	UI	
9			Repeat from step 7 until 1500 K octets of acknowledged data and 1000 K octets of unacknowledged data are transmitted. I Verify that : The MS does not retransmit any frame. N(S) begins with 0 and is incremented by 1 mod (512) for each transmission N(U) begins with 0 and is incremented by 1 mod (512) for each transmission

46.1.2.6.2   Simultaneous acknowledged and unacknowledged data transfer on different SAPIs

Applicability

This test is applicable to mobiles which support more than one PDP context simultaneously.

46.1.2.6.2.1 Conformance requirement

The purpose of LLC is to convey information between layer-3 entities in the MS and SGSN. Specifically, LLC shall support:

- multiple MSs, at the Um interface,

- multiple layer-3 entities within the MS.

Reference

GSM 4.64, clause 4.2.

46.1.2.6.2.2 Test purpose

To verify that LLC supports simultaneous acknowledged and unacknowledged data transfer on different SAPIs in different directions.

46.1.2.6.2.3 Method of test

Initial conditions

-

Related PICS/PIXIT Statement

-

Test procedure

Initiate unacknowledged data transfer from the MS on SAPI 5. Initiate acknowledged data transfer from the SS on SAPI 3 after the first i frames have been received from the MS. Send 1500K octets continuously from the SS. The value of N(S) shall begin from 0 and increment by 1 mod (512) for each frame.

Verify that the MS acknowledges all the I frames sent from the SS. Verify that the UI frames are received at the SS in sequence.

Maximum duration of the test

15 minutes.

Expected sequence

Step	Direction	Message	Comments
1		{PDP Context Activation}	Macro. Initiate PDP context activation on PDP Contexts 8 and 11 from the MS.
2			Initiate unacknowledged mode data transfer of 1 000 K octets from the MS.
3	MS -> SS	UI frame	
4			Initiate acknowledged mode data transfer of 1500 K octets from the SS.
5	SS -> MS	I+S frame	Start sending I+S frames after i UI frames have been received. Set the A bit to 1 when the window is full and for the last I+S frame.
A6	MS -> SS	UI frame	
B6	MS -> SS	RNR	If the MS sends an RNR, the SS shall resume transmission only after it transmits a SACK, RR or an ACK.
C6	MS -> SS	SACK	The SS shall retransmit the unacknowledged frames.
D6	MS -> SS	ACK	The SS shall retransmit the unacknowledged frames.
E6	MS -> SS	S frame with RR	Verify that the MS acknowledges all the frames sent from the SS.
			The MS may not send any frame if the A bit was not set in step 5.
7			Repeat steps 5 and 6 until all 1500K octets have been transmitted for the acknowledged mode from the SS and 1000 octets for the unacknowledged mode from the SS. Verify that : The MS acknowledges all I+S frames sent. -The MS sends all UI frames in the correct sequence.

46.1.2.7   XID Negotiation

46.1.2.7.1   Negotiation initiated by the SS during ABM, for T200 and N200

46.1.2.7.1.1   Conformance requirement

The negotiation procedure is one-step, i.e., one side shall start the process by sending an XID command, offering a certain set of parameters from the applicable parameter repertoire the sending entity wants to negotiate, proposing values within the allowed range. In return, the other side shall send an XID response, either confirming these requested values, or offering higher or lower ones in their place.

XID frames shall always be used with the P/F bit set to 1.

T200, N200 and N201-U can be negotiated in ADM and ABM.

Reference

GSM 4.64, clause 6.4.1.6

46.1.2.7.1.2   Test purpose

To verify that when the SS initiates XID negotiations with a certain value of T200 and N200, the MS complies with the final negotiated values

46.1.2.7.1.3   Method of test

Initial conditions

-

Related PICS/PIXIT Statement

-

Test procedure

Initiate XID negotiation from the SS, with N200 = 4 and T200 = 10 seconds. The MS will send an XID response. Initiate data transfer from the MS. Send an XID command with layer3 parameters and verify that the MS complies with the values of T200 and N200 that were agreed upon.

Maximum duration of the test

5 minutes.

Expected sequence

Step	Direction	Message	Comments
1		{PDP Context Activation}	Macro. Initiate PDP context activation from the MS for PDP Context 11
2	SS -> MS	XID	XID command with N200 = 4, T200 = 10 seconds. Check if the P/F bit is set to 1.
3	MS -> SS	XID	XID response Check if the P/F bit is set to 1. The values received in this message shall be the negotiated values.
4			Initiate acknowledged mode data transfer of 1 octet from the MS.
5	MS -> SS	I + S	
6			Do not respond with an RR.
7	MS -> SS	I+S	Verify that the MS resends the I+S frame every T200 seconds N200 times.
8	MS -> SS	SABM	Verify that the MS sends a SABM to re-establish the link
9	SS -> MS	UA	Respond with a UA within T200 seconds.

46.1.2.7.2 Negotiation initiated by the SS during ADM, for N201-I

46.1.2.7.2.1 Conformance requirement

The negotiation procedure is one-step, i.e., one side shall start the process by sending an XID command, offering a certain set of parameters from the applicable parameter repertoire the sending entity wants to negotiate, proposing values within the allowed range. In return, the other side shall send an XID response, either confirming these requested values, or offering higher or lower ones in their place.

XID frames shall always be used with the P/F bit set to 1.

N201-I, mD, mU, kD and kU can be negotiated to any value in Range in ADM. In ABM, N201-I, mD, mU, kD and kU can only be negotiated to the same or higher value as previously used.

Reference

GSM 4.64, clause 6.4.1.6

46.1.2.7.2.2 Test purpose

To verify that when the SS initiates XID negotiations with a certain value of N201-I during ADM, the MS complies with the final negotiated values.

46.1.2.7.2.3 Method of test

Initial conditions

-

Related PICS/PIXIT Statement

-

Test procedure

Initiate PDP context activation from the MS and in the UA response from the SS send a value of 140 for N201-I .. If the MS responds with an XID command, in the XID response, give N201-I = 140.

Initiate data transfer from the SS. Send an I+S frame of length N201-I with the A bit set to 1. Verify that the MS acknowledges this I+S frame.

The next I+S frame sent from the SS shall be of length N201-I +1. Verify that the MS sends FRMR and re-establishes the link.

Maximum duration of the test

5 minutes.

