

TS.11 - Annex L

Detailed Test Procedures for IMS services

Version 41

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# Annex L: Detailed Test Procedures for IMS services

This Annex contains the detailed procedures that are recommended to be used for Field and Lab Tests of IMS services.

# 90 IP Multimedia Subsystem (IMS)-IP-CAN independent

## 90.1 IP-CAN Independent – System Access & Registration

### 90.1.1 IMS SIP Registration

#### 90.1.1.1 IMS SIP Registration

Description

The DUT shall successfully perform SIP registration procedure with authentication based on AKA and Digest with IMS.

Related core specifications

3GPP TS 24.229; TS 24.173; TS 24.341; TS 24.237; TS 23.003; TS 33.203; TS 24.623

GSMA IR.92, 2.2.1; IR.92 4.3.1; IR.88 6.3.2; NG.114

Reason for test

To verify the DUT is able to register and authenticate to IMS.

Initial configuration

IMS APN is configured with Ipv4v6.

DUT is in offline mode (Flight mode enabled / powered off).

Note:

**IMS SIP Registration over VxLTE:**

Access to the network is through the PDN connection. DUT will need to perform Default Attach Procedure to the LTE network with apn “IMS” before IMS SIP Registration takes place.

**IMS SIP Registration over VxNR:**

Access to the network is through the PDU session. DUT will need to perform Registration procedure in the NR network and PDU session bringup for DNN “IMS” before IMS SIP Registration takes place.

**IMS SIP Registration over VxWi-Fi:**

Access to the network is through the ePDG connection. DUT will need to perform ePDG Data Connection to the Wi-Fi network with apn “IMS” before IMS SIP Registration takes place.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Bring DUT online so it establishes a PDN / ePDG connection. | DUT is attached to LTE / Wi-Fi accordingly. |
| 2 | Observe the IMS SIP REGISTRATION process on DUT. | At DUT, check in SIP protocol messages:  - MO REGISTER message. This message is unprotected and does not include the “Security-Verify” tag.  - MT REGISTER 401 Unauthorized message.  - MO REGISTER message. This message is protected and includes the “Security-Verify” tag.  - MT REGISTER 200 OK message. This message contains the IMS expiry timer value. |
| 3 | Observe the IMS SIP SUBSCRIPTION process on DUT. | At DUT, check in SIP protocol messages:  - MO SUBSCRIBE message.  - MT SUBSCRIBE 200 OK message.  - MT NOTIFY 200 OK message.  - MO NOTIFY message. |
| 4 | Check the IMS service indication. | DUT correctly displays an icon to indicate it is registered for IMS as per the service applicable (VxLTE / VxWi-Fi) |
| 5 | At DUT, receive MT voice call from Client-1. | Call is successfully established with 2-way audio. |
| 6 | At Client-1, end the voice call. | Call is ended. |

#### 90.1.1.2 IMS SIP Registration (Periodic, Idle)

Description

The DUT shall successfully perform the Periodic SIP re-registration procedure with authentication based on AKA and Digest with IMS.

Related core specifications

3GPP TS 24.229; TS 23.228

GSMA IR.92 2.2.1; IR.51 2.2.1; NG.114 2.2.1

Reason for test

To verify the DUT is able to re-register after timer expiry.

Initial configuration

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

The server timer expiry for Re-registration is known (This can be found in the MT REGISTER 200 OK message at Registration).

Note:

For timer values <20, the re-registration shall take place when half of the expiry time has elapsed.

For timer values >20, the re-registration shall take place 10 minutes before the timer expires.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Observe DUT during expected re-registration time. | At DUT, check in SIP protocol messages:  - MO REGISTER message.  - MT REGISTER 200 OK message. |
| 2 | Check the IMS service indication. | DUT correctly displays an icon to indicate it is registered for IMS as per the service applicable (VxLTE / VxWi-Fi/VxNR) |
| 3 | At DUT, receive MT voice call from Client-1. | Call is successfully established with 2-way audio. |
| 4 | At Client-1, end the voice call. | Call is ended. |

#### 90.1.1.3 IMS SIP Registration (Periodic, During Voice Call)

Description

The DUT shall successfully perform the Periodic SIP re-registration procedure with authentication based on AKA and Digest with IMS.

Related core specifications

3GPP TS 24.229, 5.1.1.4.,

GSMA IR.92 2.2.1; IR.51 2.2.1; NG.114 2.2.1

Reason for test

To verify the DUT is able to re-register after timer expiry during a voice call.

Initial configuration

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

The server timer expiry for Re-registration is known (This can be found in the MT REGISTER 200 OK message at Registration).

Note:

For timer values <20, the re-registration shall take place when half of the expiry time has elapsed.

For timer values >20, the re-registration shall take place 10 minutes before the timer expires.

DUT is in an ongoing voice call with Client-1.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Observe DUT during expected re-registration time. | At DUT, check in SIP protocol messages:  - MO REGISTER message.  - MT REGISTER 200 OK message. |
| 2 | Check the IMS service indication. | DUT correctly displays an icon to indicate it is registered for IMS as per the service applicable (VxLTE / VxWi-Fi/VxNR) |
| 3 | Confirm Voice call with Client-1 is ongoing, | Call is ongoing with 2-way audio. |
| 4 | At Client-1, end the voice call. | Call is ended. |

### 90.1.2 IMS SIP Deregistration

#### 90.1.2.1 IMS SIP Deregistration before Bearer Detach (Idle)

Description

The DUT shall successfully perform SIP deregistration procedure.

Related core specifications

3GPP TS 24.229, 5.1.1.4.,

GSMA IR.92 2.2.1; IR.51 2.2.1; NG.114 2.2.1

Reason for test

To verify the DUT is able to deregister from IMS before Detaching from the bearer.

Initial configuration

IMS APN is configured with Ipv4v6.

DUT is in offline mode (Flight mode enabled / powered off).

Note:

**IMS SIP Registration over VxLTE:**

Access to the network is through the PDN connection. DUT will need to perform Default Attach Procedure to the LTE network with apn “IMS” before IMS SIP Registration takes place.

**IMS SIP Registration over VxNR:**

Access to the network is through the PDU session. DUT will need to perform Registration procedure in the NR network and PDU session bringup for DNN “IMS” before IMS SIP Registration takes place.

**IMS SIP Registration over VxWi-Fi:**

Access to the network is through the ePDG connection. DUT will need to perform ePDG Data Connection to the Wi-Fi network with apn “IMS” before IMS SIP Registration takes place.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Bring DUT online so it establishes a PDN / ePDG connection. | DUT is attached to LTE / Wi-Fi accordingly. |
| 2 | Observe the IMS SIP REGISTRATION process on DUT. | At DUT, check in SIP protocol messages:  - MO REGISTER message.  Make a note of the URI information in the FROM header.  Make a note of the CALL-ID information. |
| 3 | Check the IMS service indication. | DUT correctly displays an icon to indicate it is registered for IMS as per the service applicable (VxLTE/VxWi-Fi/VxNR) |
| 4 | Use a SIP signalling tool so that the signalling can be observed during the power off procedure. This could be an internal logger that stored the information that can be viewed later or live in an external tool.  Power off DUT. | At DUT, check in SIP protocol messages:  - MO REGISTER message contains “Expires = 0”  Confirm the URI information in the FROM header is the same as in step 2 above.  Confirm the CALL-ID information is the same as in step 2 above.  - MT REGISTER 200 OK message. |

#### 90.1.2.2 IMS SIP Deregistration before Bearer Detach (During Voice Call)

Description

The DUT shall successfully perform SIP deregistration procedure.

Related core specifications

3GPP TS 24.229, 5.1.1.4.,

GSMA IR.92 2.2.1; IR.51 2.2.1; NG.114 2.2.1

Reason for test

To verify the DUT is able to deregister from IMS before Detaching from the bearer when in an ongoing voice call.

Initial configuration

IMS APN is configured with Ipv4v6.

DUT is in offline mode (Flight mode enabled / powered off).

Note:

**IMS SIP Registration over VxLTE:**

Access to the network is through the PDN connection. DUT will need to perform Default Attach Procedure to the LTE network with apn “IMS” before IMS SIP Registration takes place.

**IMS SIP Registration over VxNR:**

Access to the network is through the PDU session. DUT will need to perform Registration procedure in the NR network and PDU session bringup for DNN “IMS” before IMS SIP Registration takes place.

**IMS SIP Registration over VxWi-Fi:**

Access to the network is through the ePDG connection. DUT will need to perform ePDG Data Connection to the Wi-Fi network with apn “IMS” before IMS SIP Registration takes place.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Bring DUT online so it establishes a PDN / ePDG connection. | DUT is attached to LTE / Wi-Fi accordingly. |
| 2 | Observe the IMS SIP REGISTRATION process on DUT. | At DUT, check in SIP protocol messages:  - MO REGISTER message.  Make a note of the URI information in the FROM header.  Make a note of the CALL-ID information. |
| 3 | Check the IMS service indication. | DUT correctly displays an icon to indicate it is registered for IMS as per the service applicable (VxLTE / VxWi-Fi/VxNR) |
| 4 | At DUT, make MO voice call to Client-1. | Call is successfully established with 2-way audio. |
| 5 | Use a SIP signalling tool so that the signalling can be observed during the power off procedure. This could be an internal logger that stored the information that can be viewed later or live in an external tool.  Power off DUT. | At DUT, check in SIP protocol messages:  - MO BYE message.  Call is ended.  - MO REGISTER message contains “Expires = 0”  Confirm the URI information in the FROM header is the same as in step 2 above.  Confirm the CALL-ID information is the same as in step 2 above.  - MT REGISTER 200 OK message. |

## 90.2 IP-CAN Independent – Basic Calls

### 90.2.1 Voice Calls

#### 90.2.1.1 MO Voice Call – To IMS Client

Description

The DUT shall successfully perform a voice call over IMS.

Related 3GPP core specifications

3GPP TS 24.229

3GPP TS 24.234

Reason for test

To verify the DUT establishes voice calls over IMS by using the SIP client.

Initial configuration

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

Client-1 is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1. | At DUT, check in SIP protocol messages:  - MO INVITE message contains “P-Preferred-Identity” header.  - MO INVITE message contains “From” header.  - MO INVITE messages contains the string “+g.3gpp.icsi-ref=”urn%3Aurn-7%3A3gpp-service.ims.icsi.mmtel” in Accept-Contact header.  - MO INVITE contains “m=audio” supported (not zero)  AT Client-1, the identity of DUT is displayed (MSISDN or contact name if stored in Client-1 phonebook).  Call is successfully established with 2-way audio. |
| 2 | At DUT, end the voice call. | At DUT, check in SIP protocol messages:  - MO BYE message.  Call is ended. |

#### 90.2.1.2 MO Voice Call – To CS Client

Description

The DUT shall successfully perform a voice call over IMS.

Related 3GPP core specifications

3GPP TS 24.229

3GPP TS 24.234

Reason for test

To verify the DUT establishes voice calls over IMS by using the SIP client.

Initial configuration

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

Client-1 is successfully registered to a CS network (UTRAN/GERAN) for CS voice services.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1. | At DUT, check in SIP protocol messages:  - MO INVITE message contains “P-Preferred-Identity” header.  - MO INVITE message contains “From” header.  - MO INVITE messages contains the string “+g.3gpp.icsi-ref=”urn%3Aurn-7%3A3gpp-service.ims.icsi.mmtel” in Accept-Contact header.  - MO INVITE contains “m=audio” supported (not zero)  AT Client-1, the identity of DUT is displayed (MSISDN or contact name if stored in Client-1 phonebook).  Call is successfully established with 2-way audio. |
| 2 | At DUT, end the voice call. | At DUT, check in SIP protocol messages:  - MO BYE message.  Call is ended. |

#### 90.2.1.3 MO Voice Call – Non-Cellular (Fixed Line)

Description

The DUT shall successfully perform a voice call over IMS.

Related 3GPP core specifications

3GPP TS 24.229

3GPP TS 24.234

Reason for test

To verify the DUT establishes voice calls over IMS by using the SIP client.

Initial configuration

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

Client-1 is a non-cellular fixed line (For example: PBX, PSTN or ISDN).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1. | At DUT, check in SIP protocol messages:  - MO INVITE message contains “P-Preferred-Identity” header.  - MO INVITE message contains “From” header.  - MO INVITE messages contains the string “+g.3gpp.icsi-ref=”urn%3Aurn-7%3A3gpp-service.ims.icsi.mmtel” in Accept-Contact header.  - MO INVITE contains “m=audio” supported (not zero)  AT Client-1, the identity of DUT is displayed (MSISDN or contact name if stored in Client-1 phonebook).  Call is successfully established with 2-way audio. |
| 2 | At DUT, end the voice call. | At DUT, check in SIP protocol messages:  - MO BYE message.  Call is ended. |

#### 90.2.1.4 Void

#### 90.2.1.5 MO Voice Call – Cancelled during MOC Setup

Description

The DUT shall be able to cancel MOC setup during the alerting phase by sending cancel command.

Related 3GPP core specifications

3GPP TS 24.229

3GPP TS 24.234

Reason for test

To verify the DUT can cancel MOC setup during the alerting phase.

Initial configuration

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

Client-1 is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1.  Do not answer the call at Client-1. | At DUT, check in SIP protocol messages:  - MO INVITE message.  Client-1 is alerting. |
| 2 | At DUT, cancel/end the call setup while Client-1 is alerting. | At DUT, check in SIP protocol messages:  - MO CANCEL message.  Call setup is ended. |

#### 90.2.1.6 MO Voice Call – To Occupied Client

Description

The DUT shall be able to make an MO call to a busy client and correctly indicate the busy status.

Related 3GPP core specifications

3GPP TS 24.229

Reason for test

To verify the DUT can make an MO call to a busy client and correctly indicate the busy status.

Initial configuration

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

Client-1 is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

Client-1 has Communication Waiting disabled at Terminal and network side (as appropriate for the network).

Client-1 has ALL Communication Forwarding deactivated.

Client-1 has voice mail deactivated.

Client-2 is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

Client-1 is in an ongoing voice call with Client-2.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1. | At DUT, check in SIP protocol messages:  - MO INVITE message.  - MT INVITE (486 Busy Here) message.  DUT displays “User Busy” or similar and emits busy tones from the speaker. |

#### 90.2.1.7 MO Voice Call – Rejected by Client

Description

The DUT shall handle an unsuccessful MOC setup when the terminating party rejects the call.

Related 3GPP core specifications

3GPP TS 24.229

Reason for test

To verify the DUT can handle an unsuccessful MOC setup when the terminating party rejects the call.

Initial configuration

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

Client-1 is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

Client-1 has ALL Communication Forwarding deactivated.

Client-1 has voice mail deactivated.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1.  Do not answer the call at Client-1. | At DUT, check in SIP protocol messages:  - MO INVITE message. |
| 2 | At Client-1, Reject the call. | At DUT, check in SIP protocol messages:  - MT SIP 486 (Busy Here) response.  DUT displays “User Busy” or similar and emits busy tones from the speaker. |

#### 90.2.1.8 MO Voice Call – Mute/Unmute audio

Description

When the DUT is muted, no outgoing audio shall be transmitted. When the DUT is unmuted, outgoing audio shall be available.

Related 3GPP core specifications

3GPP TS 24.229

3GPP TS 24.234

Reason for test

To verify the DUT can handle mute and unmute of audio during an IMS call.

Initial configuration

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

Client-1 is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1. | Call is successfully established with 2-way audio. |
| 2 | At DUT, use the in-call menu option to mute the audio.  Speak into the DUT microphone. | DUT indicates to the user that the call is muted.  No audio can be heard from DUT at Client-1. |
| 3 | At DUT, use the in-call menu option to unmute the audio.  Speak into the DUT microphone. | DUT indicates to the user that the call is unmuted.  Audio can be heard from DUT at Client-1. |
| 4 | At DUT, end the voice call. | Call is ended. |

#### 90.2.1.9 MO Voice Call – DTMF Emission

Description

The DUT shall transmit DTMF tones during an IMS voice call.

Related core specifications

3GPP TS 24.229, TS26.114

GSMA IR.92, section 3.3; NG.114 3.5

Reason for test

To ensure the DUT can transmit DTMF tones during an IMS voice call.

Initial configuration

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

Client 1 is capable of interpreting DTMF tones (e.g. voicemail system).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO Voice call to Client-1. | Voice call is established between DUT and Client. |
| 2 | Using DUT keypad, successfully send DTMF tones for digits 0-9, \* and #. | DTMF tones for digits 0-9, \* and # are sent correctly and interpreted by the Client. |
| 3 | End the voice call between DUT and Client-1. | Call is ended. |

#### 90.2.1.10 MT Voice Call – From IMS Client

Description

The DUT shall successfully receive a voice call over IMS.

Related 3GPP core specifications

3GPP TS 24.229

3GPP TS 24.234

Reason for test

To verify the DUT receives voice calls over IMS by using the SIP client.

Initial configuration

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

Client-1 is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | At DUT, check in SIP protocol messages:  - MT INVITE contains “m=audio” supported (not zero)  AT DUT, the identity of Client-1 is displayed (MSISDN or contact name if stored in DUT phonebook).  Call is successfully established with 2-way audio. |
| 2 | At Client-1, end the voice call. | At DUT, check in SIP protocol messages:  - MT BYE message.  Call is ended. |

#### 90.2.1.11 MT Voice Call – From CS Client

Description

The DUT shall successfully receive a voice call over IMS.

Related 3GPP core specifications

3GPP TS 24.229

3GPP TS 24.234

Reason for test

To verify the DUT receives voice calls over IMS by using the SIP client.

Initial configuration

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

Client-1 is successfully registered to a CS network (UTRAN/GERAN) for CS voice services.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | At DUT, check in SIP protocol messages:  - MT INVITE contains “m=audio” supported (not zero)  AT DUT, the identity of Client-1 is displayed (MSISDN or contact name if stored in DUT phonebook).  Call is successfully established with 2-way audio. |
| 2 | At Client-1, end the voice call. | At DUT, check in SIP protocol messages:  - MT BYE message.  Call is ended. |

#### 90.2.1.12 MT Voice Call – From Non-Cellular (Fixed Line)

Description

The DUT shall successfully receive a voice call over IMS.

Related 3GPP core specifications

3GPP TS 24.229

3GPP TS 24.234

Reason for test

To verify the DUT receives voice calls over IMS by using the SIP client.

Initial configuration

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

Client-1 is a non-cellular fixed line (For example: PBX, PSTN or ISDN)

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | At DUT, check in SIP protocol messages:  - MT INVITE contains “m=audio” supported (not zero)  AT DUT, the identity of Client-1 is displayed (MSISDN or contact name if stored in DUT phonebook).  Call is successfully established with 2-way audio. |
| 2 | At Client-1, end the voice call. | At DUT, check in SIP protocol messages:  - MT BYE message.  Call is ended. |

#### 90.2.1.13 Void

#### 90.2.1.14 Void

#### 90.2.1.15 Voice Call – Call Control Tones

Description

Verify that the appropriate call control tones are audible in each call scenario.

Related 3GPP core specifications

3GPP TS 24.229

Reason for test

To ensure the DUT is able to provide appropriate call control tones in each call scenario.

Initial configuration

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

Client-1 is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

Communication Waiting is enabled at DUT.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1. | At DUT, Ringback tone is heard. |
| 2 | At Client-1, answer the call. | Call is successfully established with 2-way audio. |
| 3 | At DUT, receive MT voice call from Client-2. | At DUT, Call Waiting tone can be heard. |
| 4 | At DUT, answer the call from Client-2 and release the call with Client-1. | DUT is now in call with Client-2. |
| 5 | At DUT, release the call with Client-2. | Call end tone is emitted.  Call is ended. |

### 90.2.2 Video Calls

#### 90.2.2.1 MO Video Call – To IMS Client

Description

The DUT shall successfully perform a video call over IMS.

Related 3GPP core specifications

GSMA IR.92; NG. 114

Reason for test

To verify the DUT establishes video calls over IMS by using the SIP client.

Initial configuration

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

Client-1 is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO video call to Client-1. | At DUT, check in SIP protocol messages:  - MO INVITE message contains “P-Preferred-Identity” header.  - MO INVITE message contains “From” header.  - MO INVITE messages contains the string “+g.3gpp.icsi-ref=”urn%3Aurn-7%3A3gpp-service.ims.icsi.mmtel” in Accept-Contact header.  - MO INVITE contains “video” in Accept-Contact header.  - MO INVITE contains “m=video” supported (not zero)  AT Client-1, the identity of DUT is displayed (MSISDN or contact name if stored in Client-1 phonebook).  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1. |
| 2 | At DUT, end the video call. | At DUT, check in SIP protocol messages:  - MO BYE message.  Call is ended. |

#### 90.2.2.2 MO Video Call – Cancelled during MOC Setup

Description

The DUT shall be able to cancel MOC setup during the alerting phase by sending cancel command.