Expected sequence

Step	Direction	Message	Comments
1		{PDP Context Activation}	Macro. Initiate PDP context activation from the MS using PDP Context 11.
2	MS -> SS	SABM	
3	SS -> MS	UA	Set N201-I = 140 in the UA sent. If the MS sends an XID command with a different value of N201-I, send back a response with N201-1 = 140. If the MS sends an XID command, respond with a value of N201-I = 140.
4	SS -> MS	I+S	Send an I+S frame from the SS with length N201-I with the A bit set to 1.
A5 (optional step)	MS -> SS	RNR	If the MS sends an RNR, verify that the RNR acknowledges the frame sent in step 3. Do not transmit the next I+S frame to the SS until the MS sends an RR.
5	MS -> SS	RR	Verify that the MS responds with an RR.
6	SS -> MS	I+S	The length of this I+S frame shall be N201-I + 1. Set the A bit to 1.
7	MS -> SS	FRMR	Verify that the control field of the I+S message is sent back in the FRMR response. Also verify that the value of V(R) indicates all the frames sent so far except the erroneous I+S frame have been received. W2 and W4 shall be set to 1. W1, W3 and the C/R field shall be set to 0.
8	MS -> SS	SABM	Verify that the MS re-establishes the link with a SABM.
9	SS -> MS	UA	Respond with a UA within T200 seconds.

46.1.2.7.3 Negotiation initiated by the SS (using SABM, for IOV-I)

46.1.2.7.3.1 Conformance requirement

The negotiation procedure is one-step, i.e., one side shall start the process by sending an XID command, offering a certain set of parameters from the applicable parameter repertoire the sending entity wants to negotiate, proposing values within the allowed range. In return, the other side shall send an XID response, either confirming these requested values, or offering higher or lower ones in their place.

XID frames shall always be used with the P/F bit set to 1.

LLC layer and layer-3 parameters may be negotiated with the exchange of XID frames or with the exchange of SABM and UA frames. After successful negotiations of SABM and UA frames, the LLE shall be in ABM mode of operation

IOV-I shall only be negotiated with SABM and UA frames. IOV-UI and IOV-I shall only be transmitted in the downlink direction.

Reference

GSM 4.64, clause 6.4.1.6, 8.5.3

46.1.2.7.3.2   Test purpose

To verify that when the SS sends IOV-I to the MS in a SABM, the MS shall cipher its output using this value of IOV-I.

46.1.2.7.3.3   Method of test

Initial conditions

The MS shall be GPRS attached with ciphering enabled.

Related PICS/PIXIT Statement

-

Test procedure

Initiate link establishment from the SS. In the SABM command, send a new value of IOV-I, different from the default used. Send 1000 octets from the MS and verify that the frames have been ciphered as per the new value of IOV-I.

Maximum duration of the test

5 minutes.

Expected sequence

Step	Direction	Message	Comments
1		{PDP Context Activation}	Macro. Initiate PDP context activation from the SS using PDP Context 11.
2		{PDP Context Modification}	Macro. Initiate PDP context modification to PDP Context 13 from the SS.
3	SS -> MS	SABM	With IOV-I = $2^{27} * 10$.
4	MS -> SS	UA	
5	MS -> SS	I+S	Initiate data transfer from the MS. Send 1000 octets.
6	SS -> MS	RR	Verify that ciphering is as per the new value of IOV-I. The SS shall check this by analyzing the FCS. Acknowledge all the I+S frames.
7	SS -> MS	I + S	Initiate data transfer from the SS. Send 1 I+S frame with A=1
A8	MS -> SS	RNR	Verify that the MS acknowledges the frame sent in step 7.
B8	MS -> SS	RR	Verify that the MS acknowledges the frames.

46.1.2.7.4   Negotiation initiated by the SS (during ADM, for N201-U)

46.1.2.7.4.1   Conformance requirement

The negotiation procedure is one-step, i.e., one side shall start the process by sending an XID command, offering a certain set of parameters from the applicable parameter repertoire the sending entity wants to negotiate, proposing

values within the allowed range. In return, the other side shall send an XID response, either confirming these requested values, or offering higher or lower ones in their place.

XID frames shall always be used with the P/F bit set to 1.

T200, N200 and N201-U can be negotiated in ADM and ABM.

N201-U is used for U and UI frames.

Reference

GSM 4.64, clause 6.4.1.6, clause 8.9.5

46.1.2.7.4.2 Test purpose

To verify that when the SS initiates XID negotiations with a certain value of N201-U during ADM, the MS complies with the final negotiated values.

46.1.2.7.4.3 Method of test

Initial conditions

-

Related PICS/PIXIT Statement

-

Test procedure

Initiate XID negotiation from the SS, with N201-U = 140. The MS shall send an XID response. The value of N201-U in the XID response shall be regarded as the final negotiated value.

Initiate data transfer from the MS. Verify that the length of the UI frames sent from the MS never exceeds the negotiated value of N201-U.

Maximum duration of the test

5 minutes.

Expected sequence

Step	Direction	Message	Comments
1		{PDP Context Activation}	Macro. Initiate PDP context activation from the MS using PDP Context 9.
2	SS -> MS	XID	XID command with N201-U = 140
3	MS -> SS	XID	XID response. The value of N201-U shall be regarded as the negotiated value.
4			Initiate unacknowledged data transfer of 1000 octets from the MS.
5	MS -> SS	UI	Verify that the frame length does not exceed the negotiated value of N201-U.
6			Repeat step 5 until 1000 octets have been sent from the MS.

46.1.2.7.5 Negotiation initiated by the SS (during ADM, for IOV-UI)

46.1.2.7.5.1 Conformance requirement

The negotiation procedure is one-step, i.e., one side shall start the process by sending an XID command, offering a certain set of parameters from the applicable parameter repertoire the sending entity wants to negotiate, proposing values within the allowed range. In return, the other side shall send an XID response, either confirming these requested values, or offering higher or lower ones in their place.

XID frames shall always be used with the P/F bit set to 1.

IOV-UI shall only be negotiated in ADM, and only before ciphering is enabled. IOV-UI and IOV-I shall only be transmitted in the downlink direction.

IOV-UI is associated with a TLLI.

Reference

GSM 4.64, clauses 6.4.1.6, 8.5.3, 8.9

GSM 4.08 clause 4.7.12

46.1.2.7.5.2 Test purpose

To verify that when the SS sends IOV-UI to the MS in an XID command, before ciphering is enabled,

- The MS shall cipher its output using this value of IOV-UI.

- This value of IOV-UI shall be applicable for all SAPIs using this TLLI.

- Identity Response sent from the MS shall not be ciphered.

46.1.2.7.5.3 Method of test

Initial conditions

-

Related PICS/PIXIT Statement

-

Test procedure

Send a value of IOV-UI from the SS, different from the default used. Send 1000 octets from the MS and verify that the frames have been ciphered as per the new value of IOV-UI.

Send 1000 octets from the MS on SAPI 11. Verify that the frames have been ciphered as per the new value of IOV-UI.

Maximum duration of the test

3 minutes.

Expected sequence

Step	Direction	Message	Comments
1		{PDP Context Activation}	Macro. Initiate a PDP context activation from the MS using PDP Context 10.
2	SS -> MS	XID	XID command with IOV-UI = 5000.
3	MS -> SS	XID	Verify that the MS accepts this value of IOV-UI by sending an XID response. Verify the XID response received. If the MS has requested for a new set of XID parameters, verify that the values requested are within range.
4	SS -> MS	UI [Authentication and Ciphering Request]	Send the Authentication and Ciphering Request from the SS to start ciphering.
5	MS -> SS	UI [Authentication and Ciphering Response]	
6			Initiate unacknowedged data transfer of 1000 octets from the MS.
7	MS -> SS	UI	Verify that these frames have been ciphered as per the new value of IOV-UI.
8	SS -> MS	UI [Identity Request]	This UI frame must not be sent ciphered.
9	MS -> SS	UI [Identity Response]	This UI frame shall not be ciphered. The E bit shall not be set to 1.
10		{PDP Context Dectivation}	Macro. Deactivate PDP Context 10.
11		{PDP Context Activation}	Macro. Activate PDP Context 9.
12			Initiate a data transfer of 50 octets from the MS on SAPI 11 for the same value of TLLI as before.
13	MS -> SS	UI	Verify that ciphering is as per the new value of IOV-UI.

46.1.2.7.6 Negotiation initiated by the SS (during ABM, for Reset)

Send Reset during unacknowledged mode data transfer and check if N(S) begins from 0.

Applicability

This test is applicable to only those mobiles which can support more than one PDP context simultaneously.

46.1.2.7.6.1 Conformance requirement

The negotiation procedure is one-step, i.e., one side shall start the process by sending an XID command, offering a certain set of parameters from the applicable parameter repertoire the sending entity wants to negotiate, proposing values within the allowed range. In return, the other side shall send an XID response, either confirming these requested values, or offering higher or lower ones in their place.

XID frames shall always be used with the P/F bit set to 1.

Reset shall only be negotiated with an XID frame, and only transmitted in the downlink direction. If Reset is present in an XID frame, it shall be the first parameter in the XID information field.

The Reset parameter shall be used, in the SGSN originating Reset and the MS receiving Reset, to:

- set all LLC layer parameters to the default values given in Table 9;

- change any LLEs in ABM state to ADM state;

- set the unconfirmed state variable V(U) to value 0;

- set the unconfirmed receive state variable V(UR) to 0;

- set the OCs for unacknowledged information transfer to 0.

The Reset parameter shall be treated before any additional XID parameters present in the same XID frame.

Reference

GSM 4.64, clause 6.4.1.6, 8.5.3.1

46.1.2.7.6.2 Test purpose

To verify that when the SS sends the Reset parameter to the MS in an XID,

- It sets all LLC layer parameters to the default values

- change any LLEs in ABM state to ADM state;

- set the unconfirmed state variable V(U) to value 0;

- set the unconfirmed receive state variable V(UR) to 0;

- set the OCs for unacknowledged information transfer to 0.

46.1.2.7.6.3 Method of test

Initial conditions

The System Simulator shall support two cells, each in a different SGSN Routing Area.

Related PICS/PIXIT Statement

-

Test procedure

For this test case, $N_{MS} = N_{SS} = 200$.

Initiate unacknowledged data transfer from the MS. Send N_{MS} UI frames.

Initiate unacknowledged data transfer from the SS. Send N_{SS} UI frames.

During PDP context activation for Context 11, initiate XID negotiation from the SS, with N200 = 4 and T200 = 10. Initiate data transfer from the MS. Do not acknowledge the first frame sent from the MS and verify that the MS complies with the values of T200 and N200 that were agreed upon.

Initiate inter-SGSN Routing Area Update from the MS, which will make the SS send an XID command with the Reset parameter. Send I+S frames from the MS, with the A bit set to 1. Do not acknowledge the first I+S frame. Verify that the MS sends the I+S frame N200 times, every T201 seconds. Verify that the values of N200 and T201 are the default values.

Initiate unacknowledged data transfer from the MS for the same SAPI and for the same TLLI used before sending Reset from the SS. Verify that the frames are numbered from 0 and not from $N_{MS} + 1$. Verify that the frames can be decrypted using OC = 0.

Initiate unacknowledged data transfer from the SS for the same SAPI and for the same TLLI used before sending Reset from the SS. The first frame shall have its sequence number set to N_{SS}. Verify that the MS does not discard these frames.

Maximum duration of the test

3 minutes.

Expected sequence

Step	Direction	Message	Comments
1		{PDP Context Activation}	Macro. Initiate PDP context activation from the MS using PDP Context 9.
2	MS -> SS	UI frame	
3			Repeat step 2 until N_{MS} frames are sent.
4	SS -> MS	UI frame	
5			Repeat step 4 until N_{SS} frames are sent.
6		{PDP Context Activation}	Macro. Initiate PDP context activation from the MS for PDP Context 11.
7	MS -> SS	SABM	
8	SS -> MS	UA	Send N200 = 4, T200 = 10 seconds in the UA response. If the MS sends an XID command, respond accepting the proposed values.
9			Initiate acknowledged mode data transfer of 1 octet from the MS.
10	MS -> SS	I + S	
11			Do not respond with an RR..Verify that the MS retransmits the I+S frame N200 times every T200 seconds.
13	MS -> SS	SABM	Verify that the MS sends a SABM to re-establish the link
14	SS -> MS	UA	Respond with a UA within T200 seconds.
15		{Inter-SGSN Routing Area Update}	Macro. Initiate Inter-SGSN Routing Area Update from the MS. (This procedure sends XID reset). The MS shall reselect the new cell and do a Routing Area Update with the new SGSN.
16	SS->MS	SABM	
17	MS-> SS	UA	
18	MS -> SS	I + S	Resume data transfer from the MS.
19			Do not respond with an RR from the SS. Check that the MS retransmits the frame after T201 seconds, N200 times. T201 and N200 shall be as per the values negotiated, if any, after link re-establishment and not as per the values of N200 and T200 negotiated before sending a Reset, in step 8.
20	MS -> SS	SABM	Verify that the MS sends a SABM to re-establish the link
21	SS -> MS	UA	Respond with a UA within T200 seconds.
22	MS -> SS	UI	Initiate unacknowledged data transfer from the MS and send 50 octets for the same SAPI and for the same TLLI used before sending Reset from the SS. Verify that These frames have been ciphered with OC = 0. These frames are numbered from 0 and not from N_{MS}.