Related 3GPP core specifications

3GPP TS 24.229

3GPP TS 24.234

Reason for test

To verify the DUT can cancel MOC setup during the alerting phase.

Initial configuration

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

Client-1 is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO video call to Client-1.  Do not answer the call at Client-1. | At DUT, check in SIP protocol messages:  - MO INVITE message.  Client-1 is alerting. |
| 2 | At DUT, cancel/end the call setup while Client-1 is alerting. | At DUT, check in SIP protocol messages:  - MO CANCEL message.  Call setup is ended. |

#### 90.2.2.3 MO Video Call – To Occupied Client

Description

The DUT shall be able to make an MO video call to a busy client and correctly indicate the busy status.

Related 3GPP core specifications

3GPP TS 24.229

Reason for test

To verify the DUT can make an MO video call to a busy client and correctly indicate the busy status.

Initial configuration

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

Client-1 is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

Client-1 has Communication Waiting disabled at Terminal and network side (as appropriate for the network).

Client-1 has ALL Communication Forwarding deactivated.

Client-1 has voice mail deactivated.

Client-2 is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

Client-1 is in an ongoing video call with Client-2.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO video call to Client-1. | At DUT, check in SIP protocol messages:  - MO INVITE message.  - MT INVITE (486 Busy Here) message.  DUT displays “User Busy” or similar and emits busy tones from the speaker. |

#### 90.2.2.4 MO Video Call – Rejected by Client

The DUT shall handle an unsuccessful MOC setup when the terminating party rejects the call.

Related 3GPP core specifications

3GPP TS 24.229

Reason for test

To verify the DUT can handle an unsuccessful MOC setup when the terminating party rejects the call.

Initial configuration

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

Client-1 is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

Client-1 has ALL Communication Forwarding deactivated.

Client-1 has voice mail deactivated.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO video call to Client-1.  Do not answer the call at Client-1. | At DUT, check in SIP protocol messages:  - MO INVITE message. |
| 2 | At Client-1, Reject the call. | At DUT, check in SIP protocol messages:  - MT SIP 486 (Busy Here) response.  DUT displays “User Busy” or similar and emits busy tones from the speaker. |

#### 90.2.2.5 Void

#### 90.2.2.6 MO Video Call – Mute/Unmute audio

Description

When the DUT is muted, no outgoing audio shall be transmitted. When the DUT is unmuted, outgoing audio shall be available.

Related 3GPP core specifications

3GPP TS 24.229

3GPP TS 24.234

Reason for test

To verify the DUT can handle mute and unmute of audio during an IMS call.

Initial configuration

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

Client-1 is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO video call to Client-1. | Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1. |
| 2 | At DUT, use the in-call menu option to mute the audio.  Speak into the DUT microphone. | DUT indicates to the user that the call is muted.  No audio can be heard from DUT at Client-1.  Confirm 2-way video media stream between DUT and Client-1. |
| 3 | At DUT, use the in-call menu option to unmute the audio.  Speak into the DUT microphone. | DUT indicates to the user that the call is unmuted.  Audio can be heard from DUT at Client-1.  Confirm 2-way video media stream between DUT and Client-1. |
| 4 | At DUT, end the video call. | Call is ended. |

#### 90.2.2.7 MO Video Call – DUT Hides and Displays Video Stream

Description

The DUT shall successfully hide and display the video stream.

Related 3GPP core specifications

3GPP TS 24.229, TS 24.301 and TS 36.331

Reason for test

To verify the DUT can hide and display the video stream as requested by the user.

Initial configuration

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

Client-1 is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO video call to Client-1. | Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1. |
| 2 | At DUT, select the menu option to hide the video stream. | Video Stream from DUT is no longer displayed on Client-1.  Confirm 2-way audio between DUT and Client-1. |
| 3 | At DUT, select the menu option to display the video stream. | Video Stream from DUT is displayed on Client-1.  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1. |
| 4 | At DUT, end the video call. | Call is ended. |

#### 90.2.2.8 MT Video Call – From IMS Client

Description

The DUT shall successfully receive a video call over IMS.

Related 3GPP core specifications

3GPP TS 24.229

3GPP TS 24.234

Reason for test

To verify the DUT receives video calls over IMS by using the SIP client.

Initial configuration

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

Client-1 is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT video call from Client-1. | At DUT, check in SIP protocol messages:  - MT INVITE messages contains the string “+g.3gpp.icsi-ref=”urn%3Aurn-7%3A3gpp-service.ims.icsi.mmtel” in Accept-Contact header.  - MT INVITE contains “video” in Accept-Contact header.  - MT INVITE contains “m=video” supported (not zero)  AT DUT, the identity of Client-1 is displayed (MSISDN or contact name if stored in DUT phonebook).  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1. |
| 2 | At Client-1, end the video call. | At DUT, check in SIP protocol messages:  - MT BYE message.  Call is ended. |

#### 90.2.2.9 MT Video Call – DUT Accepts as Voice only Call

Description

The DUT can accept an incoming video call as a voice call.

Related 3GPP core specifications

GSMA IR.92, IR.94; NG.114

Reason for test

To verify the DUT can accept an incoming video call as a voice call.

Initial configuration

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

Client-1 is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT video call from Client-1. | At DUT, check in SIP protocol messages:  - MT INVITE contains “video” in Accept-Contact header.  - MT INVITE contains “m=video” supported (not zero)  - MO SESSION PROGRESS contains “m=video” supported (not zero) |
| 2 | At DUT, choose the option to accept the call as a voice call. | DUT sends UPDATE- MT UPDATE contains “m=video” not supported (zero)  - MO 200 OK response contains “m=video” not supported (zero)  Voice call is successfully established.  Confirm 2-way audio between DUT and Client-1. |
| 3 | At Client-1, end the voice call. | Call is ended. |

#### 90.2.2.10 MT Video Call – Client Hides and Displays Video Stream

Description

The DUT shall continue the video call when the Client hides their outgoing stream. When the stream is displayed again, the DUT shall successfully display this to the user.

Related 3GPP core specifications

3GPP TS 24.229, TS 24.301 and TS 36.331

Reason for test

To verify the DUT can continue the video call when the Client hides their outgoing stream. When the stream is displayed again, the DUT shall successfully display this to the user.

Initial configuration

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

Client-1 is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT video call from Client-1. | Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1. |
| 2 | At Client-1, select the menu option to hide the video stream. | Video Stream from Client-1 is no longer displayed on DUT.  Confirm 2-way audio between DUT and Client-1. |
| 3 | At Client-1, select the menu option to display the video stream. | Video Stream from Client-1 is displayed on DUT.  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1. |
| 4 | At Client-1, end the video call. | Call is ended. |

#### 90.2.2.11 Video Call – Switch to Background and Resume

Description

The DUT shall successfully maintain the dedicated bearer for video calls when the video application is temporarily switched to the background.

Related 3GPP core specifications

3GPP TS. 24.229

GSMA IR.92; NG.114

Reason for test

To verify the DUT can maintain a dedicated bearer for video calls when the application is switched to the background.

Initial configuration

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

Client-1 is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO video call to Client-1. | Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1. |
| 2 | At DUT, switch the video call to the background (for example pressing the Home button to display the home screen).  Open another application (for example the calculator)  Keep for at least 25 seconds. | Confirm the RTCP flow for video media stream is transferred by DUT.  Confirm the call remains active, but without the video stream being displayed. Confirm 2-way audio between DUT and Client-1.  The new application can be used without interfering with the audio quality of the video call. |
| 3 | At DUT, bring the video call back so it is the main open application. | Confirm 2-way video media stream between DUT and Client-1 is available again.  Confirm 2-way audio between DUT and Client-1. |
| 4 | At Client-1, switch the video call to the background (for example pressing the Home button to display the home screen).  Open another application (for example the calculator)  Make sure the RTCP flow for video media stream is transferred by Client-1.  Keep for at least 25 seconds. | Confirm the call remains active, but without the video stream being displayed.  Confirm the DUT has not downgraded the call to voice call.  Confirm 2-way audio between DUT and Client-1. |
| 5 | At Client-1, bring the video call back so it is the main open application. | Confirm 2-way video media stream between DUT and Client-1 is available again.  Confirm 2-way audio between DUT and Client-1. |
| 6 | At DUT, end the video call. | Call is ended. |

#### 90.2.2.12 Video Call – Rotation (Rotation on DUT)

Description

The DUT shall successfully indicate to the client when the video orientation has changed.

Related 3GPP core specifications

GSMA IR.92; NG.114

Reason for test

To verify the DUT can successfully indicate to the client when the video orientation has changed.

Initial configuration

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

Client-1 is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

DUT and Client-1 support Video orientation (3gpp:video-orientation).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | DUT and Client-1 are both in portrait orientation.  At DUT, make MO video call to Client-1. | At DUT, check in SIP protocol messages:  - MO INVITE message contains “3gpp :video-orientation”  Confirm 2-way video media stream between DUT and Client-1. |
| 2 | At DUT, rotate the device 90 degrees clockwise so it is in landscape orientation. | The incoming video stream on Client-1 is rotated so that the video stream still appears upright. |
| 3 | At DUT, rotate the device 90 degrees counter-clockwise so it is in portrait orientation. | The incoming video stream on Client-1 is rotated so that the video stream still appears upright. |
| 4 | At DUT, rotate the device 90 degrees counter-clockwise so it is in landscape orientation. | The incoming video stream on Client-1 is rotated so that the video stream still appears upright. |
| 5 | At DUT, end the video call. | Call is ended. |

#### 90.2.2.13 Video Call – Rotation (Rotation on Client)

Description

The DUT shall successfully update the incoming video stream orientation when it is changed at the Client.

Related 3GPP core specifications

GSMA IR.92; NG.114

Reason for test

To verify the DUT can successfully update the incoming video stream orientation when it is changed at the Client.

Initial configuration

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

Client-1 is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

DUT and Client-1 support Video orientation (3gpp:video-orientation).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | DUT and Client-1 are both in portrait orientation.  At DUT, receive MT video call from Client-1. | At DUT, check in SIP protocol messages:  - MT INVITE message contains “3gpp :video-orientation”  Confirm 2-way video media stream between DUT and Client-1. |
| 2 | At Client-1, rotate the device 90 degrees clockwise so it is in landscape orientation. | The incoming video stream on DUT is rotated so that the video stream still appears upright. |
| 3 | At Client-1, rotate the device 90 degrees counter-clockwise so it is in portrait orientation. | The incoming video stream on DUT is rotated so that the video stream still appears upright. |
| 4 | At Client-1, rotate the device 90 degrees counter-clockwise so it is in landscape orientation. | The incoming video stream on DUT is rotated so that the video stream still appears upright. |
| 5 | At Client-1, end the video call. | Call is ended. |

#### 90.2.2.14 MO Video Call – To CS Client

Description

The DUT shall successfully downgrade to voice call when establishing video call to a client in the CS network.

Related 3GPP core specifications

GSMA IR.94, NG.114

3GPP TS 24.229

Reason for test

To verify the DUT downgrade to voice call when establishing video call to a client in the CS network.

Initial configuration

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

Client-1 is successfully registered to a CS network (UTRAN/GERAN) for CS voice services.

**Test procedure**

|  |  |  |
| --- | --- | --- |
| Steps | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO video call to Client-1. | At DUT, check in SIP protocol messages:  - MO INVITE contains “m=audio” supported (not zero)  - MO INVITE contains “m=video” supported (not zero)  2-way audio call is successfully established. |
| 2 | At DUT, end the voice call. | Call setup is ended. |

### 90.2.3 Tones and Announcements

#### 90.2.3.1 MO Voice Call – Early Media – Announcement during MOC setup

Description

The DUT shall support P-Early-Media header to provide announcements during the establishment of a call. This announcement could be a message to the user that the line they have called is chargeable and if they do not want to be charged they should hang up now, otherwise remain on the line. Alternatively it could be a queuing status indication of a service hotline.

Related core specifications

3GPP TS 24.229 and TS 24.628

GSMA IR.92, clause 2.2.7; NG.114 clause 2.2.6

Reason for test

Verify that the early media can be received and played by DUT before the desired session is accepted by the user.

Initial configuration

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

Client-1 is available which is a known chargeable line or a service hotline.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO Voice call to Client-1. | The DUT establishes a connection to the B-Party and the announcement is played.  At DUT, check in SIP protocol messages:  - MO INVITE message contains “P-Early-Media” tag as supported.  - MT 183 SESSION PROGRESS contains “P-Early-Media” tag. With value “sendonly” or “sendreceive” |
| 2 | Wait until the announcement is finished or an action to establish the session is required. | The voice call is established. |
| 3 | At DUT, end the call. | Call is ended. |

#### 90.2.3.2 MO Voice Call – Early Media – Alternative Ringtone

Description

The DUT shall support P-Early-Media header to use provided alternative ring tone. The alternative ring tone shall override the local ring tones provided by the DUT.

Related core specifications

3GPP TS 24.229 and TS 24.628

Reason for test

Verify that the early media can be received and played by DUT before the desired session is established.

Initial configuration

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

Client-1 is configured with an alternative ringtone.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO Voice call to Client-1. | During MO call setup, the DUT can hear the Alternative ringtone.  At DUT, check in SIP protocol messages:  - MO INVITE message contains “P-Early-Media” tag as supported.  - Check one of the following messages contains “P-Early-Media” tag: with value “sendonly” or “sendreceive”  MT 183 SESSION PROGRESS  Or  MT 180 RINGING |
| 2 | At Client-1, accept the call. | Confirm the voice call is established. |
| 3 | At DUT, end the call. | Call is ended. |

#### 90.2.3.3 MO Voice Call – Early Media – Video Alerting Tone

Description

The DUT shall support P-Early-Media header to use provided video alerting tone during establishment of VxLTE/VxWi-Fi/VxNR call. This video alerting tone could be video clips recorded by Users before User accepts the desired call.

Related core specifications

3GPP TS 24.229, TS 24.128 and TS 24.628

Reason for test

Verify that the early media can be received and played by DUT before the desired session is established.

Initial configuration

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

Client-1 is configured with Video alerting tone.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO Voice call to Client-1. | During MO call setup, the DUT can hear the Video alerting tone as configured on Client-1.  At DUT, check in SIP protocol messages:  - MO INVITE message contains “P-Early-Media” tag as supported.  - Check one of the following messages contains “P-Early-Media” tag: with value “sendonly” or “sendreceive”  MT 183 SESSION PROGRESS  Or  MT 180 RINGING |
| 2 | At Client-1, accept the call. | Confirm the voice call is established.  Confirm the Video alerting tone stops when the call is established. |
| 3 | At DUT, end the call. | Call is ended. |

#### 90.2.3.4 MO Video Call – Early Media – Customized Alerting Tone

Description

The DUT shall support P-Early-Media header to use provided audio or video customized alerting tone (CAT) during establishment of VxLTE/VxWi-Fi/VxNR call.

Related core specifications

3GPP TS 24.229, TS 24.128 and TS 24.628

Reason for test

Verify that the early media can be received and played by DUT before the desired session is established.

Initial configuration

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

**Scenario A**:Client-1 is configured with audio CAT.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO Video call to Client-1. | During MO call setup, the DUT can hear the audio alerting tone as configured on Client-1.  At DUT, check in SIP protocol messages:  - MO INVITE message contains “P-Early-Media” tag as supported.  - Check one of the following messages contains “P-Early-Media” tag with value “sendonly” or “sendreceive”:  MT 183 SESSION PROGRESS  Or  MT 180 RINGING |
| 2 | At Client-1, accept the call. | Confirm the video call is established.  Confirm the audio alerting tone stops when the call is established. |
| 3 | At DUT, end the call. | Call is ended. |

**Scenario B**: Client-1 is configured with video CAT. This video CAT could be video clips recorded by Users before User accepts the desired call.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO Video call to Client-1. | During MO call setup, the DUT can hear the Video alerting tone as configured on Client-1.  At DUT, check in SIP protocol messages:  - MO INVITE message contains “P-Early-Media” tag as supported.  - Check one of the following messages contains “P-Early-Media” tag with value “sendonly” or “sendreceive”:  MT 183 SESSION PROGRESS  Or  MT 180 RINGING |
| 2 | At Client-1, accept the call. | Confirm the video call is established.  Confirm the video alerting tone stops when the call is established. |
| 3 | At DUT, end the call. | Call is ended. |

### 90.2.4 Addressing

#### 90.2.4.1 MO Voice Call – Public User Identity Format (SIP-URI)

Description

Standard addressing format of Public User URI.

Related 3GPP core specifications

GSMA IR.92, sub clause 2.2.3; NG.114 clause 2.2.3

3GPP TS 23.003, sub clause 13.4, 3GPP TS 24.229

Reason for test

To verify that the DUT can handle different Public User Identity formats on outgoing call.

Initial configuration

DUT Local URI type is configured as “SIP-URI”.

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

Client-1 is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

Server under test must support “SIP-URI” in order to perform the test.

**Scenario A :** Dial non-international format

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1. | At DUT, check in SIP protocol messages:  - MO INVITE message contains “To = [sip:1234;phone-context=*home\_operator.com*@*home\_operator.com*;user=phone](sip:1234;phone-context=home_operator.com@home_operator.com;user=phone)”  Call is successfully established with 2-way audio. |
| 2 | At DUT, end the voice call. | Call is ended. |

**Scenario B:** Dial international format

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1. | At DUT, check in SIP protocol messages:  - MO INVITE message contains “To= <sip:+1234@home_operator.com;user=phone>>”  Call is successfully established with 2-way audio. |
| 2 | At DUT, end the voice call. | Call is ended. |

#### 90.2.4.2 MO Voice Call – Public User Identity Format (TEL-URI)

Description

Standard addressing format of Public User URI.

Related 3GPP core specifications

GSMA IR.92, sub clause 2.2.3; NG.114 clause 2.2.3

3GPP TS 23.003, sub clause 13.4, 3GPP TS 24.229

Reason for test

To verify that the DUT can handle different Public User Identity formats on outgoing call.

Initial configuration

DUT Local URI type is configured as “TEL-URI”.

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

Client-1 is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

Server under test must support “TEL-URI” in order to perform the test.

**Scenario A :** Dial non-international format

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1. | At DUT, check in SIP protocol messages:  - MO INVITE message contains “To = [tel:1234;phone-context=*home\_operator.com*@*home\_operator.com*;user=phone](tel:1234;phone-context=home_operator.com@home_operator.com;user=phone)  Call is successfully established with 2-way audio. |
| 2 | At DUT, end the voice call. | Call is ended. |

**Scenario B:** Dial international format

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1. | At DUT, check in SIP protocol messages:  - MO INVITE message contains “To= <tel:+1234>”  Call is successfully established with 2-way audio. |
| 2 | At DUT, end the voice call. | Call is ended. |

#### 90.2.4.3 MO Voice Call – Using geo-local number

Description

Standard addressing format of geo-local number

Related 3GPP core specifications

GSMA IR.92, sub clause 2.2.3; NG.114 clause 2.2.3

3GPP TS 23.003, sub clause 13.4, 3GPP TS 24.229

Reason for test

To verify that the DUT is correctly constructing the URI in case if geo-local numbers are in use and registered for IMS service in VPLMN

Initial configuration

DUT is successfully registered for IMS services in roaming on VPLMN (e.g. MCC=234; MNC=15)

DUT is configured with Policy\_on\_local\_numbers = geo-local

**Scenario A:** Using SIP-URI

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1.  The number in use is not in an international format | At DUT, check in SIP protocol messages:  - MO INVITE message contains  “To = <sip:1234;phone-context>= [234.15.eps.home\_operator.com@home\_operator.com;user=phone](mailto:234.15.eps.home_operator.com@home_operator.com;user=phone)”  Call is successfully established with 2-way audio. |
| 2 | At DUT, end the voice call. | Call is ended. |

**Scenario B:** Using TEL-URI

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1.  The number in use is not in an international format | At DUT, check in SIP protocol messages:  - MO INVITE message contains “To = <tel:1234;phone-context>= 234.15.eps.home\_operator.com”  Call is successfully established with 2-way audio. |
| 2 | At DUT, end the voice call. | Call is ended. |

### 90.2.5 SIP Preconditions Required (Resource Available)

#### 90.2.5.1 MO Voice Call – SIP Preconditions required (Client not supporting SIP Preconditions)

Description

When Resource is available, but the receiving Client is not supporting Preconditions, the DUT should not apply the QoS mechanism.

Related core specifications

GSMA IR.92, section 2.4.1

3GPP TS 24.229, RFC 3312, RFC 4032

Reason for test

To confirm when Resource is available, but the receiving Client is not supporting Preconditions; the DUT should not apply the QoS mechanism.