46.1.2.7.7 XID command with unrecognised type field

46.1.2.7.7.1 Conformance requirement

If a SABM or XID command with an invalid XID information field is received, then the SABM or XID command, respectively, shall be ignored.

If a SABM or XID command with unrecognised type field is received, then this parameter shall be ignored.

Reference

GSM 4.64, clause 8.5.3.3

46.1.2.7.7.2 Test purpose

To test the MS response to an XID command with an unrecognised type field.

46.1.2.7.7.3 Method of test

Initial conditions

-

Related PICS/PIXIT Statement

-

Test procedure

Send an XID frame from the SS with N200 = 5 and another parameter with type = 15. Verify that the MS responds with an XID response. Send an I+S frame from the MS with the A bit set to 1. Do not respond with an RR. Verify that the MS retransmits the I+S frame N200 times, every T201 seconds, with N200 taking the negotiated value.

Maximum duration of the test

3 minutes.

Expected sequence

Step	Direction	Message	Comments
1		{PDP Context Activation}	Macro. Initiate a PDP context from the MS using PDP Context 11.
2	SS -> MS	XID	Send an XID command with N200 = 5 and an XID parameter with its type = 15, length =4 and value = 1500.
3	MS -> SS	XID	Verify the XID response received. If the MS has requested for a new XID value, verify tha the new values are within range the sense of negotiation is correct The values received in the XID response shall be regarded as the final negotiated values.
4			Initiate acknowledged mode data transfer of 1 octet from the MS.
5	MS -> SS	I+S	Initiate data transfer from the MS. Send an I+S frame from the MS with the A bit set to 1. Do not acknowledge the frame from the SS. Verify that The MS sends an I+S frame every T201 seconds, N200 times.
6	MS -> SS	SABM	Verify that the MS re-establishes the link by sending a SABM, after all retransmissions are complete.
7	SS -> MS	UA	Respond with a UA

46.1.2.7.8 XID Response with out of range values

46.1.2.7.8.1 Conformance requirement

If UA or XID response with an invalid XID information field is received, then the UA or XID response shall be ignored, the SABM or XID command shall be retransmitted, and the retransmission counter shall be incremented.

Reference

GSM 4.64, clause 8.5.3.3

46.1.2.7.8.2   Test purpose

To test the MS response to an XID response with the N201-I value out of range.

46.1.2.7.8.3   Method of test

Initial conditions

-

Related PICS/PIXIT Statement

-

Test procedure

Send an XID frame within SABM , from the MS with layer3 parameters. Respond from the SS with an XID, with N201-I = 1600. Verify that the MS ignores this response and resends the SABM with the XID command. Now accept the XID values received at the SS. Send an I+S frame with length less than N201-I and the A bit set to 1 and verify that the MS responds with an RR. Send an I+S frame from the SS with its length larger than the maximum negotiated value of N201-I and verify that the MS sends an FRMR and re-establishes the link.

Maximum duration of the test

3 minutes.

Expected sequence

Step	Direction	Message	Comments
1		{PDP Context Activation}	Macro. Initiate PDP context activation from the MS, using PDP context 11.
2	MS -> SS	SABM[XID]	XID command with layer3 parameters, sent with SABM.
3	SS -> MS	UA[XID]	Send an XID response in UA, with N201-I = 1600
4	MS -> SS	SABM[XID]	Verify that the MS resends the SABM command.
5	SS -> MS	UA[XID]	Send UA accepting all the XID values.
6	SS -> MS	I+S	Send an I+S frame with the maximum negotiated value of N201-I, with the A bit set to 1.
7	MS -> SS	RR	Verify that the MS responds with an RR
8	SS -> MS	I+S	Send an I+S frame with length = N201 – I + 1, with the A bit set to 1.
9	MS -> SS	FRMR	Verify that the MS responds with an FRMR
10	MS -> SS	SABM	Verify that the MS initiates link re-establishment
11	SS -> MS	UA	Respond with a UA.

46.2   SNDCP Tests

This clause contains the test case requirements for Subnetwork Dependent Convergence Protocol(SNDCP) procedures in the General Packet Radio Service (GPRS).

46.2.1   Default Conditions

-   The MS default initial condition is that it is GPRS attached.

-   Data and header compression are off .

The N-PDU size shall be more than the negotiated values of N201-U and N201-I so that segmentation at SNDCP is ensured.Unless stated otherwise, the default conditions shall apply.

If the MS sends an XID command with XID parameters any time before a data transfer, the SS shall send an XID response, accepting the values proposed by the MS.

46.2.2 Test cases

46.2.2.1 Data transfer

46.2.2.1.1 Mobile originated normal data transfer with LLC in acknowledged mode

46.2.2.1.1.1 Conformance requirement

The SNDCP entity shall initiate acknowledged data transmission only if the PDP context for the NSAPI identified in the SN-DATA.request has been activated and if acknowledged LLC operation has been established.

The N-PDU number in acknowledged mode is a number assigned to each N-PDU received by SNDCP through an SN-DATA.request. N-PDU numbers for different NSAPIs shall be assigned independently. The N-PDU number shall be included in the SNDCP header of the first segment of an N-PDU.

Upon reception of an SN-DATA.request, the SNDCP entity shall assign to the N-PDU received the current value of the Send N-PDU number as the N-PDU number, increment the Send N-PDU number by 1, perform the compression and segmentation functions, then forward the SN-PDU(s) in LL-DATA.request to the LLC layer. The N-PDU shall be stored into a buffer in the SNDCP entity. The buffered N-PDU shall be deleted when the SN-DATA PDU carrying the last segment of the N-PDU is confirmed by an LL-DATA.confirm primitive.

A (possibly compressed) N-PDU shall be segmented into one or more SN-PDUs. The length of each SN-PDU shall not be greater than N201-I (for acknowledged mode) or N201-U (for unacknowledged mode).

Reference

GSM 04.65, section 6.9.1, 6.7.1.1.

46.2.2.1.1.2 Test purpose

To verify that

- The MS sends the N-PDU number in the first segment of every N-PDU.

- The MS increments the N-PDU number properly.

- The size of a segment must not be greater than N201-I.

46.2.2.1.1.3 Method of test

Initial conditions

-

Related PICS/PIXIT Statement

-

Test procedure

Activation of PDP context 13 is initiated from MS.

Verify that the first segment of the first N-PDU received has N-PDU number 0. Acknowledge all the segments received from the MS. For the subsequent N-PDUs received, verify that the N-PDU number is incremented properly.

Repeat the test case for PDP contexts 11 and 12.

Maximum duration of the test

3 minutes.

Expected sequence

Step	Direction	Message	Comments
1		{PDP Context Activation}	Macro. Initiate PDP context activation from the MS. The PDP context used here is PDP context 13.
2			Initiate data transfer of 5000 octets from the MS .
3	MS -> SS	SN-DATA PDU	Verify that the number of octets in the SN-DATA PDU does not exceed N201-I. Verify that the first SN-DATA PDU received has M=1, T=0, F=1, X = 0, DCOMP = PCOMP = 0,N-PDU number = 0.
4			Verify that the last segment of every N-PDU received has M=0, T=0, and F=0.
5			Verify that for the subsequent N-PDUs, the N-PDU number is incremented properly
6			Repeat step 3 to 5 until 5000 octets are sent.
7			Repeat the test case for SAPIs 3 and 9.The PDP context used for SAPI 3 is PDP Context 11 and the one for SAPI 9 is PDP Context 12.

46.2.2.1.2 Mobile originated normal data transfer with LLC in unacknowledged mode

46.2.2.1.2.1 Conformance requirement

The SNDCP entity shall initiate unacknowledged data transmission only if the PDP context for the NSAPI identified in the SN-DATA.request has been activated. The SNDCP entity may initiate unacknowledged data transmission even if the acknowledged peer-to-peer operation is not established for that NSAPI. The N-PDU number in unacknowledged mode is a number assigned to each N-PDU received by SNDCP through an SN-UNITDATA.request. N-PDU numbers for different NSAPIs shall be assigned independently. The N-PDU number shall be included in the SNDCP header of every SN-UNITDATA PDU.

A variable, the Send N-PDU number (unacknowledged), shall be maintained for each NSAPI using unacknowledged peer-to-peer LLC operation. When an NSAPI using unacknowledged peer-to-peer LLC operation is activated, the Send N-PDU number (unacknowledged) shall be set to 0. The Send N-PDU number (unacknowledged) shall also be set as described in subclauses 5.1.2.1 and 5.1.2.22. Modulo 4096 operation shall be applied to the Send N-PDU number (unacknowledged).

Upon reception of an SN-UNITDATA request, the SNDCP entity shall assign the current value of the Send N-PDU number (unacknowledged) as the N-PDU number of the N-PDU received, increment Send N-PDU number (unacknowledged) by 1, compress and segment the information, then forward the SN-PDU(s) in LL-UNITDATA.request to the LLC layer. The N-PDU shall be deleted immediately after the data has been delivered to the LLC layer.

A (possibly compressed) N-PDU shall be segmented into one or more SN-PDUs. The length of each SN-PDU shall not be greater than N201-I (for acknowledged mode) or N201-U (for unacknowledged mode).

Reference

GSM 04.65, section 6.9.2, 6.7.1.1.

46.2.2.1.2.2 Test purpose

To verify that

- The MS sends the N-PDU number in every segment of every N-PDU.

- The MS increments the N-PDU number and segment number properly.

- The size of a segment shall not be greater than N201-U.

46.2.2.1.2.3 Method of test

Initial conditions

-

Related PICS/PIXIT Statement

-

Test procedure

PDP context 10 is initiated from MS.

Verify that the first segment of the first N-PDU received has N-PDU number 0. For the subsequent N-PDUs received, verify that the N-PDU number is incremented properly.

Maximum duration of the test

2 minutes.

Expected sequence

Step	Direction	Message	Comments
1		{PDP Context Activation}	Macro. Initiate PDP context activation from the MS. The PDP context used here is PDP context 10.
2			Initiate data transfer of 5000 octets from the MS.
3	MS -> SS	SN-UNITDATA PDU	Verify that the number of octets in the SN-UNITDATA PDU does not exceed N201-U. Verify that the first SN-UNITDATA PDU received has M=1, T=1, F=1, X = 0, DCOMP = PCOMP = 0, N-PDU number = 0, segment = 0.
4			Verify that the segment number is incremented properly for every SN-PDU. Verify that the last segment of every N-PDU received has M=0, T=1, and F=0.
5			Verify that for the subsequent N-PDUs, the N-PDU number is incremented properly and N-PDU number is present in every SN-UNITDATA PDU
6			Repeat step 3 to 5 until 5000 octets are sent.

46.2.2.1.3   Usage of acknowledged mode for data transmission before and after PDP Context modification, on different SAPIs

46.2.2.1.3.1   Conformance Requirement

Upon reception of the SNSM-MODIFY.indication from the SM sublayer:

- the SNDCP entity shall, if necessary, establish the acknowledged peer-to-peer LLC operation for the indicated SAPI (the establishment criteria and procedure are described in subclause 6.2.1);

the SNDCP entity shall also, if necessary, release the acknowledged peer-to-peer LLC operation for the originally-assigned SAPI (the release criteria and procedure are described in subclause 6.2.2); In addition, if the newly-assigned SAPI is different from the original SAPI:

- LL-DATA.indication, LL-DATA.confirm and LL-UNITDATA.indication received on the old SAPI shall be ignored;

- LL-DATA.request and LL-UNITDATA.request shall be sent on the new SAPI; and

- if acknowledged peer-to-peer LLC operation is used both before and after the receipt of the SNSM-MODIFY. indication, then all buffered N-PDUs (i.e., the ones whose complete reception has not been acknowledged and the ones that have not been transmitted yet) shall be transmitted starting from the oldest N-PDU.

Reference

GSM 04.65, section 5.1.2.23.

46.2.2.1.3.2 Test purpose

To verify that after the PDP context modification,

- the MS resumes acknowledged data transfer correctly with the oldest N-PDU which is buffered after a PDP context modification.

46.2.2.1.3.3 Method of test

Initial conditions

-

Related PICS/PIXIT Statement

-

Test procedure

PDP Context 11 is initiated from MS.

After the first N-PDU is correctly received in acknowledged mode, the last segment of the second N-PDU (N-PDU number=1) is not acked and a PDP context modification is initiated from SS to PDP context 12, ie: using SAPI 9 in acknowledged mode.

After the modification procedure is complete, the first SN-DATA PDU received shall have the N-PDU number 1. The N-PDU received shall be the same as the last one before the modification procedure was triggered.

Maximum duration of the test

2 minutes.