Initial configuration

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

The DUT is supporting SIP Precondition.

Client-1 is not supporting SIP Precondition.

Note: Client-1 can be any terminating point in the network where the preconditions are not deployed (e.g. CS Network; Fixed line network; VxWiFi). It does not imply to be a device with IMS services.

Network is supporting SIP Precondition.

QoS Resources are available.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO Voice call to Client-1. | At DUT, check in SIP protocol messages:  - MO INVITE message indicates “Precondition” within the “Supported” tag.  - MO INVITE message contains a=des: qos mandatory local “sendrecv”  - MO INVITE message contains a=des: qos optional remote “sendrecv”  At DUT, check the MT messages received from Client-1. Implementation can be different according to Client and server:  - [OPTIONAL] MT SESSION PROGRESS message, DOES NOT indicate “Precondition” within the “Require” tag.  - [OPTIONAL] MT SESSION PROGRESS message, DOES NOT indicate “a=des: qos local” or “a=des: qos remote”.  - [OPTIONAL] MT RINGING message, DOES NOT indicate “Precondition” within the “Supported” tag. |
| 2 | Answer the call at Client-1. | Confirm the voice call is established.  Confirm 2-way audio between DUT and Client-1. |
| 3 | End the voice call between DUT and Client-1. | Call is ended. |

#### 90.2.5.2 MT Voice Call – SIP Preconditions required (Client not supporting SIP Preconditions)

Description

When Resource is available, but the originating Client is not supporting Preconditions, the DUT should not apply the QoS mechanism.

Related core specifications

GSMA IR.92, section 2.4.1

3GPP TS 24.229, RFC 3312, RFC 4032

Reason for test

To confirm when Resource is available, but the originating Client is not supporting Preconditions; the DUT should not apply the QoS mechanism.

Initial configuration

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

The DUT is supporting SIP Precondition.

Client-1 is not supporting SIP Precondition.

Note: Client-1 can be any terminating point in the network where the preconditions are not deployed (e.g.CS Network; Fixed line network; VxWiFi). It does not imply to be a device with IMS services

Network is supporting SIP Precondition.

QoS Resources are available.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | At DUT, check in SIP protocol messages:  - MT INVITE message DOES NOT indicate “Precondition” within the “Supported” tag.  - MT INVITE message DOES NOT contain a=des: qos mandatory local “sendrecv”  - MT INVITE message DOES NOT contain a=des: qos optional remote “sendrecv” |
| 2 | Answer the call at Client-1. | Confirm the voice call is established.  Confirm 2-way audio between DUT and Client-1. |
| 3 | End the voice call between DUT and Client-1. | Call is ended. |

#### 90.2.5.3 MO Voice Call – SIP Preconditions required (Client not supporting SIP Preconditions) – DUT upgrades call to Video

Description

When Resource is available, but the receiving Client is not supporting Preconditions, the DUT should not apply the QoS mechanism.

Related core specifications

GSMA IR.92, section 2.4.1

3GPP TS 24.229, RFC 3312, RFC 4032

Reason for test

To confirm when Resource is available, but the receiving Client is not supporting Preconditions; the DUT should not apply the QoS mechanism.

Initial configuration

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

The DUT is supporting SIP Precondition.

Client-1 is not supporting SIP Precondition.

Note: Client-1 can be any terminating point in the network where the preconditions are not deployed (e.g.CS Network; Fixed line network; VxWiFi). It does not imply to be a device with IMS services

Network is supporting SIP Precondition.

QoS Resources are available.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO Voice call to Client-1. | Confirm the voice call is established.  Confirm 2-way audio between DUT and Client-1. |
| 2 | At DUT, select the in-call menu option to upgrade to a video call. | Video Stream is successfully added.  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1.  At DUT, check in SIP protocol messages:  - MO INVITE message indicates “Precondition” within the “Supported” tag.  - MO INVITE message contains a=des: qos mandatory local “sendrecv”  - MO INVITE message contains a=des: qos optional remote “sendrecv”  At DUT, check the MT messages received from Client-1. Implementation can be different according to Client and server:  - [OPTIONAL] MT SESSION PROGRESS message, DOES NOT indicate “Precondition” within the “Require” tag.  - [OPTIONAL] MT SESSION PROGRESS message, DOES NOT indicate “a=des: qos local” or “a=des: qos remote”.  - [OPTIONAL] MT RINGING message, DOES NOT indicate “Precondition” within the “Supported” tag. |
| 3 | End the video call between DUT and Client-1. | Call is ended. |

#### 90.2.5.4 MT Voice Call – SIP Preconditions required (Client not supporting SIP Preconditions) – Client upgrades call to Video

Description

When Resource is available, but the originating Client is not supporting Preconditions, the DUT should not apply the QoS mechanism.

Related core specifications

GSMA IR.92, section 2.4.1

3GPP TS 24.229, RFC 3312, RFC 4032

Reason for test

To confirm when Resource is available, but the originating Client is not supporting Preconditions; the DUT should not apply the QoS mechanism.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

The DUT is supporting SIP Precondition.

Client-1 is not supporting SIP Precondition.

Note: Client-1 can be any terminating point in the network where the preconditions are not deployed (e.g.CS Network; Fixed line network; VxWiFi). It does not imply to be a device with IMS services

Network is supporting SIP Precondition.

QoS Resources are available.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | Confirm the voice call is established.  Confirm 2-way audio between DUT and Client-1. |
| 2 | At Client-1, select the in-call menu option to upgrade to a video call. | Video Stream is successfully added.  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1.  At DUT, check in SIP protocol messages:  - MT INVITE message DOES NOT indicate “Precondition” within the “Supported” tag.  - MT INVITE message DOES NOT contain a=des: qos mandatory local “sendrecv”  - MT INVITE message DOES NOT contain a=des: qos optional remote “sendrecv” |
| 3 | End the video call between DUT and Client-1. | Call is ended. |

#### 90.2.5.5 MO Video Call – SIP Preconditions required (Client not supporting SIP Preconditions)

Description

When Resource is available, but the receiving Client is not supporting Preconditions, the DUT should not apply the QoS mechanism.

Related core specifications

GSMA IR.92, section 2.4.1

3GPP TS 24.229, RFC 3312, RFC 4032

Reason for test

To confirm when Resource is available, but the receiving Client is not supporting Preconditions; the DUT should not apply the QoS mechanism.

Initial configuration

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

The DUT is supporting SIP Precondition.

Client-1 is not supporting SIP Precondition.

Note: Client-1 can be any terminating point in the network where the preconditions are not deployed (CS Network; Fixed line network; VxWiFi). It does not imply to be a device with IMS services.

Network is supporting SIP Precondition.

QoS Resources are available.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO Video call to Client-1. | At DUT, check in SIP protocol messages:  - MO INVITE message indicates “Precondition” within the “Supported” tag.  - MO INVITE message contains a=des: qos mandatory local “sendrecv”  - MO INVITE message contains a=des: qos optional remote “sendrecv”  At DUT, check the MT messages received from Client-1. Implementation can be different according to Client and server:  - [OPTIONAL] MT SESSION PROGRESS message, DOES NOT indicate “Precondition” within the “Require” tag.  - [OPTIONAL] MT SESSION PROGRESS message, DOES NOT indicate “a=des: qos local” or “a=des: qos remote”.  - [OPTIONAL] MT RINGING message, DOES NOT indicate “Precondition” within the “Supported” tag. |
| 2 | Answer the call at Client-1. | Confirm the video call is established.  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1. |
| 3 | End the video call between DUT and Client-1. | Call is ended. |

#### 90.2.5.6 MT Video Call – SIP Preconditions required (Client not supporting SIP Preconditions)

Description

When Resource is available, but the originating Client is not supporting Preconditions, the DUT should not apply the QoS mechanism.

Related core specifications

GSMA IR.92, section 2.4.1

3GPP TS 24.229, RFC 3312, RFC 4032

Reason for test

To confirm when Resource is available, but the originating Client is not supporting Preconditions; the DUT should not apply the QoS mechanism.

Initial configuration

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

The DUT is supporting SIP Precondition.

Client-1 is not supporting SIP Precondition.

Note: Client-1 can be any terminating point in the network where the preconditions are not deployed (CS Network; Fixed line network; VxWiFi). It does not imply to be a device with IMS services

Network is supporting SIP Precondition.

QoS Resources are available.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT video call from Client-1. | At DUT, check in SIP protocol messages:  - MT INVITE message DOES NOT indicate “Precondition” within the “Supported” tag.  - MT INVITE message DOES NOT contain a=des: qos mandatory local “sendrecv”  - MT INVITE message DOES NOT contain a=des: qos optional remote “sendrecv” |
| 2 | Answer the call at Client-1. | Confirm the video call is established.  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1. |
| 3 | End the video call between DUT and Client-1. | Call is ended. |

### 90.2.6 SIP Preconditions Required (Resource Unavailable)

### 90.2.7 Voice Codecs

#### 90.2.7.1 MO Voice Call (DUT EVS – Client EVS) – EVS Codec Established

Description

The DUT shall use the appropriate audio codec for the IMS call.

Related 3GPP core specifications

3GPP TS 24.229

GSMA IR.92, 3.2.1; NG.114 3.2.1

Reason for test

To verify the DUT uses the appropriate audio codec during an IMS call.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

The DUT is supporting EVS, WB-AMR and NB-AMR voice codecs.

Client-1 is supporting EVS, WB-AMR and NB-AMR voice codecs.

The network supports EVS, WB-AMR and NB-AMR voice codecs.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1. | Call is successfully established with 2-way audio.  At DUT, check in SIP protocol messages:  - Confirm EVS voice codec has been successfully negotiated. |
| 2 | At DUT, end the voice call. | Call is ended. |

#### 90.2.7.2 MO Voice Call (DUT EVS – Client WB) – WB Codec Established

Description

The DUT shall use the appropriate audio codec for the IMS call.

Related 3GPP core specifications

3GPP TS 24.229,

GSMA IR.92, 3.2.1; NG.114 3.2.1

Reason for test

To verify the DUT uses the appropriate audio codec during an IMS call.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

The DUT is supporting EVS, WB-AMR and NB-AMR voice codecs.

Client-1 is supporting WB-AMR and NB-AMR voice codecs.

The network supports EVS, WB-AMR and NB-AMR voice codecs

The network does not support configuring EVS AMR-WB IO payload format

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1. | Call is successfully established with 2-way audio.  At DUT, check in SIP protocol messages:  - Confirm WB-AMR voice codec has been successfully negotiated. |
| 2 | At DUT, end the voice call. | Call is ended. |

#### 90.2.7.3 MO Voice Call (DUT EVS – Client WB) – EVS AMR-WB IO Codec Established

Description

The DUT shall use the appropriate audio codec for the IMS call.

Related 3GPP core specifications

3GPP TS 24.229,

GSMA IR.92, 3.2.1; NG.114 3.2.1

Reason for test

To verify the DUT uses the appropriate audio codec during an IMS call.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

The DUT is supporting EVS, WB-AMR and NB-AMR voice codecs.

Client-1 is supporting WB-AMR and NB-AMR voice codecs.

The network supports EVS, WB-AMR and NB-AMR voice codecs

The network supports configuring EVS AMR-WB IO payload format

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1. | Call is successfully established with 2-way audio.  At DUT, check in SIP protocol messages:  - Confirm EVS AMR-WB IO voice codec has been successfully negotiated. |
| 2 | At DUT, end the voice call. | Call is ended. |

#### 90.2.7.4 MO Voice Call (DUT EVS – Client NB) – NB Codec Established

Description

The DUT shall use the appropriate audio codec for the IMS call.

Related 3GPP core specifications

3GPP TS 24.229,

GSMA IR.92, 3.2.1; NG.114 3.2.1

Reason for test

To verify the DUT uses the appropriate audio codec during an IMS call.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

The DUT is supporting EVS, WB-AMR and NB-AMR voice codecs.

Client-1 is supporting NB-AMR voice codec.

The network supports WB-AMR and NB-AMR voice codecs

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1. | Call is successfully established with 2-way audio.  At DUT, check in SIP protocol messages:  - Confirm NB-AMR voice codec has been successfully negotiated. |
| 2 | At DUT, end the voice call. | Call is ended. |

#### 90.2.7.5 MO Voice Call (DUT WB – Client EVS) – WB Codec Established

Description

The DUT shall use the appropriate audio codec for the IMS call.

Related 3GPP core specifications

3GPP TS 24.229,

GSMA IR.92, 3.2.1; NG.114 3.2.1

Reason for test

To verify the DUT uses the appropriate audio codec during an IMS call.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

The DUT is supporting WB-AMR and NB-AMR voice codecs.

Client-1 is supporting EVS, WB-AMR and NB-AMR voice codecs.

The network supports EVS, WB-AMR and NB-AMR voice codecs

The network does not support configuring EVS AMR-WB IO payload format

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1. | Call is successfully established with 2-way audio.  At DUT, check in SIP protocol messages:  - Confirm WB-AMR voice codec has been successfully negotiated. |
| 2 | At DUT, end the voice call. | Call is ended. |

#### 90.2.7.6 MO Voice Call (DUT WB – Client WB) – WB Codec Established

Description

The DUT shall use the appropriate audio codec for the IMS call.

Related 3GPP core specifications

3GPP TS 24.229,

GSMA IR.92, 3.2.1; NG.114 3.2.1

Reason for test

To verify the DUT uses the appropriate audio codec during an IMS call.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

The DUT is supporting WB-AMR and NB-AMR voice codecs.

Client-1 is supporting WB-AMR and NB-AMR voice codecs.

The network supports WB-AMR and NB-AMR voice codecs

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1. | Call is successfully established with 2-way audio.  At DUT, check in SIP protocol messages:  - Confirm WB-AMR voice codec has been successfully negotiated. |
| 2 | At DUT, end the voice call. | Call is ended. |

#### 90.2.7.7 MO Voice Call (DUT WB – Client NB) – NB Codec Established

Description

The DUT shall use the appropriate audio codec for the IMS call.

Related 3GPP core specifications

3GPP TS 24.229,

GSMA IR.92, 3.2.1; NG.114 3.2.1

Reason for test

To verify the DUT uses the appropriate audio codec during an IMS call.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

The DUT is supporting WB-AMR and NB-AMR voice codecs.

Client-1 is supporting NB-AMR voice codec.

The network supports WB-AMR and NB-AMR voice codecs

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1. | Call is successfully established with 2-way audio.  At DUT, check in SIP protocol messages:  - Confirm NB-AMR voice codec has been successfully negotiated. |
| 2 | At DUT, end the voice call. | Call is ended. |

#### 90.2.7.8 MT Voice Call (DUT EVS – Client EVS) – EVS Codec Established

Description

The DUT shall use the appropriate audio codec for the IMS call.

Related 3GPP core specifications

3GPP TS 24.229,

GSMA IR.92, 3.2.1; NG.114 3.2.1

Reason for test

To verify the DUT uses the appropriate audio codec during an IMS call.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

The DUT is supporting EVS, WB-AMR and NB-AMR voice codecs.

Client-1 is supporting EVS, WB-AMR and NB-AMR voice codecs.

The network supports EVS, WB-AMR and NB-AMR voice codecs.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | Call is successfully established with 2-way audio.  At DUT, check in SIP protocol messages:  - Confirm EVS voice codec has been successfully negotiated. |
| 2 | At Client-1, end the voice call. | Call is ended. |

#### 90.2.7.9 MT Voice Call (DUT EVS – Client WB) – WB Codec Established

Description

The DUT shall use the appropriate audio codec for the IMS call.

Related 3GPP core specifications

3GPP TS 24.229,

GSMA IR.92, 3.2.1; NG.114 3.2.1

Reason for test

To verify the DUT uses the appropriate audio codec during an IMS call.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

The DUT is supporting EVS, WB-AMR and NB-AMR voice codecs.

Client-1 is supporting WB-AMR and NB-AMR voice codecs.

The network supports EVS, WB-AMR and NB-AMR voice codecs

The network does not support configuring EVS AMR-WB IO payload format

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | Call is successfully established with 2-way audio.  At DUT, check in SIP protocol messages:  - Confirm WB-AMR voice codec has been successfully negotiated. |
| 2 | At Client-1, end the voice call. | Call is ended. |

#### 90.2.7.10 MT Voice Call (DUT EVS – Client WB) – EVS AMR-WB IO Codec Established

Description

The DUT shall use the appropriate audio codec for the IMS call.

Related 3GPP core specifications

3GPP TS 24.229,

GSMA IR.92, 3.2.1; NG.114 3.2.1

Reason for test

To verify the DUT uses the appropriate audio codec during an IMS call.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

The DUT is supporting EVS, WB-AMR and NB-AMR voice codecs.

Client-1 is supporting WB-AMR and NB-AMR voice codecs.

The network supports EVS, WB-AMR and NB-AMR voice codecs

The network supports configuring EVS AMR-WB IO payload format

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | Call is successfully established with 2-way audio.  At DUT, check in SIP protocol messages:  - Confirm EVS AMR-WB IO voice codec has been successfully negotiated. |
| 2 | At Client-1, end the voice call. | Call is ended. |

#### 90.2.7.11 MT Voice Call (DUT EVS – Client NB) – NB Codec Established

Description

The DUT shall use the appropriate audio codec for the IMS call.

Related 3GPP core specifications

3GPP TS 24.229,

GSMA IR.92, 3.2.1; NG.114 3.2.1

Reason for test

To verify the DUT uses the appropriate audio codec during an IMS call.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

The DUT is supporting EVS, WB-AMR and NB-AMR voice codecs.

Client-1 is supporting NB-AMR voice codec.

The network supports WB-AMR and NB-AMR voice codecs

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | Call is successfully established with 2-way audio.  At DUT, check in SIP protocol messages:  - Confirm NB-AMR voice codec has been successfully negotiated. |
| 2 | At Client-1, end the voice call. | Call is ended. |

#### 90.2.7.12 MT Voice Call (DUT WB – Client EVS) – WB Codec Established

Description

The DUT shall use the appropriate audio codec for the IMS call.

Related 3GPP core specifications

3GPP TS 24.229,

GSMA IR.92, 3.2.1; NG.114 3.2.1

Reason for test

To verify the DUT uses the appropriate audio codec during an IMS call.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

The DUT is supporting WB-AMR and NB-AMR voice codecs.

Client-1 is supporting EVS, WB-AMR and NB-AMR voice codecs.

The network supports EVS, WB-AMR and NB-AMR voice codecs

The network does not support configuring EVS AMR-WB IO payload format

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | Call is successfully established with 2-way audio.  At DUT, check in SIP protocol messages:  - Confirm WB-AMR voice codec has been successfully negotiated. |
| 2 | At Client-1, end the voice call. | Call is ended. |

#### 90.2.7.13 MT Voice Call (DUT WB – Client WB) – WB Codec Established

Description

The DUT shall use the appropriate audio codec for the IMS call.

Related 3GPP core specifications

3GPP TS 24.229,

GSMA IR.92, 3.2.1; NG.114 3.2.1

Reason for test

To verify the DUT uses the appropriate audio codec during an IMS call.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

The DUT is supporting WB-AMR and NB-AMR voice codecs.

Client-1 is supporting WB-AMR and NB-AMR voice codecs.

The network supports WB-AMR and NB-AMR voice codecs

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | Call is successfully established with 2-way audio.  At DUT, check in SIP protocol messages:  - Confirm WB-AMR voice codec has been successfully negotiated. |
| 2 | At Client-1, end the voice call. | Call is ended. |

#### 90.2.7.14 MT Voice Call (DUT WB – Client NB) – NB Codec Established

Description

The DUT shall use the appropriate audio codec for the IMS call.

Related 3GPP core specifications

3GPP TS 24.229,

GSMA IR.92, 3.2.1; NG.114 3.2.1

Reason for test

To verify the DUT uses the appropriate audio codec during an IMS call.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

The DUT is supporting WB-AMR and NB-AMR voice codecs.

Client-1 is supporting NB-AMR voice codec.

The network supports WB-AMR and NB-AMR voice codecs

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | Call is successfully established with 2-way audio.  At DUT, check in SIP protocol messages:  - Confirm NB-AMR voice codec has been successfully negotiated. |
| 2 | At Client-1, end the voice call. | Call is ended. |

#### 90.2.7.15 Voice Communication Hold (DUT EVS – Client EVS)

Description

The DUT shall use the appropriate audio codec for the IMS call.

Related 3GPP core specifications

3GPP TS 24.229

GSMA IR.92, 3.2.1; NG.114 3.2.1

Reason for test

To verify the DUT uses the appropriate audio codec during an IMS call.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

The DUT is supporting EVS, WB-AMR and NB-AMR voice codecs.

Client-1 is supporting EVS, WB-AMR and NB-AMR voice codecs.