Expected sequence

Step	Direction	Message	Comments
1		{PDP Context Activation}	Macro. Initiate PDP context activation from the MS. Use PDP context 11.
2			Initiate acknowledged data transfer for 5000 octets, from the MS.
3	MS -> SS	SN-DATA PDU	Verify that the number of octets in the SN-DATA PDU does not exceed N201-I. Verify that the first SN-DATA PDU received has M=1, T=0, F=1, X = 0, DCOMP = PCOMP = 0, N-PDU number = 0.
4			Verify that the last segment of the first N-PDU received has M=0, T=0, and F=0.
5			Receive the next N-PDU, N-PDU = 1 by following steps 3 and 4. Do not acknowledge the last segment of the N-PDU.
6		{PDP Context Modification}	Macro. Initiate PDP context modification procedure from the SS. Use PDP context 12 (ie: using SAPI 9 in acknowledged mode)
7	SS->MS	DISC	Initiate the release of LLC link by sending DISC on SAPI 3 and receive UA from MS.
8	MS->SS	UA	
9	SS->MS	SABM	Initiate the establishment of LLC link by sending SABM on SAPI 9 and receive UA from MS.
10	MS->SS	UA	
11	MS -> SS	SN-DATA PDU	Verify that the number of octets in the SN-DATA PDU does not exceed N201-I. Verify that the first SN-DATA PDU received has M=1, T=1, F=1, X = 0, DCOMP = PCOMP = 0, N-PDU number = 0. Verify that the N-PDU received has N-PDU number = 1.
12			Verify that the last segment of every N-PDU received has M=0, T=0, and F=0.
13			Verify that for the subsequent N-PDUs, the N-PDU number is incremented properly
14			Repeat steps 11 to 13 until 5000 octets are sent.

46.2.2.1.4 Reset indication during unacknowledged mode

46.2.2.1.4.1 Conformance Requirement

Upon receipt of the LL-RESET.indication, the SNDCP layer shall:

- reset all SNDCP XID parameters to their default values;

- in the MS, for every NSAPI using unacknowledged peer-to-peer LLC operation, set the Send N-PDU number (unacknowledged) to 0

Reference

GSM 04.65, section 5.1.2.1.

46.2.2.1.4.2 Test purpose

To verify that the MS resets the Send N-PDU number to 0 on link reset during an unacknowledged mode data transfer.

46.2.2.1.4.3 Method of test

Initial conditions

-

Related PICS/PIXIT Statement

-

Test procedure

PDP Context 10 is initiated from MS.

An XID command is sent with reset from SS during unacknowledged data transfer, after receiving N-PDU number 5 from MS. The next N-PDU number from MS shall be 0.

Maximum duration of the test

2 minutes.

Expected sequence

Step	Direction	Message	Comments
1		{PDP Context Activation}	Macro. Initiate PDP context activation from the MS. Use PDP context 10.
2			Initiate unacknowledged data transfer for 5000 octets, from the MS.
3	MS -> SS	SN-UNITDATA PDU	Verify that the number of octets in the SN-UNITDATA PDU does not exceed N201-U. Verify that the first SN-UNITDATA PDU received has M=1, T=1, F=1, X = 0, DCOMP = PCOMP = 0, N-PDU number = 0, sequence number = 0.
4			Verify that the last segment of the first N-PDU received has M=0, T=1, and F=0.
5			Receive the N-PDUs from the MS until N-PDU number becomes 5
6	SS->MS	XID	Initiate the XID command from SS with reset
7	MS->SS	XID	XID response
8	MS -> SS	SN-UNITDATA PDU	Verify that the number of octets in the SN-UNITDATA PDU does not exceed N201-U. Verify that the first SN-UNITDATA PDU received after link reset has M=1, T=1, F=1, X = 0, DCOMP = PCOMP = 0, N-PDU number = 0, segment number = 0. Verify that the last segment of every N-PDU received has M=0, T=1, F=0
9			Repeat step 8 until 5000 octets are sent.

46.2.2.1.5 Reset indication during acknowledged mode

46.2.2.1.5.1 Conformance Requirement

Upon receipt of the LL-RESET.indication, the SNDCP layer shall:

- reset all SNDCP XID parameters to their default values;

- for every NSAPI using acknowledged peer-to-peer LLC operation, enter the recovery state and suspend the transmission of SN-PDUs until an SNSM-SEQUENCE.indication primitive is received for the NSAPI.

Reference

GSM 04.65, section 5.1.2.1.

46.2.2.1.5.2 Test purpose

To verify that the MS suspends the data transfer in acknowledged mode on link reset and resume when indicated by the SS.

46.2.2.1.5.3 Method of test

Initial conditions

Two cells , cell A and B need to be supported.B is in a routing area (in a new SGSN) and location area different from that of A. The power level of cell A shall be higher than that of cell B so that the MS selects cell A.

Related PICS/PIXIT Statement

-

Test procedure

PDP Context 13 is initiated from MS.

Acknowledge the first 3 N-PDUs received from MS during the data transfer.

Initiate an inter SGSN Routing Area Update procedure from MS.. An XID command is sent with reset from SS, after receiving N-PDU number N from MS. Specify the Receive N-PDU number to be 5 in the Routing Area Update Accept message. Verify that the data transfer is resumed and the MS sends the next N-PDU with N-PDU number 5. The MS shall not send the buffered N-PDU with N-PDU number 4.

Maximum duration of the test

2 minutes.

Expected sequence

Step	Direction	Message	Comments
1		{PDP Context Activation}	Macro. Initiate PDP context activation from the MS. Use PDP context 13.
2			Initiate acknowledged data transfer for 5000 octets, from the MS.
3	MS -> SS	SN-DATA PDU	Verify that the number of octets in the SN-DATA PDU does not exceed N201-I. Verify that the first SN-DATA PDU received has M=1, T=0, F=1, X = 0, DCOMP = PCOMP = 0,N-PDU number = 0.
4			Verify that the last segment of the first N-PDU received has M=0, T=0, and F=0.
5			Receive the N-PDUs from the MS until N-PDU number becomes 3 and acknowledge all the segments completely.
6			Receive the N-PDUs 4 and 5 from the MS and do not acknowledge.
7		{Inter-SGSN Routing Area Update}	Macro.Initiate a cell change requesting the MS to move to cell B. Initiate an inter SGSN Routing Area Update procedure from SS. Send the Receive N-PDU number as 5 in the Routing Area Update Accept message.
8	SS->MS	SABM	
9	MS->SS	UA	
10	MS -> SS	SN-DATA PDU	Verify that the number of octets in the SN-DATA PDU does not exceed N201-I. Verify that the first segment of the SN-DATA PDU received has M=1, T=0, F=1, X = 0, DCOMP = PCOMP = 0,N-PDU number = 5
11			Repeat steps 3 to 5 until 5000 octets are sent.

Note: This test assumes that the LLC layer in the MS has sufficient window size to support two outstanding N-PDUs.

46.2.2.2 Segmentation

46.2.2.2.1 LLC link re-establishment on receipt of SN-DATA PDU with F=0 in ack mode in the Receive First Segment state

46.2.2.2.1.1 Conformance Requirement

Receive First Segment state

- If an SN-DATA PDU is received with the F bit set to 0, the SN-DATA PDU shall be discarded, and the acknowledged LLC operation shall be re-established for the SAPI used.

Reference

GSM 04.65, section 6.7.4.1.

46.2.2.2.1.2 Test purpose

To verify that the MS re-establishes the LLC SAPI on receipt of an SN-DATA PDU with F=0 as the first segment in the acknowledged mode data transfer

46.2.2.2.1.3 Method of test

Initial conditions

-

Related PICS/PIXIT Statement

-

Test procedure

PDP Context 13 is initiated from MS.

An acknowledged mode data transfer is started from SS with the first SN_DATA PDU with F=0.

Verify that the MS shall re-establish the LLC SAPI 11.

Maximum duration of the test

2 minutes.

Expected sequence

Step	Direction	Message	Comments
1		{PDP Context Activation}	Macro. Initiate PDP context activation from the MS. Use PDP context 13.
2			Initiate acknowledged data transfer for 5000 octets, from the SS.
3	SS -> MS	SN-DATA PDU	Send the first SN-DATA PDU with M=1, T=0, F=0, X = 0, DCOMP = PCOMP = 0, N-PDU number = 0 .
4	MS->SS	SABM	MS re-establishes the LLC SAPI 11
5	SS->MS	UA	
6	SS -> MS	SN-DATA PDU	Send the first SN-DATA PDU with M=1, T=0, F=1, X = 0, DCOMP = PCOMP = 0, N-PDU number = 0
7			Repeat step 6 until 5000 octets are sent. Verify that all SN-DATA PDUs are acknowledged.

46.2.2.2.2 LLC link re-establishment on receiving second segment with F=1 and with different PCOMP and DCOMP values in the acknowledged mode data transfer

46.2.2.2.2.1 Conformance Requirement

Receive Subsequent Segment state

- If an SN-DATA PDU is received with the F bit set to 1, and if DCOMP, PCOMP or N-PDU number is different from those in the first segment, then the SN-DATA PDU and all previous segments belonging to the same N-PDU shall be discarded, and the acknowledged LLC operation shall be re-established for the SAPI used..

Reference

GSM 04.65, section 6.7.4.2.

46.2.2.2.2.2 Test purpose

To verify that the MS re-establishes the LLC SAPI on reception of the second SN-DATA PDU with F=1 and with PCOMP and DCOMP values different from those of the previous segment, in the second segment in acknowledged mode data transfer.

46.2.2.2.2.3 Method of test

Initial conditions

-

Related PICS/PIXIT Statement

Test procedure

PDP Context 13 is initiated from MS.

AN acknowledged mode data transfer is started from SS with the first SN_DATA PDU with F=1. Send the second SN-DATA PDU from SS with F=1 and with PCOMP and DCOMP values different from those in the first segment.

Verify that the MS shall re-establish the LLC SAPI 11.

Maximum duration of the test

2 minutes.

Expected sequence

Step	Direction	Message	Comments
1		{PDP Context Activation}	Macro. Initiate PDP context activation from the MS. Use PDP context 13.
2			Initiate acknowledged data transfer for 5000 octets, from the SS.
3	SS -> MS	SN-DATA PDU	Send the first SN-DATA PDU with M=1, T=0, F=1, X = 0, DCOMP = PCOMP = 0,N-PDU number = 0.
4	SS->MS	SN-DATA PDU	Send the second SN-DATA PDU with M=1, T=0, F=1, X = 0, DCOMP = PCOMP = 1,N-PDU number = 0.
5	MS->SS	SABM	Re-establishment of LLC link on SAPI 11.
6	SS->MS	UA	
7	SS -> MS	SN-DATA PDU	Send the first SN-DATA PDU with M=1, T=0, F=1, X = 0, DCOMP = PCOMP = 0, N-PDU number = 0
8			Repeat step 7 until 5000 octets are sent. Verify that all SN-DATA PDUs are acknowledged.

46.2.2.2.3 Single segment N-PDU from MS

46.2.2.2.3.1 Conformance Requirement

- The F bit in the SNDCP header shall be set to 1 for the first segment, and 0 for all subsequent segments. For unacknowledged peer-to-peer LLC operation, DCOMP and PCOMP shall be included in the header when the F bit is set to 1, and shall not be included when the F bit is set to 0. For acknowledged peer-to-peer LLC operation, DCOMP, PCOMP and N-PDU number shall be included in the header when the F bit is set to 1, and shall not be included when the F bit is set to 0.

- The M bit in the SNDCP header shall be set to 0 for the last segment, and 1 for all previous segments. If only one SN-PDU is generated for an N-PDU, the F bit shall be set to 1 and the M bit set to 0.

Reference

GSM 04.65, section 6.7.1.1.

46.2.2.2.3.2   Test purpose

To verify that for a single segment N-PDU, the MS shall send the SN_UNITDATA PDU with F=1 and M=0 during unacknowledged data transfer

46.2.2.2.3.3   Method of test

Initial conditions

-

Related PICS/PIXIT Statement

-

Test procedure

PDP Context 10 is initiated from MS.

An unacknowledged mode data transfer is started from MS for a data size less than N201-U. Verify that the MS sends the SN-UNITDATA PDU with M=0 and F=1.

Maximum duration of the test

2 minutes.

Expected sequence

Step	Direction	Message	Comments
1		{PDP Context Activation}	Macro. Initiate PDP context activation from the MS. Use PDP context 10.
2			Initiate unacknowledged data transfer for 1 octet, from the MS.
3	MS -> SS	SN-UNITDATA PDU	Verify that the single SN-UNITDATA PDU is received with M=0 and F=1.

46.2.2.3   Link Release

46.2.2.3.1   LLC link release on receiving DM from the SS during link establishment

46.2.2.3.1.1   Conformance Requirement

If the originator of the establishment procedure receives an LL-RELEASE.indication with Cause "DM received", it shall inform the SM sub-layer using the SNSM-STATUS.request primitive with Cause "DM received". SM shall then deactivate all PDP contexts for that SAPI requiring acknowledged peer-to-peer LLC operation.

Reference

GSM 04.65, section 6.2.1.4.

46.2.2.3.1.2   Test purpose

To verify that in MS, the LLC SAPI is released and the PDP context is deactivated on receipt of DM response from SS during link establishment.

46.2.2.3.1.3 Method of test

Initial conditions

-

Related PICS/PIXIT Statement

-

Test procedure

PDP Context 13 is initiated from MS.

A DM response is sent from SS, after receiving a SABM from the MS for link establishment. The MS shall release the LLC SAPI 11 and the PDP context for the NSAPI shall be deactivated.