The network supports EVS, WB-AMR and NB-AMR voice codecs.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1. | Call is successfully established with 2-way audio.  At DUT, check in SIP protocol messages:  - Confirm EVS voice codec has been successfully negotiated. |
| 2 | At DUT, place Client-1 on hold using the menu option. | Confirm there is a visible indication on the DUT that the call is held.  Confirm there is no audio is either direction. |
| 3 | Wait 15 seconds. | Confirm call is on hold. |
| 4 | At DUT, retrieve the call using the menu option. | Confirm the call with Client-1 is restored.  Confirm 2-way audio between DUT and Client-1.  At DUT, check in SIP protocol messages:  - Confirm EVS or WB-AMR voice codec has been successfully negotiated. |
| 5 | At DUT, end the voice call. | Call is ended. |

#### 90.2.7.16 Voice Conference (DUT EVS – Client-1 EVS – Client-2 WB)

Description

The DUT shall use the appropriate audio codec for the IMS call.

Related 3GPP core specifications

3GPP TS 24.229; TS 24.605; TS 24.147; TS 26.114

GSMA IR.92, 3.2.1; NG.114 3.2.1

Reason for test

To verify the DUT uses the appropriate audio codec during an IMS call.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

The DUT is supporting EVS, WB-AMR and NB-AMR voice codecs.

Client-1 is supporting EVS, WB-AMR and NB-AMR voice codecs.

Client-2 is supporting WB-AMR and NB-AMR voice codecs.

The network supports EVS, WB-AMR and NB-AMR voice codecs.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1. | Call is successfully established with 2-way audio.  At DUT, check in SIP protocol messages:  - Confirm EVS voice codec has been successfully negotiated. |
| 2 | At DUT, use the menu option to make a “new call” to Client-2.  Answer the call at Client-2. | Call with Client-1 is on hold.  Call is successfully established between DUT and Client-2 with 2-way audio.  At DUT, check in SIP protocol messages:  - Confirm WB-AMR voice codec has been successfully negotiated. |
| 3 | At DUT, use the menu option to “merge” the calls. | Conference call is successfully established between DUT, Client-1 and Client-2 with 3-way audio.  At DUT, check in SIP protocol messages:  - Confirm WB-AMR voice codec has been successfully negotiated. |
| 4 | At DUT, use the menu option to remove and end the call with Client-2. | Client-2 is successfully removed from the conference and the call is ended.  Call remains active between DUT and Client-1 with 2-way audio.  At DUT, check in SIP protocol messages:  - Confirm EVS or WB-AMR voice codec has been successfully negotiated. |
| 5 | At DUT, end the voice call. | Call is ended. |

### 90.2.8 Voice and Video Call Interworking

#### 90.2.8.1 MO Voice Call – DUT upgrades call to Video

Description

The DUT shall successfully upgrade the voice call into a video call.

Related 3GPP core specifications

3GPP TS 24.229, TS 24.301 and TS 36.331

Reason for test

To verify the DUT can upgrade the voice call into a video call.

Initial configuration

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

Client-1 is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1. | Confirm 2-way audio between DUT and Client-1.  At DUT, check in SIP protocol messages:  - MO INVITE contains “m=audio” supported (not zero)  - MO INVITE does not contain “m=video”. |
| 2 | At DUT, select the in-call menu option to upgrade to a video call. | Video Stream is successfully added.  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1.  At DUT, check in SIP protocol messages:  - MO INVITE contains “m=audio” supported (not zero)  - MO INVITE contains “m=video” supported (not zero) |
| 3 | At DUT, end the video call. | Call is ended. |

#### 90.2.8.2 MO Voice Call – DUT upgrades call to Video (Rejected by Client)

Description

The DUT shall maintain the current voice call when the Client rejects the video upgrade.

Related 3GPP core specifications

3GPP TS 24.229, TS 24.301 and TS 36.331

Reason for test

To verify the DUT can maintain the current voice call when the Client rejects the video upgrade.

Initial configuration

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

Client-1 is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1. | Confirm 2-way audio between DUT and Client-1.  At DUT, check in SIP protocol messages:  - MO INVITE contains “m=audio” supported (not zero)  - MO INVITE does not contain “m=video”. |
| 2 | At DUT, select the in-call menu option to upgrade to a video call.  At Client-1, reject the incoming video upgrade. | Video Stream is not added.  DUT no longer displays the outgoing video stream and returns to the voice in-call menu.  Confirm 2-way audio between DUT and Client-1.  At DUT, check in SIP protocol messages:  - MO INVITE contains “m=audio” supported (not zero)  - MO INVITE contains “m=video” supported (not zero)  - MT SIP response contains 603 Decline |
| 3 | At DUT, end the voice call. | Call is ended. |

#### 90.2.8.3 MT Voice Call – Client upgrades call to Video

Description

The DUT shall successfully upgrade the voice call into a video call.

Related 3GPP core specifications

3GPP TS 24.229, TS 24.301 and TS 36.331

Reason for test

To verify the DUT can upgrade the voice call into a video call when the Client attempts to do so.

Initial configuration

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

Client-1 is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | Confirm 2-way audio between DUT and Client-1.  At DUT, check in SIP protocol messages:  - MT INVITE contains “m=audio” supported (not zero)  - MT INVITE does not contain “m=video”. |
| 2 | At Client-1, select the in-call menu option to upgrade to a video call. | Video Stream is successfully added.  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1.  At DUT, check in SIP protocol messages:  - MT INVITE contains “m=audio” supported (not zero)  - MT INVITE contains “m=video” supported (not zero) |
| 3 | At Client-1, end the video call. | Call is ended. |

#### 90.2.8.4 MT Voice Call – Client upgrades call to Video (Rejected by DUT)

Description

The DUT shall be able to reject an incoming video upgrade during a voice call.

Related 3GPP core specifications

3GPP TS 24.229, TS 24.301 and TS 36.331

Reason for test

To verify the DUT is able to reject an incoming video upgrade during a voice call and maintain the current voice call.

Initial configuration

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

Client-1 is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | Confirm 2-way audio between DUT and Client-1.  At DUT, check in SIP protocol messages:  - MT INVITE contains “m=audio” supported (not zero)  - MT INVITE does not contain “m=video”. |
| 2 | At Client-1, select the in-call menu option to upgrade to a video call.  At DUT, reject the incoming video stream. | Video Stream is not added.  Confirm 2-way audio between DUT and Client-1.  At DUT, check in SIP protocol messages:  - MT INVITE contains “m=audio” supported (not zero)  - MT INVITE contains “m=video” supported (not zero)  - MO SIP response contains 603 Decline |
| 3 | At Client-1, end the voice call. | Call is ended. |

#### 90.2.8.5 MO Video Call – DUT downgrades call to Voice

Description

The DUT shall successfully downgrade the video call into a voice call.

Related 3GPP core specifications

3GPP TS 24.229, TS 24.301 and TS 36.331

Reason for test

To verify the DUT can downgrade the video call into a voice call.

Initial configuration

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

Client-1 is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO video call to Client-1. | Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1.  At DUT, check in SIP protocol messages:  - MO INVITE contains “m=audio” supported (not zero)  - MO INVITE contains “m=video” supported (not zero) |
| 2 | At DUT, select the menu option to downgrade the video call into a voice call. | Video Stream is successfully removed.  Confirm 2-way audio between DUT and Client-1.  At DUT, check in SIP protocol messages:  - MO INVITE contains “m=audio” supported (not zero)  - MO INVITE does not contain “m=video” or MO INVITE contains “m=video” not supported (zero). |
| 3 | At DUT, end the voice call. | Call is ended. |

#### 90.2.8.6 MT Video Call – Client downgrades call to Voice

Description

The DUT shall successfully handle a downgrade of the video call into a voice call.

Related 3GPP core specifications

3GPP TS 24.229, TS 24.301 and TS 36.331

Reason for test

To verify the DUT can handle a downgrade of the video call into a voice call.

Initial configuration

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

Client-1 is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT video call from Client-1. | Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1.  At DUT, check in SIP protocol messages:  - MT INVITE contains “m=audio” supported (not zero)  - MT INVITE contains “m=video” supported (not zero) |
| 2 | At Client-1, select the in-call menu option to downgrade to a voice call. | Video Stream is successfully removed.  Confirm 2-way audio between DUT and Client-1.  At DUT, check in SIP protocol messages:  - MT INVITE contains “m=audio” supported (not zero)  - MT INVITE does not contain “m=video” or MO INVITE contains “m=video” not supported (zero). |
| 3 | At Client-1, end the voice call. | Call is ended. |

#### 90.2.8.7 MO Video Call – Video not supported by Client

Description

The DUT shall successfully downgrade to a voice call when attempting a video call to a client not supporting video.

Related 3GPP core specifications

GSMA IR.92; NG.114

Reason for test

To verify the DUT can downgrade to a voice call when attempting a video call to a client not supporting video.

Initial configuration

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

Client-1 is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

Client-1 is not supporting video calls over IMS (VxLTE/VxWi-Fi/VxNR)

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO video call to Client-1. | At DUT, check in SIP protocol messages:  - MO INVITE contains “video” in Accept-Contact header.  - MO INVITE contains “m=video” supported (not zero)  - MT SESSION PROGRESS contains “m=video” not supported (zero)  DUT performs an update to the call.  - MO UPDATE contains “m=video” not supported (zero)  - MT UPDATE contains “m=video” not supported (zero)  Voice call is successfully established.  Confirm 2-way audio between DUT and Client-1. |
| 2 | At DUT, end the voice call. | Call is ended. |

#### 90.2.8.8 MT Voice Call – Reconfigured from Video Call (Video not supported)

Description

The DUT shall successfully downgrade to a voice call when receiving a video call if the DUT is not supporting video over IMS.

Related 3GPP core specifications

GSMA IR.92; NG.114

Reason for test

To verify the DUT can downgrade to a voice call when receiving a video call if the DUT is not supporting video over IMS.

Initial configuration

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

Client-1 is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

DUT is not supporting video calls over IMS (VxLTE/VxWi-Fi/VxNR)

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT video call from Client-1. | At DUT, check in SIP protocol messages:  - MT INVITE contains “video” in Accept-Contact header.  - MT INVITE contains “m=video” supported (not zero)  - MO SESSION PROGRESS contains “m=video” not supported (zero)  Client-1 performs an Update.  - MT UPDATE contains “m=video” not supported (zero)  - MO UPDATE contains “m=video” not supported (zero)  Voice call is successfully established.  Confirm 2-way audio between DUT and Client-1. |
| 2 | At Client-1, end the voice call. | Call is ended. |

#### 90.2.8.9 MO Voice Call – DUT upgrades call to Video (Cancelled by DUT)

Description

The DUT shall be able to cancel an outgoing video upgrade request during a voice call.

Note：This test case can be tested only if the device support cancelling the upgrade request in the UI.

Related 3GPP core specifications

3GPP TS 24.229 5.1.3.1, TS 24.301 and TS 36.331, RFC 3261

Reason for test

To verify the DUT is able to cancel an outgoing video upgrade request during a video call.

Initial configuration

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

Client-1 is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1. | Confirm 2-way audio between DUT and Client-1. |
| 2 | At DUT, select the in-call menu option to upgrade to a video call.  At DUT, cancel the video upgrade | Video Stream is not added.  Confirm 2-way audio between DUT and Client-1. |
| 3 | At DUT, end the voice call. | Call is ended. |

## 90.3 IP-CAN Independent – SMS

### 90.3.1 SMS over IMS

#### 90.3.1.1 MO SMS over IMS

Description

Verify the DUT can successfully send an MO SMS via IMS.

Related core specifications

3GPP TS 24.341

GSMA IR.92 2.5; NG.114 2.4

Reason for test

To verify the DUT is able to send an MO SMS over IMS.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

The DUT supports MO SMS over IMS.

The IMS server supports MO SMS over IMS.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Using the DUT messaging application, create a new SMS and enter the MSISDN of Client-1 as the recipient.  Enter 160 characters (1 segment) in the SMS text. | The SMS is created. |
| 2 | Send the SMS to Client-1 | At DUT, check in SIP protocol messages:  - MO MESSAGE message.  SMS is successfully received on Client 1.  The message content is identical to the message prepared on DUT. |

#### 90.3.1.2 MO SMS over IMS (Concatenated)

Description

Verify the DUT can successfully send a concatenated MO SMS via IMS.

Related core specifications

3GPP TS 24.341

GSMA IR.92 2.5; NG.114 2.4

Reason for test

To verify the DUT is able to send a concatenated MO SMS over IMS.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

The DUT supports MO SMS over IMS.

The IMS server supports MO SMS over IMS.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Using the DUT messaging application, create a new SMS and enter the MSISDN of Client-1 as the recipient.  Enter 459 characters (3 segments) in the SMS text. | The SMS is created. |
| 2 | Send the SMS to Client-1. | At DUT, check in SIP protocol messages:  - 3 x MO MESSAGE.  SMS is successfully received on Client 1.  The message content is identical to the message prepared on DUT. |

#### 90.3.1.3 MO SMS over IMS (during Voice Call)

Description

Verify the DUT can successfully send an MO SMS via IMS during an active voice call.

Related core specifications

3GPP TS 24.341

GSMA IR.92 2.5; NG.114 2.4

Reason for test

To verify the DUT is able to send an MO SMS over IMS during an active voice call.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

The DUT supports MO SMS over IMS.

The IMS server supports MO SMS over IMS.

The DUT is in an active voice call with Client-1 over IMS.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Using the DUT messaging application, create a new SMS and enter the MSISDN of Client-1 as the recipient.  Enter 160 characters (1 segment) in the SMS text. | The SMS is created. |
| 2 | Send the SMS to Client-1 | At DUT, check in SIP protocol messages:  - MO MESSAGE message.  SMS is successfully received on Client 1.  The message content is identical to the message prepared on DUT. |

#### 90.3.1.4 MT SMS over IMS

Description

Verify the DUT can successfully receive an MT SMS via IMS.

Related core specifications

3GPP TS 24.341

GSMA IR.92 2.5; NG.114 2.4

Reason for test

To verify the DUT is able to receive an MT SMS over IMS.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

The DUT supports MT SMS over IMS.

The IMS server supports MT SMS over IMS.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At Client-1, create a new SMS and enter the MSISDN of DUT as the recipient.  Enter 160 characters (1 segment) in the SMS text. | The SMS is created. |
| 2 | Send the SMS to DUT | At DUT, check in SIP protocol messages:  - MT MESSAGE message.  SMS is successfully received on DUT.  The message content is identical to the message prepared on Client-1. |

#### 90.3.1.5 MT SMS over IMS (Concatenated)

Description

Verify the DUT can successfully receive a concatenated MT SMS via IMS.

Related core specifications

3GPP TS 24.341

GSMA IR.92 2.5; NG.114 2.4

Reason for test

To verify the DUT is able to receive a concatenated MT SMS over IMS.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

The DUT supports MT SMS over IMS.

The IMS server supports MT SMS over IMS.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At Client-1, create a new SMS and enter the MSISDN of DUT as the recipient.  Enter 459 characters (3 segments) in the SMS text. | The SMS is created. |
| 2 | Send the SMS to DUT. | At DUT, check in SIP protocol messages:  - 3 x MT MESSAGE messages.  SMS is successfully received on DUT.  The message content is identical to the message prepared on Client-1. |

#### 90.3.1.6 MT SMS over IMS (during Voice Call)

Description

Verify the DUT can successfully receive an MT SMS via IMS during an active voice call.

Related core specifications

3GPP TS 24.341

GSMA IR.92 2.5; NG.114 2.4

Reason for test

To verify the DUT is able to receive an MT SMS over IMS during an active voice call.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

The DUT supports MT SMS over IMS.

The IMS server supports MT SMS over IMS.

The DUT is in an active voice call with Client-1 over IMS.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At Client-1, create a new SMS and enter the MSISDN of DUT as the recipient.  Enter 160 characters (1 segment) in the SMS text. | The SMS is created. |
| 2 | Send the SMS to DUT. | At DUT, check in SIP protocol messages:  - MT MESSAGE message.  SMS is successfully received on DUT.  The message content is identical to the message prepared on Client-1. |

#### 90.3.1.7 MT WAP-PUSH SMS over IMS

Description

Verify the DUT can successfully receive an MT WAP-PUSH SMS via IMS.

Related core specifications

3GPP TS 24.341

GSMA IR.92 2.5; NG.114 2.4

Reason for test

To verify the DUT is able to receive an MT WAP-PUSH SMS over IMS.

Initial configuration

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

The DUT supports MT SMS over IMS.

The IMS server supports MT SMS over IMS.

Client-1 is attached to a RAT capable of sending MMS.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At Client-1, create a new MMS and enter the MSISDN of DUT as the recipient.  Add a subject to the MMS.  Attach an image to the MMS.  Enter some text. | The MMS is created. |
| 2 | Send the MMS to DUT | At DUT, check in SIP protocol messages:  - MT MESSAGE message.  MMS is successfully received on DUT.  The message content is identical to the message prepared on Client-1. |

## 90.4 IP-CAN Independent – Supplementary Services

Basis for this section is 3GPP TS 22.173 – IP Multimedia Core Network Subsystem (IMS) Multimedia Telephony Service and supplementary services (Release 12).

### 90.4.0 General

### 90.4.1 Originating Identification Presentation (OIP)

#### 90.4.1.1 MT Voice (P-Asserted-Identity header Supported by server)

Description

The DUT shall display the identity as contained in the “P-Asserted-Identity” header when supported by the server.

Related 3GPP core specifications

3GPP 24.607, Section 4.5.2.1

Reason for test

To ensure the DUT displays the correct identity of the originating caller.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

Network is supporting P-Asserted-Identity header.

DUT is configured to display the identity from P-Asserted-Identity header

|  |  |  |
| --- | --- | --- |
| - | Test procedure | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | At DUT, check in SIP protocol messages:  - MT INVITE message contains “P-Asserted-Identity”  - MT INVITE message contains “From” header.  AT DUT, the identity of Client-1 is displayed (MSISDN or contact name if stored in DUT phonebook) based on the information received in P-Asserted-Identity header.  Call is successfully established with 2-way audio. |
| 2 | End the voice call between DUT and Client-1. | Call is ended. |

#### 90.4.1.2 MT Voice (P-Asserted-Identity header Not Supported by server)

Description

The DUT shall display the identity as contained in the “From” header if the “P-Asserted-Identity” is not supported by the server.

Related 3GPP core specifications

3GPP 24.607, Section 4.5.2.1

Reason for test

To ensure the DUT displays the correct identity of the originating caller.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

Network is not supporting P-Asserted-Identity header.

**Scenario A:** DUT is configured to display the identity based on “From” Header

|  |  |  |
| --- | --- | --- |
| - | Test procedure | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | At DUT, check in SIP protocol messages:  - MT INVITE message does not contain “P-Asserted-Identity”  - MT INVITE message contains “From” header.  AT DUT, the identity of Client-1 is displayed (MSISDN or contact name if stored in DUT phonebook).  Call is successfully established with 2-way audio. |
| 2 | End the voice call between DUT and Client-1. | Call is ended. |

**Scenario B:** DUT is configured to display the identity based on “P-Asserted-Identity” Header

|  |  |  |
| --- | --- | --- |
| - | Test procedure | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | At DUT, check in SIP protocol messages:  - MT INVITE message does not contain “P-Asserted-Identity”  - MT INVITE message contains “From” header.  AT DUT, the identity of Client-1 is not displayed. Only the string “unknown”.  Call is successfully established with 2-way audio. |
| 2 | End the voice call between DUT and Client-1. | Call is ended. |

### 90.4.2 Originating identification restriction (OIR)

#### 90.4.2.1 MO Voice (OIR Enabled temporarily) – Terminal Based

Description

The DUT shall restrict its identity when making an MO call with OIR temporarily enabled by the user.

Related 3GPP core specifications

3GPP 24.607, Section 4.5.2.1

Reason for test

To ensure the DUT restricts its identity when making an MO call with OIR temporarily enabled by the user.