Maximum duration of the test

2 minutes.

Expected sequence

Step	Direction	Message	Comments
1		{PDP Context Activation}	Macro. Initiate PDP context activation from the MS. Use PDP context 13.
2	MS -> SS	SABM	SABM sent for link establishment during PDP context activation
3	SS->MS	DM	Initiate a DM response with F=1 from the SS.
4			Verify that the MS initiates PDP Context Deactivation.

46.2.2.4 XID negotiation

46.2.2.4.1 Response from MS on receiving XID request from the SS

46.2.2.4.1.1 Conformance Requirement

The XID negotiation is a one-step procedure; i.e., the initiating end proposes parameter values, and the responding end either accepts these or offers different values in their place according to the XID negotiation rules described in the present document; the rules limit the range of parameter values as well as the sense of negotiation .The initiating end accepts (or rejects) the values in the response; this concludes the negotiation.

A bit set to 0 means that the compression entity is not applicable to the corresponding NSAPI. A bit set to 1 means that the compression entity is applicable to the corresponding NSAPI.

Reference

GSM 04.65, section 6.8.1

46.2.2.4.1.2 Test purpose

To verify that

- the MS which does not support compression, responds with applicable NSAPI field with 0 for an XID request from the SS with some compression entity.

- The MS which supports compression responds with the applicable NSAPI field set to 1 for an XID request from the SS with some compression entity.

46.2.2.4.1.3 Method of test

Initial conditions

-

Related PICS/PIXIT Statement

MS supports compression.

Test procedure

PDP Context 11 is initiated from MS. Modify the PDP Context to PDP Context 12 from the SS.

While sending SABM during PDP context modification, send an XID parameter from SS with some compression entity for the NSAPI assigned for the PDP context.

The MS which does not support compression shall respond with XID response setting the applicable NSAPI field set to 0, indicating that compression is not supported.

The MS which supports compression shall respond with XID response setting the applicable NSAPI field set to 1, indicating that compression is supported.

Maximum duration of the test

2 minutes.

Expected sequence

Step	Direction	Message	Comments
1		{PDP Context Activation}	Macro. Initiate PDP context activation from the MS. Use PDP context 11.
A2		{PDP Context Modification}	Macro. Initiate PDP Context Modification from the SS. The new context is PDP Context 12, for mobiles which do not support compression.
B2		{PDP Context Modification}	Macro. Initiate PDP Context Modification from the SS. The new context is PDP Context 14, for mobiles which support compression.
3	SS -> MS	SABM	In the layer3 XID parameters, send a PCOMP entity with parameter type = 1and algorithm type = 0. In the applicable NSAPI field, set the bit for the NSAPI assigned for the PDP context.
A4	MS -> SS	UA	Verify that the MS which does not support compression responds with the assigned NSAPI field set to 0.
B4	MS -> SS	UA	Verify that the MS which supports compression responds with the assigned NSAPI field set to 1.
5			Initiate acknowledged data transfer for 5000 octets, from the MS.
6	MS -> SS	SN-DATA PDU	Verify that the number of octets in the SN-DATA PDU does not exceed N201-I.
A7			For mobiles which do not support compression, verify that the first SN-DATA PDU received has M=1, T=0, F=1, X = 0, DCOMP = PCOMP = 0,N-PDU number = 0.
B7			For mobiles which support compression, verify that the first SN-DATA PDU received has M=1, T=0, F=1, X = 0, DCOMP = the negotiated value, PCOMP = the negotaited value,N-PDU number = 0.
8			Verify that the last segment of the first N-PDU received has M=0, T=0, and F=0.
9			Verify that for the subsequent N-PDUs, the N-PDU number is incremented properly
10			Repeat step 6 to 9 until 5000 octets are sent.

46.2.2.4.2 Response from MS on receiving an XID request from the SS with an unassigned entity number

46.2.2.4.2.1 Conformance Requirement

In the originating SNDCP XID block, if an unassigned entity number is included with the P bit set to 0, then the Applicable NSAPIs field in the response shall be set to 0.

Reference

GSM 04.65, section 6.8.3

46.2.2.4.2.2 Test purpose

To verify that in the originating SNDCP XID block, if an unassigned entity number is included with the P bit set to 0, the Applicable NSAPIs field in the response shall be set to 0.

46.2.2.4.2.3 Method of test

Initial conditions

-

Related PICS/PIXIT Statement

-

Test procedure

PDP Context 11 is initiated from MS.

Send an XID command from the SS with P bit set to 0, with an unassigned entity number.

The MS shall respond with XID response setting the applicable NSAPI field set to 0, indicating that compression is not supported.

Maximum duration of the test

2 minutes.

Expected sequence

Step	Direction	Message	Comments
1		{PDP Context Activation}	Macro. Initiate PDP context activation from the MS. Use PDP context 11.
2	SS -> MS	XID	In the layer3 XID parameters, send a PCOMP entity with parameter type = 1 and algorithm type = 0. Set the P bit to 0 and the entity number to a number not assigned.
3	MS -> SS	XID	Verify that the MS responds with the assigned NSAPI field set to 0.

46.2.2.4.3 Response from MS on receiving an XID response from the SS with unrecognised type field

46.2.2.4.2.1 Conformance Requirement

If the responding SNDCP XID block includes a parameter with unrecognised Type field, unsupported length, an out-of-range value or a value violating the sense of negotiation, a parameter type 1 or 2 which violates the rules in subclause 6.8.1, a parameter with duplicated instances, contains prohibited changes (see subclauses 6.5.1.2 and 6.6.1.2) to the parameters of compression entities used with acknowledged peer-to-peer LLC operation when the SNDCP XID block is sent on LL-XID primitives, or a compression field with the P bit set to 1, then the originator shall ignore the block and reinitiate the negotiation.

Reference

GSM 04.65, section 6.8.3

46.2.2.4.1.2 Test purpose

To verify that in the XID response, if an unrecognised type field is specified, the originator shall ignore the block and reinitate XID negotiation.

46.2.2.4.1.3 Method of test

Initial conditions

-

Related PICS/PIXIT Statement

-

Test procedure

PDP Context 11 is initiated from MS.

In the response to SABM, in the UA, send parameter type = 30.

The MS shall resend the SABM command.

Maximum duration of the test

2 minutes.

Expected sequence

Step	Direction	Message	Comments
1		{PDP Context Activation}	Macro. Initiate PDP context activation from the MS. Use PDP context 11.
2	MS -> SS	SABM	
3	SS -> MS	UA	Include a layer3 XID parameter with parameter type = 30.
4	MS -> SS	SABM	Verify that the MS resends SABM.