Initial configuration

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

UICC subscription used in DUT has OIR enabled by default at the network.

|  |  |  |
| --- | --- | --- |
| - | Test procedure | Expected behaviour |
| 1 | At DUT, set “show my caller ID” setting set to “Hide number” in the call settings menu. | Confirm DUT indicates that “Hide my number” has been setup.  Confirm that no Ut/XCAP signalling has been sent to the network.  Confirm no NAS signalling has been sent to the network. |
| 2 | At DUT, make MO voice call to Client-1. | At DUT, check in SIP protocol messages:  - MO INVITE message contains “From” header with anonymous setting:  “From: “Anonymous” <sip:anonymous@anonymous.invalid>;tag= xxxxxxx.”  OPTIONAL [1]:  - MO INVITE message contains Privacy “header” tag.  OPTIONAL [2]:  - MO INVITE message contains “P-Preferred-Identity”  Or  - MO INVITE message DOES NOT contain “P-Preferred-Identity” and instead has Privacy header set to “id”  At Client-1, the identity of DUT is not displayed. E.g. “Unknown” or “private” caller id displayed.  Call is successfully established with 2-way audio. |
| 3 | End the voice call between DUT and Client-1. | Call is ended. |
| 4 | At DUT, set “show my caller ID” setting set to “show number” in the call settings menu. | Confirm DUT indicates that “Show my number” has been setup.  Confirm that no Ut/XCAP signalling has been sent to the network.  Confirm no NAS signalling has been sent to the network. |
| 5 | At DUT, make MO voice call to Client-1. | At DUT, check in SIP protocol messages:  - MO INVITE message contains “P-Preferred-Identity” header.  - MO INVITE message contains “From” header.  - MO INVITE messages contains the string “+g.3gpp.icsi-ref=”urn%3Aurn-7%3A3gpp-service.ims.icsi.mmtel” in Accept-Contact header.  AT Client-1, the identity of DUT is displayed (MSISDN or contact name if stored in Client-1 phonebook).  Call is successfully established with 2-way audio. |

#### 90.4.2.2 MT Voice (OIR Enabled on Client)

Description

The DUT shall handle incoming calls correctly when the Client has restricted its identity.

Related 3GPP core specifications

3GPP 24.607, Section 4.5.2.1

Reason for test

To ensure the DUT can handle incoming calls correctly when the caller identity is restricted.

Initial configuration

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

UICC subscription used in Client-1 has OIR enabled by default at the network.

|  |  |  |
| --- | --- | --- |
| - | Test procedure | Expected behaviour |
| 1 | At Client-1, make MO voice call to DUT using the string #31#DN (where DN is the MSISDN of DUT). | At DUT, check in SIP protocol messages:  - MT INVITE message contains “From” header with anonymous setting:  “From: “Anonymous” <sip:anonymous@anonymous.invalid>;tag= xxxxxxx.”  At DUT, the identity of Client-1 is not displayed. E.g. “Unknown” or “private” caller id displayed.  Call is successfully established with 2-way audio. |
| 2 | End the voice call between DUT and Client-1. | Call is ended. |

### 90.4.3 Terminating Identification Presentation (TIP)

#### 90.4.3.1Terminating Identification Presentation (TIP)

Description

Terminating Identification Presentation (TIP) service provides the originating party with the possibility of receiving trusted information in order to identify the terminating party.

Related core specifications

3GPP TS 24.608

Reason for test

To ensure when the DUT is subscribed to TIP it will:

- Correctly invoke the TIP procedures during the Initial request.

- Display the terminating client information (if included by the network).

Initial configuration

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

Terminating Identification Presentation is subscribed at DUT

Terminating Identification Presentation is supported by the network.

Client-1 has call forwarding unconditional activated to Client-2.

|  |  |  |
| --- | --- | --- |
| - | Test procedure | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1. | At DUT, check in SIP protocol messages:  - MO INVITE message contains “from-change” TAG in the Supported header.  The call is forwarded to Client-2  Confirm Client-2 identity is displayed on DUT  Call is successfully established with 2-way audio. |
| 2 | End the voice call between DUT and Client-2. | Call is ended. |

### 90.4.4 Terminating Identification Restriction (TIR)

#### 90.4.4.1 Terminating Identification Restriction (TIR)

Description

The Terminating Identification Restriction (TIR) is a service offered to the connected party which enables the connected party to prevent presentation of the terminating identity information to originating party.

Related core specifications

3GPP TS 24.608

Reason for test

To ensure when the DUT receives an MT voice call when subscribed to TIR, the originating Client side does not receive the DUT identity information

Initial configuration

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

Terminating Identification Restriction is subscribed at DUT

Terminating Identification Restriction is supported by the network.

Client-1 has call forwarding unconditional activated to DUT.

|  |  |  |
| --- | --- | --- |
| - | Test procedure | Expected behaviour |
| 1 | At Client-2, make MO voice call to Client-1. | The call is forwarded to DUT  At DUT, check in SIP protocol messages:  - Privacy header with privacy type of “id” is included in any non-100 responses  Confirm DUT identity is NOT displayed on Client-2.  Call is successfully established with 2-way audio. |
| 2 | End the voice call between DUT and Client-2. | Call is ended. |

### 90.4.5 Malicious Communication Identification (MCID)

### 90.4.6 Anonymous Communication Rejection (ACR)

### 90.4.7 Communication diversion services (CDIV)

#### 90.4.7.1 Communication Forwarding Unconditional (CFU)

Description

The DUT must be able to register/activate and erase/deactivate the Communication Diversion successfully over Ut/XCAP while registered for IMS services. When activated, the voice call shall be forwarded as expected for the Communication Diversion configured in the DUT.

Related core specifications

3GPP TS 24.229, TS 24.604

Reason for test

To confirm the DUT is able to successfully register/activate and erase/deactivate Communication Forwarding Unconditional over Ut/XCAP when registered for IMS services.

Initial Configuration

Network under test supports Communication Diversion over Ut/XCAP.

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

All Communication Forwarding are erased at DUT.

Client-1 and Client-2 required.

|  |  |  |
| --- | --- | --- |
| - | Test procedure | Expected behaviour |
| 1 | At DUT register CFU to MSISDN of Client-1. | Confirm DUT indicates CFU is activated.  Confirm DUT used Ut/XCAP protocol. |
| 2 | At DUT interrogate the status of CFU. | Confirm DUT indicates CFU is activated to MSISDN of Client-1.  Confirm DUT used Ut/XCAP protocol. |
| 3 | At Client-2 make MO voice call to DUT. | Confirm the voice call from Client-2 is forwarded to Client-1.  Confirm DUT shows no indication of the voice call from Client-2. |
| 4 | At Client-2 end the call. | Call is ended. |
| 5 | At DUT deactivate CFU. | Confirm DUT indicates CFU is deactivated.  Confirm DUT used Ut/XCAP protocol. |
| 6 | At DUT interrogate the status of CFU. | Confirm DUT indicates CFU is deactivated.  Confirm DUT used Ut/XCAP protocol.  Confirm MSISDN of Client-1 is still set as the destination number, even though the service is deactivated. |
| 7 | At DUT activate CFU. | Confirm DUT indicates CFU is activated.  Confirm DUT used Ut/XCAP protocol. |
| 8 | At DUT interrogate the status of CFU. | Confirm DUT indicates CFU is activated to MSISDN of Client-1.  Confirm DUT used Ut/XCAP protocol.  Confirm MSISDN of Client-1 is displayed as the destination number. |
| 9 | At DUT erase CFU to MSISDN of Client-1. | Confirm DUT indicates CFU is erased.  Confirm DUT used Ut/XCAP protocol. |
| 10 | At DUT interrogate the status of CFU. | Confirm DUT indicates CFU is deactivated.  Confirm DUT used Ut/XCAP protocol.  Confirm no destination number is pre-set anymore. |
| 11 | At Client-2 make MO voice call to DUT. | Confirm the voice call from Client-2 is received successfully on DUT. |
| 12 | End the voice call between DUT and Client-2. | Call is ended. |

#### 90.4.7.2 Communication Forwarding on no Reply (CFNRy)

Description

The DUT must be able to register/activate and erase/deactivate the Communication Diversion successfully over XCAP while registered for IMS services. When activated, the voice call shall be forwarded as expected for the Communication Diversion configured in the DUT.

Related core specifications

3GPP TS 24.229, TS 24.604

Reason for test

To confirm the DUT is able to successfully register/activate and erase/deactivate Communication Forwarding on no Reply over XCAP when registered for IMS services.

Initial Configuration

Network under test supports Communication Diversion over Ut/XCAP.

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

All Communication Forwarding are erased at DUT.

Client-1 and Client-2 required.

|  |  |  |
| --- | --- | --- |
| - | Test procedure | Expected behaviour |
| 1 | At DUT register CFNRy to MSISDN of Client-1. (If the DUT has an option to choose the ringing timer, then select 10s, otherwise the DUT default timer will be used.) | Confirm DUT indicates CFNRy is activated.  Confirm DUT used Ut/XCAP protocol. |
| 2 | At DUT interrogate the status of CFNRy. | Confirm DUT indicates CFNRy is activated to MSISDN of Client-1.  Confirm DUT used Ut/XCAP protocol. |
| 3 | At Client-2 make MO voice call to DUT. | Confirm the voice call from Client -2 is alerting at DUT.  Wait for the no reply timer set in step 1 to expire.  Confirm DUT is no longer alerting.  Confirm the voice call from Client -2 is forwarded to Client -1. |
| 4 | At Client-2 end the call. | Call is ended. |
| 5 | At DUT deactivate CFNRy. | Confirm DUT indicates CFNRy is deactivated.  Confirm DUT used Ut/XCAP protocol. |
| 6 | At DUT interrogate the status of CFNRy. | Confirm DUT indicates CFNRy is deactivated.  Confirm DUT used Ut/XCAP protocol.  Confirm MSISDN of Client-1 is still set as the destination number, even though the service is deactivated. |
| 7 | At DUT activate CFNRy. | Confirm DUT indicates CFNRy is activated.  Confirm DUT used Ut/XCAP protocol. |
| 8 | At DUT interrogate the status of CFNRy. | Confirm DUT indicates CFNRy is activated to MSISDN of Client-1.  Confirm DUT used Ut/XCAP protocol.  Confirm MSISDN of Client-1 is displayed as the destination number. |
| 9 | At DUT erase CFNRy to MSISDN of Client-1. | Confirm DUT indicates CFNRy is erased.  Confirm DUT used Ut/XCAP protocol. |
| 10 | At DUT interrogate the status of CFNRy. | Confirm DUT indicates CFNRy is deactivated.  Confirm DUT used Ut/XCAP protocol.  Confirm no destination number is pre-set anymore. |
| 11 | At Client-2 make MO voice call to DUT. | Confirm the voice call from Client -2 is alerting at DUT.  Wait for the no reply timer set in step 1 to expire.  Confirm the DUT is still alerting after the timer expiry and the call can be established. |
| 12 | End the voice call between DUT and Client-2. | Call is ended. |

#### 90.4.7.3 Communication Forwarding on Busy User (CFB)

Description

The DUT must be able to register/activate and erase/deactivate the Communication Diversion successfully over XCAP while registered for IMS service. When activated, the voice call shall be forwarded as expected for the Communication Diversion configured in the DUT.

Related core specifications

3GPP TS 24.229, TS 24.604

Reason for test

To confirm the DUT is able to successfully register/activate and erase/deactivate Communication Forwarding on Busy User over XCAP when registered for IMS services.

Initial Configuration

Network under test supports Communication Diversion over Ut/XCAP.

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

All Communication Forwarding are erased at DUT.

Communication Waiting is deactivated on DUT.

Client-1, Client-2 and Client-3 required.

|  |  |  |
| --- | --- | --- |
| - | Test procedure | Expected behaviour |
| 1 | At DUT register CFB to MSISDN of Client-1. | Confirm DUT indicates CFB is activated.  Confirm DUT used Ut/XCAP protocol. |
| 2 | At DUT interrogate the status of CFB. | Confirm DUT indicates CFB is activated to MSISDN of Client-1.  Confirm DUT used Ut/XCAP protocol. |
| 3 | At DUT make MO voice call to Client-3. | Confirm the voice call is established. |
| 4 | At Client-2 make MO voice call to DUT. | Confirm the voice call from Client-2 is forwarded to Client-1.  Confirm DUT shows no indication of the voice call from Client-2. |
| 5 | At Client-2 end the call. | Call is ended. |
| 6 | At DUT end the call. | Call is ended. |
| 7 | At DUT deactivate CFB. | Confirm DUT indicates CFB is deactivated.  Confirm DUT used Ut/XCAP protocol. |
| 8 | At DUT interrogate the status of CFB. | Confirm DUT indicates CFB is deactivated.  Confirm DUT used Ut/XCAP protocol.  Confirm MSISDN of Client-1 is still set as the destination number, even though the service is deactivated. |
| 9 | At DUT activate CFB. | Confirm DUT indicates CFB is activated.  Confirm DUT used Ut/XCAP protocol. |
| 10 | At DUT interrogate the status of CFB. | Confirm DUT indicates CFB is activated to MSISDN of Client-1.  Confirm DUT used Ut/XCAP protocol.  Confirm MSISDN of Client-1 is displayed as the destination number. |
| 11 | At DUT erase CFB to MSISDN of Client-1. | Confirm DUT indicates CFB is erased.  Confirm DUT used Ut/XCAP protocol. |
| 12 | At DUT interrogate the status of CFB. | Confirm DUT indicates CFB is deactivated.  Confirm DUT used Ut/XCAP protocol.  Confirm no destination number is pre-set anymore. |
| 13 | At DUT make MO voice call to Client-3. | Confirm the voice call is established. |
| 14 | At Client-2 make MO voice call to DUT. | Confirm Client-2 displays a notification that DUT is busy in another call (audible/visual) and the call is not forwarded. |
| 15 | End the voice call between DUT and Client-3. | Call is ended. |

#### 90.4.7.4 Communication Forwarding Not Reachable (CFNRc)

Description

The DUT must be able to register/activate and erase/deactivate the Communication Diversion successfully over XCAP while registered for IMS services. When activated, the voice call shall be forwarded as expected for the Communication Diversion configured in the DUT.

Related core specifications

3GPP TS 24.229, TS 24.604

Reason for test

To confirm the DUT is able to successfully register/activate and erase/deactivate Communication Forwarding on Subscriber not Reachable over XCAP when registered for IMS services.

Initial Configuration

Network under test supports Communication Diversion over Ut/XCAP.

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

All Communication Forwarding are erased at DUT.

Client-1 and Client-2 required.

|  |  |  |
| --- | --- | --- |
| - | Test procedure | Expected behaviour |
| 1 | At DUT register CFNRc to MSISDN of Client-1. | Confirm DUT indicates CFNRc is activated.  Confirm DUT used Ut/XCAP protocol. |
| 2 | At DUT interrogate the status of CFNRc. | Confirm DUT indicates CFNRc is activated to MSISDN of Client-1.  Confirm DUT used Ut/XCAP protocol. |
| 3 | At DUT enable flight mode / power of DUT. | DUT is out of service. |
| 4 | At Client-2 make MO voice call to DUT. | Confirm the voice call from Client-2 is forwarded to Client-1. |
| 5 | At Client-2 end the call. | Call is ended. |
| 6 | At DUT disable flight mode / power on DUT. | DUT is back in service. |
| 7 | At DUT deactivate CFNRc. | Confirm DUT indicates CFNRc is deactivated.  Confirm DUT used Ut/XCAP protocol. |
| 8 | At DUT interrogate the status of CFNRc. | Confirm DUT indicates CFNRc is deactivated.  Confirm DUT used Ut/XCAP protocol.  Confirm MSISDN of Client-1 is still set as the destination number, even though the service is deactivated. |
| 9 | At DUT activate CFNRc. | Confirm DUT indicates CFNRc is activated.  Confirm DUT used Ut/XCAP protocol. |
| 10 | At DUT interrogate the status of CFNRc. | Confirm DUT indicates CFNRc is activated to MSISDN of Client-1.  Confirm DUT used Ut/XCAP protocol.  Confirm MSISDN of Client-1 is displayed as the destination number. |
| 11 | At DUT erase CFNRc to MSISDN of Client-1. | Confirm DUT indicates CFNRc is erased.  Confirm DUT used Ut/XCAP protocol. |
| 12 | At DUT interrogate the status of CFNRc. | Confirm DUT indicates CFNRc is deactivated.  Confirm DUT used Ut/XCAP protocol.  Confirm no destination number is pre-set anymore. |
| 13 | At DUT enable flight mode / power of DUT. | DUT is out of service. |
| 14 | At Client-2 make MO voice call to DUT. | Confirm Client-2 displays a notification that DUT is not available (audible/visual) and the call is not forwarded. |
| 15 | At DUT disable flight mode / power on DUT. | DUT is back in service. |

### 90.4.8 Communication Waiting (CW)

The Communication Waiting (CW) service enables a terminating party to be informed at the time that a new communication is requested, and that no resources are available for that incoming communication.

#### 90.4.8.1 Communication Waiting (CW) – Configuration

##### 90.4.8.1.1 Communication Waiting (CW) – Configuration – Terminal Based

Description

For Terminal based Communication Waiting, the operation is handled at the DUT. The user shall be able to activate and deactivate Communication waiting and interrogate the current status.

Related core specifications

GSMA IR.92, clause 2.3.4; NG.114 2.3.4

3GPP TS 24.615

Reason for test

To verify the DUT can activate, deactivate and interrogate Terminal based Communication Waiting without sending any signalling (XCAP/Ut) to the network. I.e. it is handled at the Terminal.

Initial configuration

Communication Waiting is activated in the network.

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

Communication Waiting is activated in the DUT.

|  |  |  |
| --- | --- | --- |
| - | Test procedure | Expected behaviour |
| 1 | At DUT, deactivate CW | Confirm DUT indicates that CW has been deactivated.  Confirm that no Ut/XCAP signalling has been sent to the network.  Confirm no NAS signalling has been sent to the network. |
| 2 | At DUT interrogate CW status | Confirm DUT indicates that CW is deactivated.  Confirm that no Ut/XCAP signalling has been sent to the network.  Confirm no NAS signalling has been sent to the network. |
| 3 | At DUT activate CW | Confirm DUT indicates that CW has been activated.  Confirm that no Ut/XCAP signalling has been sent to the network.  Confirm no NAS signalling has been sent to the network. |
| 4 | At DUT interrogate CW status | Confirm DUT indicates that CW is activated.  Confirm that no Ut/XCAP signalling has been sent to the network.  Confirm no NAS signalling has been sent to the network. |

##### 90.4.8.1.2 Communication Waiting (CW) – Configuration – Network based (Ut/XCAP)

Description

For Network based Communication Waiting, the operation is handled at the network side. The user shall be able to activate and deactivate Communication waiting and interrogate the current status.

Related core specifications

GSMA IR.92, clause 2.3.4; NG.114 2.3.4

3GPP TS 24.615

Reason for test

To verify the DUT can activate, deactivate and interrogate Network based Communication Waiting using Ut/XCAP.

Initial configuration

Communication Waiting is activated in the network.

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

|  |  |  |
| --- | --- | --- |
| - | Test procedure | Expected behaviour |
| 1 | At DUT, deactivate CW | Confirm DUT indicates that CW has been deactivated.  Confirm DUT used Ut/XCAP protocol. |
| 2 | At DUT interrogate CW status | Confirm DUT indicates that CW is deactivated.  Confirm DUT used Ut/XCAP protocol. |
| 3 | At DUT activate CW | Confirm DUT indicates that CW has been activated.  Confirm DUT used Ut/XCAP protocol. |
| 4 | At DUT interrogate CW status | Confirm DUT indicates that CW is activated.  Confirm DUT used Ut/XCAP protocol. |

#### 90.4.8.2 Communication Waiting (CW) – Invocation

##### 90.4.8.2.1 Communication Waiting (CW) – Invocation – Activated in DUT – Accept and Hold

Description

For Terminal based Communication Waiting, the operation is handled at the DUT. When a second incoming call is received, the DUT must handle the call according to the DUT Communication Waiting status.

Related core specifications

GSMA IR.92, clause 2.3.4; NG.114 2.3.4

3GPP TS 24.615

Reason for test

To verify when Terminal based Communication Waiting is activated and the DUT is in an ongoing voice call, the DUT indicates to the user when a 2nd incoming call is received. If the 2nd incoming call is answered, the initial call can be placed on hold.

Initial configuration

Communication Waiting is activated in the network.

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

Communication Waiting is activated in the DUT.

Client-1 and Client-2 required.

**Scenario A**: Voice

|  |  |  |
| --- | --- | --- |
| - | Test procedure | Expected behaviour |
| 1 | At DUT, make MO Voice call to Client-1. | Confirm Voice call with Client-1 is established.  Confirm 2-way audio. |
| 2 | At DUT, receive MT Voice call from Client-2. | Confirm DUT has an audible / visual notification that a 2nd incoming call from Client-2 is waiting. |
| 3 | At DUT, accept the Voice call from Client-2 and put the Voice call with Client-1 on hold. | Confirm DUT puts Client-1 on hold.  Confirm Voice call with Client-2 is established. Confirm 2-way audio. |
| 4 | At Client-1, end the call with DUT. | Confirm the held call with Client-1 is released.  Confirm the active call with Client-2 is stable with 2-way audio. |
| 5 | At DUT, end all calls. | Confirm all calls are released. |

**Scenario B:** Video

|  |  |  |
| --- | --- | --- |
| - | Test procedure | Expected behaviour |
| 1 | At DUT, make MO Video call to Client-1. | Confirm Video call with Client-1 is established.  Confirm 2-way audio.  Confirm 2-way video media stream between DUT and Client-1. |
| 2 | At DUT, receive MT Voice call from Client-2. | Confirm DUT has an audible / visual notification that a 2nd incoming call from Client-2 is waiting. |
| 3 | At DUT, accept the Voice call from Client-2 and put the Video call with Client-1 on hold. | Confirm DUT puts Client-1 on hold.  Confirm Voice call with Client-2 is established. Confirm 2-way audio. |
| 4 | At Client-1, end the call with DUT. | Confirm the held call with Client-1 is released.  Confirm the active call with Client-2 is stable with 2-way audio. |
| 5 | At DUT, end all calls. | Confirm all calls are released. |

##### 90.4.8.2.2 Communication Waiting (CW) – Invocation – Activated in DUT – Accept and Release

Description

For Terminal based Communication Waiting, the operation is handled at the DUT. When a second incoming call is received, the DUT must handle the call according to the DUT Communication Waiting status.

Related core specifications

GSMA IR.92, clause 2.3.4; NG.114 2.3.4

3GPP TS 24.615

Reason for test

To verify when Terminal based Communication Waiting is activated and the DUT is in an ongoing voice call, the DUT indicates to the user when a 2nd incoming call is received. If the 2nd incoming call is answered, the initial call can be released.

Initial configuration

Communication Waiting is activated in the network.

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

Communication Waiting is activated in the DUT.

Client-1 and Client-2 required.

|  |  |  |
| --- | --- | --- |
| Scenario A: Voice- | Test procedure | Expected behaviour |
| 1 | At DUT, make MO Voice call to Client-1. | Confirm Voice call with Client-1 is established.  Confirm 2-way audio. |
| 2 | At DUT, receive MT Voice call from Client-2. | Confirm DUT has an audible / visual notification that a 2nd incoming call from Client-2 is waiting. |
| 3 | At DUT, accept the Voice call from Client-2 and release the Voice call with Client-1. | Confirm DUT releases Client-1.  Confirm Voice call with Client-2 is established. Confirm 2-way audio. |
| 4 | At DUT, end the call with Client-2. | Confirm the active call with Client-2 is released. |

**Scenario B:** Video

|  |  |  |
| --- | --- | --- |
| - | Test procedure | Expected behaviour |
| 1 | At DUT, make MO Video call to Client-1. | Confirm Video call with Client-1 is established.  Confirm 2-way audio.  Confirm 2-way video media stream between DUT and Client-1. |
| 2 | At DUT, receive MT Voice call from Client-2. | Confirm DUT has an audible / visual notification that a 2nd incoming call from Client-2 is waiting. |
| 3 | At DUT, accept the Voice call from Client-2 and release the Video call with Client-1. | Confirm DUT releases Client-1.  Confirm Voice call with Client-2 is established. Confirm 2-way audio. |
| 4 | At DUT, end the call with Client-2. | Confirm the active call with Client-2 is released. |

##### 90.4.8.2.3 Communication Waiting (CW) – Invocation – Activated in DUT – Reject

Description

For Terminal based Communication Waiting, the operation is handled at the DUT. When a second incoming call is received, the DUT must handle the call according to the DUT Communication Waiting status.

Related core specifications

GSMA IR.92, clause 2.3.4; NG.114 2.3.4

3GPP TS 24.615

Reason for test

To verify when Terminal based Communication Waiting is activated and the DUT is in an ongoing voice call, the DUT indicates to the user when a 2nd incoming call is received. If the 2nd incoming call is rejected, the DUT sends “486 Busy Here” via the SIP protocol and the 2nd caller displays a notification that the DUT is busy.

Initial configuration

Communication Waiting is activated in the network.

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

Communication Waiting is activated in the DUT.

Client-1 and Client-2 required.

**Scenario A:** Voice

|  |  |  |
| --- | --- | --- |
| - | Test procedure | Expected behaviour |
| 1 | At DUT, make MO Voice call to Client-1. | Confirm Voice call with Client-1 is established.  Confirm 2-way audio. |
| 2 | At DUT, receive MT Voice call from Client-2. | Confirm DUT has an audible / visual notification that a 2nd incoming call from Client-2 is waiting. |
| 3 | At DUT, reject the Voice call from Client-2. | Confirm Client-2 indicates that the DUT is busy (busy tones / visual notification).  Confirm DUT remains in voice call with Client-1 and it is unaffected.  Confirm via a SIP logger that DUT has sent “486 Busy Here” message. |
| 4 | At DUT, end the call with Client-1. | Confirm the active call with Client-1 is released. |

**Scenario B:** Video

|  |  |  |
| --- | --- | --- |
| - | Test procedure | Expected behaviour |
| 1 | At DUT, make MO Video call to Client-1. | Confirm Video call with Client-1 is established.  Confirm 2-way audio.  Confirm 2-way video media stream between DUT and Client-1. |
| 2 | At DUT, receive MT Voice call from Client-2. | Confirm DUT has an audible / visual notification that a 2nd incoming call from Client-2 is waiting. |
| 3 | At DUT, reject the Voice call from Client-2. | Confirm Client-2 indicates that the DUT is busy (busy tones / visual notification).  Confirm DUT remains in video call with Client-1 and it is unaffected.  Confirm via a SIP logger that DUT has sent “486 Busy Here” message. |
| 4 | At DUT, end the call with Client-1. | Confirm the active call with Client-1 is released. |

##### 90.4.8.2.4 Communication Waiting (CW) – Invocation – Activated in DUT – Distant clear

Description

For Terminal based Communication Waiting, the operation is handled at the DUT. When a second incoming call is received, the DUT must handle the call according to the DUT Communication Waiting status.

Related core specifications

GSMA IR.92, clause 2.3.4; NG.114 2.3.4

3GPP TS 24.615

Reason for test

To verify when Terminal based Communication Waiting is activated and the DUT is in an ongoing voice call, the DUT indicates to the user when a 2nd incoming call is received. If the distant party clears the 1st call, the DUT must continue to alert with the 2nd incoming call and the call can be successfully established.

Initial configuration

Communication Waiting is activated in the network.

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

Communication Waiting is activated in the DUT.

Client-1 and Client-2 required.

**Scenario A**: Voice

|  |  |  |
| --- | --- | --- |
| - | Test procedure | Expected behaviour |
| 1 | At DUT, make MO Voice call to Client-1. | Confirm Voice call with Client-1 is established.  Confirm 2-way audio. |
| 2 | At DUT, receive MT Voice call from Client-2. | Confirm DUT has an audible / visual notification that a 2nd incoming call from Client-2 is waiting. |
| 3 | At Client-1, end the call to DUT. | Confirm the active call with Client-1 is released.  Confirm DUT is alerting the call from Client-2. |
| 4 | At DUT, accept the Voice call from Client-2 | Confirm Voice call with Client-2 is established. Confirm 2-way audio. |
| 5 | At DUT, end the call with Client-2. | Confirm the active call with Client-2 is released. |

**Scenario B:** Video

|  |  |  |
| --- | --- | --- |
| - | Test procedure | Expected behaviour |
| 1 | At DUT, make MO Video call to Client-1. | Confirm Video call with Client-1 is established.  Confirm 2-way audio.  Confirm 2-way video media stream between DUT and Client-1. |
| 2 | At DUT, receive MT Voice call from Client-2. | Confirm DUT has an audible / visual notification that a 2nd incoming call from Client-2 is waiting. |
| 3 | At Client-1, end the call to DUT. | Confirm the active call with Client-1 is released.  Confirm DUT is alerting the call from Client-2. |
| 4 | At DUT, accept the Voice call from Client-2 | Confirm Voice call with Client-2 is established. Confirm 2-way audio. |
| 5 | At DUT, end the call with Client-2. | Confirm the active call with Client-2 is released. |

##### 90.4.8.2.5 Communication Waiting (CW) – Invocation – Deactivated in DUT – Terminal Based

Description

For Terminal based Communication Waiting, the operation is handled at the DUT. When a second incoming call is received, the DUT must handle the call according to the DUT Communication Waiting status.

Related core specifications

GSMA IR.92, clause 2.3.4; NG.114 2.3.4

3GPP TS 24.615

Reason for test

To verify when Terminal based Communication Waiting is deactivated and the DUT is in an ongoing voice call, the DUT sends “486 Busy Here” via the SIP protocol and the 2nd caller displays a notification that the DUT is busy.

Initial configuration

Communication Waiting is activated in the network.

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

Communication Waiting is deactivated in the DUT.

Client-1 and Client-2 required.

|  |  |  |
| --- | --- | --- |
| - | Test procedure | Expected behaviour |
| 1 | At DUT, make MO Voice call to Client-1. | Confirm Voice call with Client-1 is established.  Confirm 2-way audio. |
| 2 | At DUT, receive MT Voice call from Client-2. | Confirm DUT does not display any indication of the 2nd incoming call.  Confirm Client-2 indicates that the DUT is busy (busy tones / visual notification).  Confirm DUT remains in voice call with Client-1 and it is unaffected.  Confirm via a SIP logger that DUT has sent “486 Busy Here” message. |
| 3 | At DUT, end the call with Client-1. | Confirm the active call with Client-1 is released. |

##### 90.4.8.2.6 Communication Waiting (CW) – Invocation – Deactivated in DUT – Terminal Based – Interworking with CS Domain

Description

For Terminal based Communication Waiting, the operation is handled at the DUT. If DUT moves to a location where only a CS network is available, when a 2nd incoming call is received, the DUT must handle the call correctly.

Related core specifications

GSMA IR.92, clause 2.3.4; A.8; NG.114 2.3.4

Reason for test

If Terminal based Communication Waiting is enabled at DUT, when a 2nd incoming call is received, the DUT indicates a 2nd call is waiting. If Terminal based Communication Waiting is disabled at DUT and a 2nd incoming call is received, the DUT sends a RELEASE COMPLETE message with cause #17 “User busy” to the 2nd client.

Initial configuration:

Network is supporting Terminal based Communication Waiting in the CS domain.

Communication Waiting is activated in the network.

The DUT is camping on a CS network (UTRAN/GERAN).

Communication Waiting is deactivated in the DUT.

Client-1 and Client-2 required.

|  |  |  |
| --- | --- | --- |
| - | Test procedure | Expected behaviour |
| 1 | At DUT, make MO Voice call to Client-1. | Confirm Voice call with Client-1 is established.  Confirm 2-way audio. |
| 2 | At DUT, receive MT Voice call from Client-2. | Confirm DUT does not display any indication of the 2nd incoming call.  Confirm Client-2 indicates that the DUT is busy (busy tones / visual notification).  Confirm DUT remains in call with Client-1 and it is unaffected.  Confirm via a protocol trace that DUT has sent a RELEASE COMPLETE message with cause #17 “User busy” to Client-2. |
| 3 | At DUT, end the call with Client-1. | Confirm the active call with Client-1 is released. |

##### 90.4.8.2.7 Communication Waiting (CW) – Deactivated in DUT – Network Based (Ut/XCAP)

Description

For Network based Communication Waiting, the operation is handled at the network. When a second incoming call is received, the network must handle the call according to the network Communication Waiting status.

Related core specifications

GSMA IR.92, clause 2.3.4; NG.114 2.3.4

3GPP TS 24.615

Reason for test

To verify when Network based Communication Waiting is deactivated and the DUT is in an ongoing voice call, the network rejects the call.

Initial configuration

Communication Waiting is deactivated in the network.

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

Client-1 and Client-2 required.

|  |  |  |
| --- | --- | --- |
| - | Test procedure | Expected behaviour |
| 1 | At DUT, make MO Voice call to Client-1. | Confirm Voice call with Client-1 is established.  Confirm 2-way audio. |
| 2 | At DUT, receive MT Voice call from Client-2. | Confirm DUT does not display any indication of the 2nd incoming call.  Confirm Client-2 indicates that the DUT is busy (busy tones / visual notification).  Confirm DUT remains in call with Client-1 and it is unaffected. |
| 3 | At DUT, end the call with Client-1. | Confirm the active call with Client-1 is released. |

### 90.4.9 Communication Hold (HOLD)

The Communication Hold supplementary service enables a user to suspend the reception of media stream(s) of an established IP multimedia session, and resume the media stream(s) at a later time.

#### 90.4.9.1 MO Voice Communication Hold

Description

MO Communication Hold operation during an IMS Voice call

Related core specifications

3GPP TS 24.173, 3GPP TS 24.610

GSMA IR.92, section 2.3.10; NG.114 2.3.10

Reason for test

To ensure there is no audio on invoking side when the call is placed on hold. When the call is retrieved, there is 2-way audio.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

DUT is an ongoing Voice call with Client-1.

|  |  |  |
| --- | --- | --- |
| - | Test procedure | Expected behaviour |
| 1 | At DUT, place Client-1 on hold using the menu option. | Confirm there is a visible indication on the DUT that the call is held.  Confirm there is no audio is either direction. |
| 2 | Wait 15 seconds. | Confirm call is on hold. |
| 3 | At DUT, retrieve the call using the menu option. | Confirm the call with Client-1 is restored.  Confirm 2-way audio between DUT and Client-1. |
| 4 | Wait 15 seconds. | Confirm call is active. |
| 5 | At DUT, place Client-1 on hold using the menu option. | Confirm there is a visible indication on the DUT that the call is held.  Confirm there is no audio on invoking side (DUT) |
| 6 | Wait 15 seconds. | Confirm call is on hold. |
| 7 | At DUT, end the voice call while it is on hold. | Confirm the call is successfully ended. |

#### 90.4.9.2 MT Voice Communication Hold

Description

MT Communication Hold operation during an IMS Voice call

Related core specifications

3GPP TS 24.173, 3GPP TS 24.610

GSMA IR.92, section 2.3.10; NG.114 2.3.10

Reason for test

To ensure there is no audio on held side or announcement is played to the held user when the call is placed on hold When the call is retrieved, there is 2-way audio.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

DUT is an ongoing Voice call with Client-1.

|  |  |  |
| --- | --- | --- |
| - | Test procedure | Expected behaviour |
| 1 | At Client-1, place DUT on hold. | Confirm there is a visible notification on the DUT that the call has been placed on hold (if supported by server).  Confirm call hold tone can be heard (if supported by server).  Confirm there is no audio in either direction.  If supported by the network – an announcement will be played at held party instead of no audio in both directions. |
| 2 | Wait 15 seconds. | Confirm call is on hold. |
| 3 | At Client-1, retrieve the call. | Confirm the call with DUT is restored.  Confirm there is a visible notification on the DUT that the call has been retrieved (if supported by server).  Confirm call hold tone can no longer be heard (If there was a call hold tone when held).  Confirm 2-way audio between DUT and Client-1. |
| 4 | Wait 15 seconds. | Confirm call is active. |
| 5 | At Client-1, place DUT on hold. | Confirm there is a visible notification on the DUT that the call has been placed on hold (if supported by server).  Confirm call hold tone can be heard (if supported by server).  Confirm there is no audio in either direction.  If supported by the network – an announcement will be played at held party instead of no audio in both directions. |
| 6 | Wait 15 seconds. | Confirm call is on hold. |
| 7 | At Client-1, end the voice call while it is on hold. | Confirm the call is successfully ended. |

#### 90.4.9.3 MO & MT Voice Communication Hold

Description

MO and MT Communication Hold operation during an IMS Voice call

Related core specifications

3GPP TS 24.173, 3GPP TS 24.610

GSMA IR.92, section 2.3.10; NG.114 2.3.10

Reason for test

To ensure there is no audio in either direction when the call is placed on hold by both parties. There is only 2-way audio when both parties have retrieved the call.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

DUT is an ongoing Voice call with Client-1.

|  |  |  |
| --- | --- | --- |
| - | Test procedure | Expected behaviour |
| 1 | At DUT, place Client-1 on hold using the menu option. | Confirm there is a visible indication on the DUT that the call is held.  Confirm there is no audio on invoking side (DUT) |
| 2 | Wait 15 seconds. | Confirm call is on hold in 1 direction (Held by DUT). |
| 3 | At Client-1, place DUT on hold. | Confirm there is a visible notification on the DUT that the call has been placed on hold (if supported by server).  Confirm there is no audio in either direction. |
| 4 | Wait 15 seconds. | Confirm call is on hold in both directions (Held by DUT and Client-1). |
| 5 | At DUT, retrieve the call using the menu option. | Confirm the call from DUT to Client-1 is retrieved but there is still no audio in either direction because the call from Client-1 to DUT remains held.  If supported by the network – an announcement will be played at held party instead of no audio in both directions. |
| 6 | Wait 15 seconds. | Confirm call is on hold in 1 direction (Held by Client-1). |
| 7 | At Client-1, retrieve the call. | Confirm the call with DUT is restored.  Confirm there is a visible notification on the DUT that the call has been retrieved (if supported by server).  Confirm 2-way audio between DUT and Client-1. |
| 8 | At DUT, end the voice call. | Confirm the call is successfully ended. |

#### 90.4.9.4 MO Video Communication Hold

Description

MO Communication Hold operation during an IMS Video call

Related core specifications

3GPP TS 24.173, 3GPP TS 24.610

GSMA IR.92, section 2.3.10; NG.114 2.3.10

Reason for test

To ensure there is no audio or video media stream on invoking side when the call is placed on hold. When the call is retrieved, there is 2-way audio and video media stream.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

DUT is an ongoing Video call with Client-1.

|  |  |  |
| --- | --- | --- |
| - | Test procedure | Expected behaviour |
| 1 | At DUT, place Client-1 on hold using the menu option. | Confirm there is a visible indication on the DUT that the call is held.  Confirm there is no audio on invoking side  Confirm there is no video media stream on invoking side |
| 2 | Wait 15 seconds. | Confirm call is on hold. |
| 3 | At DUT, retrieve the call using the menu option. | Confirm the call with Client-1 is restored.  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1. |
| 4 | Wait 15 seconds. | Confirm call is active. |
| 5 | At DUT, place Client-1 on hold using the menu option. | Confirm there is a visible indication on the DUT that the call is held.  Confirm there is no audio on invoking side Confirm there is no video media stream on invoking side |
| 6 | Wait 15 seconds. | Confirm call is on hold. |
| 7 | At DUT, end the video call while it is on hold. | Confirm the call is successfully ended. |

#### 90.4.9.5 MT Video Communication Hold

Description

MT Communication Hold operation during an IMS Video call

Related core specifications

3GPP TS 24.173, 3GPP TS 24.610

GSMA IR.92, section 2.3.10; NG.114 2.3.10

Reason for test

To ensure there is no audio or video media stream on held side or an announcement is played to the held user when the call is placed on hold. When the call is retrieved, there is 2-way audio and video media stream.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

DUT is an ongoing Video call with Client-1.

|  |  |  |
| --- | --- | --- |
| - | Test procedure | Expected behaviour |
| 1 | At Client-1, place DUT on hold. | Confirm there is a visible notification on the DUT that the call has been placed on hold (if supported by server).  Confirm call hold tone can be heard (if supported by server).  Confirm there is no audio in either direction.  Confirm there is no video media stream in either direction.  If supported by the network – an announcement will be played at held party instead of no audio/video media stream in both directions. |
| 2 | Wait 15 seconds. | Confirm call is on hold. |
| 3 | At Client-1, retrieve the call. | Confirm the call with DUT is restored.  Confirm there is a visible notification on the DUT that the call has been retrieved (if supported by server).  Confirm call hold tone can no longer be heard (If there was a call hold tone when held).  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1. |
| 4 | Wait 15 seconds. | Confirm call is active. |
| 5 | At Client-1, place DUT on hold. | Confirm there is a visible notification on the DUT that the call has been placed on hold (if supported by server).  Confirm call hold tone can be heard (if supported by server).  Confirm there is no audio ins either direction.  Confirm there is no video media stream in either direction.  If supported by the network – an announcement will be played at held party instead of no audio/video media stream in both directions. |
| 6 | Wait 15 seconds. | Confirm call is on hold. |
| 7 | At Client-1, end the video call while it is on hold. | Confirm the call is successfully ended. |

#### 90.4.9.6 MO & MT Video Communication Hold

Description

MO and MT Communication Hold operation during an IMS Video call

Related core specifications

3GPP TS 24.173, 3GPP TS 24.610

GSMA IR.92, section 2.3.10; NG.114 2.3.10

Reason for test

To ensure there is no audio or video media stream in either direction when the call is placed on hold by both parties. There is only 2-way audio and video media stream when both parties have retrieved the call.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

DUT is an ongoing Video call with Client-1.

|  |  |  |
| --- | --- | --- |
| - | Test procedure | Expected behaviour |
| 1 | At DUT, place Client-1 on hold using the menu option. | Confirm there is a visible indication on the DUT that the call is held.  Confirm there is no audio is either direction.  Confirm there is no video media stream in either direction.  If supported by the network – an announcement will be played at held party instead of no audio/video media stream in both directions. |
| 2 | Wait 15 seconds. | Confirm call is on hold in 1 direction (Held by DUT). |
| 3 | At Client-1, place DUT on hold. | Confirm there is a visible notification on the DUT that the call has been placed on hold (if supported by server).  Confirm there is no audio is either direction.  Confirm there is no video media stream in either direction. |
| 4 | Wait 15 seconds. | Confirm call is on hold in both directions (Held by DUT and Client-1). |
| 5 | At DUT, retrieve the call using the menu option. | Confirm the call from DUT to Client-1 is retrieved but there is still no audio or video media stream in either direction because the call from Client-1 to DUT remains held.  If supported by the network – an announcement will be played at held party instead of no audio/video media stream in both directions. |
| 6 | Wait 15 seconds. | Confirm call is on hold in 1 direction (Held by Client-1). |
| 7 | At Client-1, retrieve the call. | Confirm the call with DUT is restored.  Confirm there is a visible notification on the DUT that the call has been retrieved (if supported by server).  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1. |
| 8 | At DUT, end the video call. | Confirm the call is successfully ended. |

### 90.4.10 Communication Barring (CB)

#### 90.4.10.1 Barring of all Incoming Calls (BAIC)

Description

The DUT must be able to activate and deactivate the Communication Baring successfully over Ut/XCAP while registered for IMS services. When activated, the voice call shall be barred as expected for the Communication barring configured in the DUT.

Related core specifications

3GPP TS 24.229, TS.24.611

Reason for test

To confirm the DUT is able to successfully activate and deactivate Communication Barring of all incoming calls over Ut/XCAP when registered for IMS services.

Initial Configuration

Network under test supports Communication Barring over Ut/XCAP.

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

Client-1 required.

|  |  |  |
| --- | --- | --- |
| - | Test procedure | Expected behaviour |
| 1 | At DUT, activate BAIC. | Confirm DUT indicates BAIC is activated.  Confirm DUT used Ut/XCAP protocol. |
| 2 | At DUT interrogate the status of BAIC. | Confirm DUT indicates BAIC is activated.  Confirm DUT used Ut/XCAP protocol. |
| 3 | At DUT, receive MT voice call from Client-1. | Confirm the voice call from Client-1 is not established.  Confirm DUT does not show any indication of the call. |
| 4 | At DUT, deactivate BAIC | Confirm DUT indicates BAIC is deactivated.  Confirm DUT used Ut/XCAP protocol. |
| 5 | At DUT interrogate the status of BAIC. | Confirm DUT indicates BAIC is deactivated.  Confirm DUT used Ut/XCAP protocol. |
| 6 | At DUT, receive MT voice call from Client-1. | Confirm the voice call from Client-1 is received successfully on DUT. |
| 7 | End the voice call between DUT and Client-1. | Call is ended. |

#### 90.4.10.2 Barring of all Outgoing Calls (BAOC)

Description

The DUT must be able to activate and deactivate the Communication Baring successfully over XCAP while registered for IMS services. When activated, the voice call shall be barred as expected for the Communication barring configured in the DUT.

Related core specifications

3GPP TS 24.229, TS.24.611

Reason for test

To confirm the DUT is able to successfully activate and deactivate Communication Barring of all outgoing calls over XCAP when registered for IMS services.

Initial Configuration

Network under test supports Communication Barring over Ut/XCAP.

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

Client-1 required.

|  |  |  |
| --- | --- | --- |
| - | Test procedure | Expected behaviour |
| 1 | At DUT, activate BAOC. | Confirm DUT indicates BAOC is activated.  Confirm DUT used Ut/XCAP protocol. |
| 2 | At DUT interrogate the status of BAOC. | Confirm DUT indicates BAOC is activated.  Confirm DUT used Ut/XCAP protocol. |
| 3 | At DUT, make MO voice call to Client-1. | Confirm the voice call to Client-1 is not established. |
| 4 | At DUT, deactivate BAOC | Confirm DUT indicates BAOC is deactivated.  Confirm DUT used Ut/XCAP protocol. |
| 5 | At DUT interrogate the status of BAIC. | Confirm DUT indicates BAOC is deactivated.  Confirm DUT used Ut/XCAP protocol. |
| 6 | At DUT, make MO voice call to Client-1. | Confirm the voice call to Client-1 is setup successfully on DUT. |
| 7 | End the voice call between DUT and Client-1. | Call is ended. |

#### 90.4.10.3 Barring of Outgoing International Calls (BOIC)

Description

The DUT must be able to activate and deactivate the Communication Baring successfully over XCAP while registered for IMS services. When activated, the voice call shall be barred as expected for the Communication barring configured in the DUT.

Related core specifications

3GPP TS 24.229, TS.24.611

Reason for test

To confirm the DUT is able to successfully activate and deactivate Communication Barring of all outgoing international calls over XCAP when registered for IMS services.

Initial Configuration

Network under test supports Communication Barring over Ut/XCAP.

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

Client-1 and Client-2 required.

The MSISDN of Client-1 has a different MCC to the SIM used in DUT.

The MSISDN of Client-2 has the same MCC to the SIM used in DUT.

|  |  |  |
| --- | --- | --- |
| - | Test procedure | Expected behaviour |
| 1 | At DUT, activate BOIC. | Confirm DUT indicates BOIC is activated.  Confirm DUT used Ut/XCAP protocol. |
| 2 | At DUT interrogate the status of BOIC. | Confirm DUT indicates BOIC is activated.  Confirm DUT used Ut/XCAP protocol. |
| 3 | At DUT, make MO voice call to Client-1. | Confirm the voice call to Client-1 is not established. |
| 4 | At DUT, make MO voice call to Client-2. | Confirm the voice call to Client-2 is setup successfully on DUT. |
| 5 | At DUT, deactivate BOIC | Confirm DUT indicates BOIC is deactivated.  Confirm DUT used Ut/XCAP protocol. |
| 6 | At DUT interrogate the status of BAIC. | Confirm DUT indicates BOIC is deactivated.  Confirm DUT used Ut/XCAP protocol. |
| 7 | At DUT, make MO voice call to Client-1. | Confirm the voice call to Client-1 is setup successfully on DUT. |
| 8 | End the voice call between DUT and Client-1. | Call is ended. |

#### 90.4.10.4 Barring of Incoming Calls when Roaming (BAIC-R)

Description

The DUT must be able to activate and deactivate the Communication Baring successfully over XCAP while registered for IMS services. When activated, the voice call shall be barred as expected for the Communication barring configured in the DUT.

Related core specifications

3GPP TS 24.229, TS.24.611

Reason for test

To confirm the DUT is able to successfully activate and deactivate Communication Barring of all incoming calls when roaming over XCAP when registered for IMS services.

Initial Configuration

Network under test supports Communication Barring over Ut/XCAP.

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

|  |  |  |
| --- | --- | --- |
| - | Test procedure | Expected behaviour |
| 1 | At DUT, activate BAIC-R. | Confirm DUT indicates BAIC-R is activated.  Confirm DUT used Ut/XCAP protocol. |
| 2 | At DUT interrogate the status of BAIC-R. | Confirm DUT indicates BAIC-R is activated.  Confirm DUT used Ut/XCAP protocol. |
| 3 | At DUT, deactivate BAIC-R | Confirm DUT indicates BAIC-R is deactivated.  Confirm DUT used Ut/XCAP protocol. |
| 4 | At DUT interrogate the status of BAIC-R. | Confirm DUT indicates BAIC-R is deactivated.  Confirm DUT used Ut/XCAP protocol. |

### 90.4.11 Completion of Communications to Busy Subscriber (CCBS)

### 90.4.12 Message Waiting Indication (MWI)

#### 90.4.12.1 Message Waiting Indication – Voicemail Notification over IMS

Description

Verify the DUT can successfully receive a voicemail notification over IMS using Message Waiting Indicator

Related core specifications

3GPP TS 24.341, TS 24.229, TS 24.606,

Reason for test

To verify the DUT can successfully receive a voicemail notification over IMS.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

UICC in DUT has Voicemail service setup.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1.  Do not answer the call on DUT. | DUT is alerting and call setup times out.  Client-1 is offered to leave a recorded voicemail message. |
| 2 | At Client-1, leave a short voicemail message. | Voicemail message is recorded and the call to the voicemail service is ended.  At DUT, check in SIP protocol messages that following message has been received from the IMS CN  - NOTIFY With indication of MWI event package referring to one voice message waiting.  DUT indicates to the user that a voicemail has been received.  : |

### 90.4.13 Conference (CONF)

#### 90.4.13.1 MO Voice Conference – Create conference with IMS Clients

Description

Conference call with multiple participants.

Related core specifications

3GPP TS 24.229

3GPP TS 24.605

3GPP TS 24.147

GSMA IR.92, sections 2.3.3, 4.3.2; IR.51; NG.114

Reason for test

To ensure the DUT can successfully create a conference call. It shall be able to add and remove participants from the conference call.

Initial configuration

The DUT, Client-1, Client-2 and Client-3 are successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

|  |  |  |
| --- | --- | --- |
| - | Test procedure | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1.  Answer the call at Client-1. | Call is successfully established between DUT and Client-1 with 2-way audio. |
| 2 | At DUT, use the menu option to make a “new call” to Client-2.  Answer the call at Client-2. | Call with Client-1 is on hold.  Call is successfully established between DUT and Client-2 with 2-way audio. |
| 3 | At DUT, use the menu option to “merge” the calls. | Conference call is successfully established between DUT, Client-1 and Client-2 with 3-way audio. |
| 4 | At DUT, use the menu option to make a “new call” to Client-3.  Answer the call at Client-3. | Conference call with Client-1 and Client-2 is on hold.  Call is successfully established between DUT and Client-3 with 2-way audio. |
| 5 | At DUT, use the menu option to “merge” the calls. | Conference call is successfully established between DUT, Client-1, Client-2 and Client-3 with 4-way audio. |
| 6 | At DUT, use the menu option to remove and end the call with Client-2. | Client-2 is successfully removed from the conference and the call is ended.  Conference call remains active between DUT, Client-1 and Client-3 with 3-way audio. |
| 7 | At DUT, use the menu option to remove and end the call with Client-1. | Client-1 is successfully removed from the conference and the call is ended.  Call remains active between DUT and Client-3 with 2-way audio. |
| 8 | End the voice call between DUT and Client-3. | Call is ended. |

#### 90.4.13.2 MO Voice Conference – Create conference with Non-IMS Clients

Description

Conference call with multiple participants.

Related core specifications

3GPP TS 24.229

3GPP TS 24.605

3GPP TS 24.147

GSMA IR.92, sections 2.3.3, 4.3.2; IR.51; NG.114

Reason for test

To ensure the DUT can successfully create a conference call. It shall be able to add and remove participants from the conference call.

Initial configuration

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

Client-1 is a PSTN (or a CS mobile device if PSTN is not available).

Client-2 is a PBX (or a CS mobile device if PBX is not available).

Client-3 is successfully registered to a CS network (UTRAN/GERAN) for CS voice services.

|  |  |  |
| --- | --- | --- |
| - | Test procedure | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1.  Answer the call at Client-1. | Call is successfully established between DUT and Client-1 with 2-way audio. |
| 2 | At DUT, use the menu option to make a “new call” to Client-2.  Answer the call at Client-2. | Call with Client-1 is on hold.  Call is successfully established between DUT and Client-2 with 2-way audio. |
| 3 | At DUT, use the menu option to “merge” the calls. | Conference call is successfully established between DUT, Client-1 and Client-2 with 3-way audio. |
| 4 | At DUT, use the menu option to make a “new call” to Client-3.  Answer the call at Client-3. | Conference call with Client-1 and Client-2 is on hold.  Call is successfully established between DUT and Client-3 with 2-way audio. |
| 5 | At DUT, use the menu option to “merge” the calls. | Conference call is successfully established between DUT, Client-1, Client-2 and Client-3 with 4-way audio. |
| 6 | At DUT, use the menu option to remove and end the call with Client-2. | Client-2 is successfully removed from the conference and the call is ended.  Conference call remains active between DUT, Client-1 and Client-3 with 3-way audio. |
| 7 | At DUT, use the menu option to remove and end the call with Client-1. | Client-1 is successfully removed from the conference and the call is ended.  Call remains active between DUT and Client-3 with 2-way audio. |
| 8 | End the voice call between DUT and Client-3. | Call is ended. |

#### 90.4.13.3 MT Voice Conference – Join conference with IMS Clients

Description

Conference call with multiple participants.

Related core specifications

3GPP TS 24.229

3GPP TS 24.605

3GPP TS 24.147

GSMA IR.92, sections 2.3.3, 4.3.2; IR.51; NG.114

Reason for test

To ensure the DUT can successfully join a conference call.

Initial configuration

The DUT, Client-1, and Client-2 are successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

|  |  |  |
| --- | --- | --- |
| - | Test procedure | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1.  Answer the call at DUT. | Call is successfully established between DUT and Client-1 with 2-way audio. |
| 2 | At Client-1, make a “new call” to Client-2.  Answer the call at Client-2. | DUT automatically goes on hold.  Call is successfully established between Client-1 and Client-2. |
| 3 | At Client-1, “merge” the calls. | Conference call is successfully established between DUT, Client-1 and Client-2 with 3-way audio. |
| 4 | At DUT, end the call. | Call is ended on DUT.  Call remains active between Client-1 and Client-2. |

#### 90.4.13.4 MT Voice Conference – Join conference with Non-IMS Clients

Description

Conference call with multiple participants.

Related core specifications

3GPP TS 24.229

3GPP TS 24.605

3GPP TS 24.147

GSMA IR.92, sections 2.3.3, 4.3.2; IR.51; NG.114

Reason for test

To ensure the DUT can successfully join a conference call.

Initial configuration

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

Client-1 is successfully registered to a CS network (UTRAN/GERAN) for CS voice services.

Client-2 is a PSTN / PBX (or a CS mobile device if PSTN / PBX are not available).

|  |  |  |
| --- | --- | --- |
| - | Test procedure | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1.  Answer the call at DUT. | Call is successfully established between DUT and Client-1 with 2-way audio. |
| 2 | At Client-1, make a “new call” to Client-2.  Answer the call at Client-2. | DUT automatically goes on hold.  Call is successfully established between Client-1 and Client-2. |
| 3 | At Client-1, “merge” the calls. | Conference call is successfully established between DUT, Client-1 and Client-2 with 3-way audio. |
| 4 | At DUT, end the call. | Call is ended on DUT.  Call remains active between Client-1 and Client-2. |

#### 90.4.13.5 MO Video Conference – Create conference with IMS Clients

Description

Conference call with multiple participants.

Related core specifications

3GPP TS 24.229

3GPP TS 24.605

3GPP TS 24.147

GSMA IR.92, sections 2.3.3, 4.3.2; IR.51; NG.114

Reason for test

To ensure the DUT can successfully create a Video conference call. It shall be able to add and remove participants from the conference call.

Initial configuration

The DUT, Client-1, Client-2 and Client-3 are successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

|  |  |  |
| --- | --- | --- |
| - | Test procedure | Expected behaviour |
| 1 | At DUT, make MO video call to Client-1.  Answer the call at Client-1. | Video Call is successfully established between DUT and Client-1.  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1. |
| 2 | At DUT, use the menu option to make a “new video call” to Client-2.  Answer the call at Client-2. | Video Call with Client-1 is on hold.  Video Call is successfully established between DUT and Client-2.  Confirm 2-way audio between DUT and Client-2.  Confirm 2-way video media stream between DUT and Client-2. |
| 3 | At DUT, use the menu option to “merge” the calls. | Video Conference call is successfully established between DUT, Client-1 and Client-2.  Confirm 3-way audio between DUT, Client-1 and Client-2.  Confirm 3-way video media stream between DUT, Client-1 and Client-2. |
| 4 | At DUT, use the menu option to make a “new video call” to Client-3.  Answer the call at Client-3. | Video Conference call with Client-1 and Client-2 is on hold.  Video Call is successfully established between DUT and Client-3.  Confirm 2-way audio between DUT and Client-3.  Confirm 2-way video media stream between DUT and Client-3. |
| 5 | At DUT, use the menu option to “merge” the calls. | Video Conference call is successfully established between DUT, Client-1 Client-2 and Client-3.  Confirm 4-way audio between DUT, Client-1, Client-2 and Client-3.  Confirm 4-way video media stream between DUT, Client-1, Client-2 and Client-3. |
| 6 | At DUT, use the menu option to remove and end the video call with Client-2. | Client-2 is successfully removed from the video conference and the call is ended.  Video Conference call remains active between DUT, Client-1 and Client-3.  Confirm 3-way audio between DUT, Client-1 and Client-3.  Confirm 3-way video media stream between DUT, Client-1 and Client-3. |
| 7 | At DUT, use the menu option to remove and end the video call with Client-1. | Client-1 is successfully removed from the video conference and the call is ended.  Video Call remains active between DUT and Client-3.  Confirm 2-way audio between DUT and Client-3.  Confirm 2-way video media stream between DUT and Client-3. |
| 8 | End the video call between DUT and Client-3. | Call is ended. |

#### 90.4.13.6 MO Video Conference – Remove and Add Video stream during Conference

Description

Conference call with multiple participants. DUT shall add and remove video stream during the conference call.

Related core specifications

3GPP TS 24.229

3GPP TS 24.605

3GPP TS 24.147

GSMA IR.92, sections 2.3.3, 4.3.2; IR.51; NG.114

Reason for test

To ensure DUT can add and remove video stream during a conference call.

Initial configuration

The DUT, Client-1, Client-2 and Client-3 are successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

The DUT, Client-1, Client-2 and Client-3 are in a 4-way video Conference call.

|  |  |  |
| --- | --- | --- |
| - | Test procedure | Expected behaviour |
| 1 | At DUT, use the menu option to disable the video stream to the Conference call. | DUT indicates to Client-1, Client-2 and Client-3 that its video stream has been disabled.  Confirm 4-way audio between DUT, Client-1, Client-2 and Client-3.  Confirm 3-way video media stream between Client-1, Client-2 and Client-3 remains. |
| 2 | At DUT, use the menu option to enable the video stream to the Conference call. | DUT indicates to Client-1, Client-2 and Client-3 that its video stream has been enabled.  Confirm 4-way audio between DUT, Client-1, Client-2 and Client-3.  Confirm 4-way video media stream between DUT, Client-1, Client-2 and Client-3. |
| 3 | At DUT, end the video Conference call. | Call is ended with all parties. |

#### 90.4.13.7 MT Video Conference – Join conference with IMS Clients

Description

Conference call with multiple participants.

Related core specifications

3GPP TS 24.229

3GPP TS 24.605

3GPP TS 24.147

GSMA IR.92, sections 2.3.3, 4.3.2; IR.51; NG.114

Reason for test

To ensure the DUT can successfully join a Video conference call.

Initial configuration

The DUT, Client-1, and Client-2 are successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

|  |  |  |
| --- | --- | --- |
| - | Test procedure | Expected behaviour |
| 1 | At DUT, receive MT video call from Client-1.  Answer the call at DUT. | Video Call is successfully established between DUT and Client-1.  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1. |
| 2 | At Client-1, make a “new video call” to Client-2.  Answer the call at Client-2. | DUT automatically goes on hold.  Video Call is successfully established between Client-1 and Client-2. |
| 3 | At Client-1, “merge” the video calls. | Video Conference call is successfully established between DUT, Client-1 and Client-2.  Confirm 3-way audio between DUT, Client-1 and Client-2.  Confirm 3-way video media stream between DUT, Client-1 and Client-2. |
| 4 | At DUT, end the call. | Call is ended on DUT.  Video Call remains active between Client-1 and Client-2. |

#### 90.4.13.8 MT Video Conference – Join conference as Voice only

Description

Conference call with multiple participants and DUT joins as voice only.

Related core specifications

3GPP TS 24.229

3GPP TS 24.605

3GPP TS 24.147

GSMA IR.92, sections 2.3.3, 4.3.2; IR.51; NG.114

Reason for test

To ensure the DUT can successfully join a Video conference call as voice only.

Initial configuration

The DUT, Client-1, and Client-2 are successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR)

|  |  |  |
| --- | --- | --- |
| - | Test procedure | Expected behaviour |
| 1 | At DUT, receive MT video call from Client-1.  Answer the call at DUT. | Video Call is successfully established between DUT and Client-1.  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1. |
| 2 | At Client-1, make a “new video call” to Client-2.  Answer the call at Client-2. | DUT automatically goes on hold.  Video Call is successfully established between Client-1 and Client-2. |
| 3 | At Client-1, “merge” the video calls.  At DUT, select the option to join the Conference call as “Voice Only”. | DUT joins Conference call with Cient-1 and Client-2 as Voice only.  Confirm 3-way audio between DUT, Client-1 and Client-2.  Confirm 2-way video media stream between Client-1 and Client-2. |
| 4 | At DUT, end the call. | Call is ended on DUT.  Video Call remains active between Client-1 and Client-2. |

### 90.4.14 USSD over IMS (Supported by network)

#### 90.4.14.1 USSD over IMS supported by network (Idle)

**Description**

The test case verifies if the DUT is correctly using USSD over IMS functionality.

**Related core specifications**

3GPP TS 24.390

**Reason for test**

To verify DUT is sending the correctly constructed USSD message and displays the received response from the network.

**Initial configuration**

Network and DUT are supporting USSD over IMS.

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

No additional IMS transactions are ongoing (e.g. MO/MT call)

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, enter and send a USSD command (for example \*100# to check the prepaid balance). | - DUT sends INVITE message containing application/vnd.3gpp.ussd+xml MIME body as described in 24.309 with a Content-Disposition header field set to “render” and with “handling” header field parameter set to “optional”.  - ussd-String information element contains the encoded USSD command sent by DUT  - Network sends INFO SIP message  - An appropriate response is displayed by DUT |

#### 90.4.14.2 USSD over IMS supported by network (During Voice Call)

**Description**

The test case verifies if the DUT is correctly using USSD over IMS functionality while there is an ongoing IMS transaction.

**Related core specifications**

3GPP TS 24.390

**Reason for test**

To verify DUT is sending the correctly constructed USSD message and displays the received response from the network. The ongoing voice call is not interrupted.

**Initial configuration**

Network and DUT are supporting USSD over IMS.

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

DUT is in an ongoing IMS call with Client-1.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, enter and send a USSD command (for example \*100# to check the prepaid balance). | - DUT sends INVITE message containing application/vnd.3gpp.ussd+xml MIME body as described in 24.309 with a Content-Disposition header field set to “render” and with “handling” header field parameter set to “optional”.  - ussd-String information element contains the encoded USSD command sent by DUT  - Network sends INFO SIP message  - An appropriate response is displayed by DUT  - Ongoing voice call between DUT and Client-1 continues unaffected with 2-way audio. |

#### 90.4.14.3 USSD over IMS supported by network (Loss of IMS service)

Description

This test case checks if the DUT can use USSD codes over the CS network when losing IMS coverage.

Related core specifications

GSMA IR.92,

3GPP TS 23.272; 3GPP TS 24.390

Reason for test

The DUT must be able to perform USSD codes over the CS network when losing IMS coverage.

Initial Configuration

Network and DUT are supporting USSD over IMS.

Network is supporting a CS infrastructure (UTRAN or GERAN).

DUT is successfully registered for IMS services (VxLTE/VxWi-Fi/VxNR).

No additional IMS transactions are ongoing (e.g. MO/MT call)

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Move DUT to an area where no IMS sesrvices are available (VxLTE/ VxWi-Fi and VxNR are not available). | DUT is camping to a CS network (UTRAN or GERAN).  DUT no longer displays IMS service indication. |
| 2 | At DUT, enter and send a USSD command (for example \*100# to check the prepaid balance). | USSD command is successfully sent to the network over the CS network (UTRAN/GERAN) and an appropriate response is displayed on the DUT. |

### 90.4.15 Void

## 90.5 IP-CAN Independent – Service Interworking

## 90.6 IP-CAN Independent – Mobility

# 91 IP Multimedia Subsystem (IMS)-VxLTE

## 91.1 VxLTE – System Access & Registration

### 91.1.1 Default Bearer Activation/Deactivation

#### 91.1.1.1 Default Bearer Activation/Deactivation (IMS PS Voice Preferred)

Description

The DUT shall successfully Activate and Deactivate the Default Bearer for VxLTE services.

Related core specifications

3GPP TS 23.228, TS 24.229, TS 33.203, TS 24.301, 6.2.2

GSMA IR.92, Chapter 5.1, 4.3.1 ; IR.88 Chapter 6.3.2

Reason for test

To verify the DUT is able to Activate and Deactivate the Default Bearer for VxLTE services.

Initial configuration

DUT is configured for IMS PS Voice Preferred, CS Secondary.

IMS APN is configured with Ipv4v6.

DUT is in offline mode (Flight mode enabled / powered off).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Bring DUT online so it establishes “Default EPS Bearer Context Activation” procedures. | At DUT, check NAS protocol messages:  - DUT sends ATTACH REQUEST containing “Voice domain preference for E-UTRAN: IMS PS voice preferred, CS Voice as secondary (3)”  - Network sends ATTACH ACCEPT containing “IMS voice over PS session in S1 mode: Supported”  - Network sends ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST containing the APN and PDN type.  DUT sends ACTIVATE DEFAULT EPS BEARER CONTEXT ACCEPT to the network. |
| 2 | Observe the IMS Default Bearer Activation process on DUT. | At DUT, check NAS protocol messages:  - DUT sends PDN CONNECTIVITY REQUEST to the network with PDN type 3 “Ipv4v6” and APN “IMS”.  - Network sends ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST to DUT  - DUT sends ACTIVATE DEFAULT BEARER CONTEXT ACCEPT to the network.  Note:  DUT must not request another PDN connection to the “IMS” APN for the other IP version |
| 3 | Check the VxLTE service indication (If supported in DUT customization). | DUT correctly displays an icon to indicate it is registered for VxLTE according to the customization requirement. |
| 4 | At DUT, receive MT voice call from Client-1. | VxLTE Call is successfully established with 2-way audio. |
| 5 | At Client-1, end the voice call. | Call is ended. |
| 6 | Make DUT offline (Power off / flight mode on) | At DUT, check NAS protocol messages:  - Network sends DEACTIVATE EPS BEARER CONTEXT REQUEST [triggered by IMS REGISTER message]  or  - DUT sends PDN DISCONNECT REQUEST. [NW dependent]  - Network sends DEACTIVATE EPS BEARER CONTEXT REQUEST  - DUT sends DEACTIVATE EPS BEARER CONTEXT ACCEPT  - DUT sends DETACH REQUEST with type 1 “switch off”. |

#### 91.1.1.2 Default Bearer Activation/Deactivation (IMS PS Voice Only)

Description

The DUT shall successfully Activate and Deactivate the Default Bearer for VxLTE services.

Related core specifications

3GPP TS 23.228, TS 24.229, TS 33.203, TS 24.301, 6.2.2

GSMA IR.92, Chapter 5.1, 4.3.1 ; IR.88 Chapter 6.3.2

Reason for test

To verify the DUT is able to Activate and Deactivate the Default Bearer for VxLTE services.

Initial configuration

DUT is configured for IMS PS Voice Only.

IMS APN is configured with Ipv4v6.

DUT is in offline mode (Flight mode enabled / powered off).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Bring DUT online so it establishes “Default EPS Bearer Context Activation” procedures. | At DUT, check NAS protocol messages:  - DUT sends ATTACH REQUEST containing “Voice domain preference for E-UTRAN: IMS PS Voice only (1)”  - Network sends ATTACH ACCEPT containing “IMS voice over PS session in S1 mode: Supported”  - Network sends ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST containing the APN and PDN type.  DUT sends ACTIVATE DEFAULT EPS BEARER CONTEXT ACCEPT to the network. |
| 2 | Observe the IMS Default Bearer Activation process on DUT. | At DUT, check NAS protocol messages:  - DUT sends PDN CONNECTIVITY REQUEST to the network with PDN type 3 “Ipv4v6” and APN “IMS”.  - Network sends ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST to DUT  - DUT sends ACTIVATE DEFAULT BEARER CONTEXT ACCEPT to the network.  Note:  DUT must not request another PDN connection to the “IMS” APN for the other IP version |
| 3 | Check the VxLTE service indication (If supported in DUT customization). | DUT correctly displays an icon to indicate it is registered for VxLTE according to the customization requirement. |
| 4 | At DUT, receive MT voice call from Client-1. | VxLTE Call is successfully established with 2-way audio. |
| 5 | At Client-1, end the voice call. | Call is ended. |
| 6 | Make DUT offline (Power off / flight mode on) | At DUT, check NAS protocol messages:  - Network sends DEACTIVATE EPS BEARER CONTEXT REQUEST [triggered by IMS REGISTER message]  or  - DUT sends PDN DISCONNECT REQUEST.  [NW dependent]  - Network sends DEACTIVATE EPS BEARER CONTEXT REQUEST  - DUT sends DEACTIVATE EPS BEARER CONTEXT ACCEPT  - DUT sends DETACH REQUEST. With type 1 “switch off”. |

#### 91.1.1.3 Default Bearer Activation Unsuccessful (VxLTE Not Supported by Network)

Description

The DUT shall not attempt to activate a Default Bearer for VxLTE services if the network has responded with IMS PS Voice not supported.

Related core specifications

3GPP TS 23.228, TS 24.229, 23.221, Chapter 7.2A; Annex A

GSMA IR.92

Reason for test

To verify the DUT does not attempt to Activate a Default Bearer for VxLTE services if the network has responded with IMS PS Voice not supported.

Initial configuration

Network is supporting E-UTRAN and UTRAN or GERAN.

VxLTE is not supported by the network.

DUT is configured for IMS PS Voice Preferred, CS Secondary

IMS APN is configured with Ipv4v6.

DUT is in offline mode (Flight mode enabled / powered off).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Bring DUT online so it establishes “Default EPS Bearer Context Activation” procedures. | At DUT, check NAS protocol messages:  - DUT sends ATTACH REQUEST containing “Voice domain preference for E-UTRAN: IMS PS voice preferred, CS Voice as secondary (3)”  - Network sends ATTACH ACCEPT containing “IMS VoPS: IMS voice over PS session in S1 mode=0 (Not supported)”  - Network sends ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST containing the APN and PDN type.  DUT sends ACTIVATE DEFAULT EPS BEARER CONTEXT ACCEPT to the network. |
| 2 | Observe that NO IMS Default Bearer Activation process occurs on DUT. | At DUT, check NAS protocol messages:  - DUT must not request a PDN connection to the “IMS” APN since the network is not supporting VxLTE. |
| 3 | Check the VxLTE service indication (If supported in DUT customization). | DUT correctly displays an icon to indicate it is registered for LTE services but no VxLTE icon. |
| 4 | At DUT, receive MT voice call from Client-1. | Voice Call is successfully established via CS Fallback with 2-way audio. |
| 5 | Wait for DUT to reselect to E-UTRAN. | DUT is camping to E-UTRAN. |
| 6 | At DUT, receive MT SMS | SMS is received over SG  (If the network is not supporting SMS over SG, then the SMS is received over CS). |
| 7 | At DUT, interrogate CFY via \*#21# | DUT performs CS Fallback to a CS network (UTRAN or GERAN) and successfully interrogates CFU status. |

#### 91.1.1.4 Default Bearer Activation Unsuccessful (UICC Not Provisioned for VxLTE)

Description

When a non-provisioned UICC is used in a VxLTE enabled device on a VxLTE network, the device shall handle IMS APN rejections correctly.

Related core specifications

GSMA IR.92

Reason for test

To confirm the DUT behaves correctly when receiving IMS APN reject messages.

Initial Configuration

Network is supporting E-UTRAN and UTRAN or GERAN.

DUT is configured for IMS PS Voice Preferred, CS Secondary

UICC used for this test is not VxLTE provisioned.

IMS APN is configured with Ipv4v6.

DUT is in offline mode (Flight mode enabled / powered off).

Note: This test case applies when the network indicates “IMS VoPS: IMS voice over PS session in S1 mode supported” during the attach or tracking area update procedure despite the subscriber is not subscribed to VxLTE services.

Expected behaviour is per 3GPP 24.301 section 6.5.1.4 Standalone PDN CONNECTIVITY REQUEST.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Bring DUT online so it establishes “Default EPS Bearer Context Activation” procedures. | At DUT, check NAS protocol messages:  - DUT sends ATTACH REQUEST containing “Voice domain preference for E-UTRAN: IMS PS voice preferred, CS Voice as secondary (3)”  - Network sends ATTACH ACCEPT containing “IMS voice over PS session in S1 mode: Supported”  - Network sends ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST containing the APN and PDN type.  DUT sends ACTIVATE DEFAULT EPS BEARER CONTEXT ACCEPT to the network. |
| 2 | Observe the IMS Default Bearer Activation process on DUT. | At DUT, check NAS protocol messages:  - DUT sends PDN CONNECTIVITY REQUEST to the network.  - Network sends PDN CONNECTIVITY REJECT.  Check within the PDN CONNECTIVITY REJECT message if T3396 timer is included.  **Timer included:**  T3396 timer included (and not deactivated or zero):  - DUT shall start back-off timer according to the value in T3396 and make a further PDN CONNECTIVITY REQUEST message to the same IMS APN only when the timer has expired. Before back-off timer expiry, confirm DUT is camping to the network but without a VxLTE registration.  T3396 timer included (set to deactivated):  - DUT shall not make any further PDN CONNECTIVITY REQUESTs until it is restarted or the SIM is removed.  T3396 timer included (set to zero):  - DUT may send a “PDN CONNECTIVITY REQUEST” message to the same IMS APN (depending on device implementation).  **T3396 Timer NOT included: Release 10/11**  T3396 timer not included: Rejected with any cause:  - DUT may send a “PDN CONNECTIVITY REQUEST” message to the same IMS APN (depending on device implementation).  **T3396 Timer NOT included: Release 12 and abo**ve:  T3396 timer not included: Rejected with #8, #27, #32 or #33.  - DUT shall start back-off timer with a default value of 12 minutes and make a further PDN CONNECTIVITY REQUEST message to the same IMS APN only when the timer has expired. Before back-off timer expiry, confirm DUT is camping to the network but without a VxLTE registration.  T3396 timer not included: Rejected with any other cause:  - DUT may send a “PDN CONNECTIVITY REQUEST” message to the same IMS APN (depending on device implementation).  N.B Some operators request the manufacturer to implement a specific timer value for their network rather than ustomiza a timer in the reject cause message. Please check with the network under test if no timer is included in the reject cause message. |
| 4 | Check the VxLTE service indication (If supported in DUT customization). | DUT correctly displays an icon to indicate it is registered for LTE services but no VxLTE icon. |
| 5 | At DUT, receive MT voice call from Client-1. | Voice Call is successfully established via CS Fallback with 2-way audio. |
| 6 | Wait for DUT to reselect to E-UTRAN. | DUT is camping to E-UTRAN. |
| 9 | At DUT, receive MT SMS | SMS is received over SG  (If the network is not supporting SMS over SG, then the SMS is received over CS). |
| 10 | At DUT, interrogate CFU via \*#21# | DUT performs CS Fallback to a CS network (UTRAN or GERAN) and successfully interrogates CFU status. |

#### 91.1.1.5 VxLTE Roaming Not Allowed by Network

Description

This test case checks that a VxLTE device that can’t use VxLTE when roaming behaves properly in a visited LTE network that is VxLTE capable for local subscribers.

Related core specifications

GSMA IR.92 A.6

Reason for test

It must be ensured that a VxLTE capable device that can only use VxLTE in home network can properly make and receive circuit switched voice calls.

Initial Configuration

VPLMN has an LTE roaming agreement with the HPLMN of the SIM card used in the DUT.

VPLMN is supporting VxLTE for local subscribers only (VoPS = 0)VPLMN may support IMS emergency (EMC BS can have any value – “0” or “1”)

VPLMN is supporting E-UTRAN and UTRAN or GERAN.

DUT is configured for IMS PS Voice Preferred, CS Secondary

IMS APN is configured with Ipv4v6.

DUT is in offline mode (Flight mode enabled / powered off).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Bring DUT online so it establishes “Default EPS Bearer Context Activation” procedures. | At DUT, check NAS protocol messages:  - DUT sends ATTACH REQUEST  - Network sends ATTACH ACCEPT containing “IMS VoPS: IMS voice over PS session in S1 mode=0 (Not supported)”  - Network sends ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST containing the APN and PDN type.  DUT sends ACTIVATE DEFAULT EPS BEARER CONTEXT ACCEPT to the network. |
| 2 | Observe that NO IMS Default Bearer Activation process occurs on DUT. | At DUT, check NAS protocol messages:  - DUT must not request a PDN connection to the “IMS” APN since the network is not supporting VxLTE. |
| 3 | Check the VxLTE service indication (If supported in DUT customization). | DUT correctly displays an icon to indicate it is registered for LTE services but no VxLTE icon. |
| 4 | At DUT, receive MT voice call from Client-1. | Voice Call is successfully established via CS Fallback with 2-way audio. |
| 5 | Wait for DUT to reselect to E-UTRAN. | DUT is camping to E-UTRAN. |
| 6 | At DUT, make MO EM call to Emergency Services (112 or 911). | DUT displays Emergency Call setup.  At DUT, check NAS protocol messages:  - DUT sends EXTENDED SERVICE REQUEST to the network with Service type 2 “Mobile originating CS fallback emergency call”.  CS Fallback to UTRAN or GERAN takes place.  At DUT, check NAS protocol messages:  - DUT sends EMERGENCY SETUP message.  Confirm 2-way audio between DUT and Emergency Services operator. |
| 7 | Wait for DUT to reselect to E-UTRAN. | DUT is camping to E-UTRAN. |
| 8 | At DUT, receive MT SMS | SMS is received over SG  (If the network is not supporting SMS over SG, then the SMS is received over CS). |
| 9 | At DUT, interrogate CFY via \*#21# | DUT performs CS Fallback to a CS network (UTRAN or GERAN) and successfully interrogates CFU status. |

#### 91.1.1.6 Default Bearer Activation/Deactivation (VxLTE Switch)

Description

The DUT shall successfully Activate and Deactivate the Default Bearer for VxLTE services using the menu switch.

Related core specifications

3GPP TS 23.228, TS 24.229, TS 33.203, TS 24.301, 6.2.2

GSMA IR.92, Chapter 5.1, 4.3.1 ; IR.88 Chapter 6.3.2

Reason for test

To verify the DUT is able to Activate and Deactivate the Default Bearer for VxLTE services using the VxLTE menu switch.

This test is only applicable to devices supporting a manual VxLTE on/off switch.

Initial configuration

IMS APN is configured with Ipv4v6.

DUT menu switch for VxLTE is set to “off”.

DUT is in offline mode (Flight mode enabled / powered off).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Bring DUT online so it establishes “Default EPS Bearer Context Activation” procedures. | At DUT, check NAS protocol messages:  - DUT sends ATTACH REQUEST.  - Network sends ATTACH ACCEPT containing “IMS voice over PS session in S1 mode: Supported”  - Network sends ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST containing the APN and PDN type.  DUT sends ACTIVATE DEFAULT EPS BEARER CONTEXT ACCEPT to the network. |
| 2 | Observe there is no IMS Default Bearer Activation process on DUT. | There are no NAS protocol messages observed for the IMS Default Bearer activation. |
| 3 | On DUT, set the VxLTE menu setting to “on”.  Observe the IMS Default Bearer Activation process on DUT. | At DUT, check NAS protocol messages:  - DUT sends PDN CONNECTIVITY REQUEST to the network with PDN type 3 “Ipv4v6” and APN “IMS”.  - Network sends ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST to DUT.  - DUT sends ACTIVATE DEFAULT BEARER CONTEXT ACCEPT to the network.  Note:  DUT must not request another PDN connection to the “IMS” APN for the other IP version |
| 4 | Check the VxLTE service indication (If supported in DUT customization). | DUT correctly displays an icon to indicate it is registered for VxLTE according to the customization requirement. |
| 5 | At DUT, receive MT voice call from Client-1. | VxLTE Call is successfully established with 2-way audio. |
| 6 | At Client-1, end the voice call. | Call is ended. |
| 7 | On DUT, set the VxLTE menu setting to “off”. | At DUT, check NAS protocol messages:  - DUT sends PDN DISCONNECT REQUEST.  - Network sends DEACTIVATE EPS BEARER CONTEXT REQUEST  - DUT sends DEACTIVATE EPS BEARER CONTEXT ACCEPT |
| 8 | Check the VxLTE service indication (If supported in DUT customization). | DUT no longer displays VxLTE service indication. |

#### 91.1.1.7 VxLTE Roaming Allowed by Network

Description

This test case checks that a VxLTE device with VxLTE roaming enabled behaves properly in a visited LTE network that is VxLTE capable for roaming subscribers.

Related core specifications

GSMA IR.92 A.6

Reason for test

It must be ensured that a VxLTE capable device with VxLTE roaming enabled can properly make and receive packet switched voice calls in VxLTE roaming NW.

Initial Configuration

VPLMN has an VxLTE roaming agreement with the HPLMN of the SIM card used in the DUT.

VPLMN is supporting VxLTE for roaming subscribers (VoPS = 1)

VPLMN can optionally support IMS emergency calls

DUT is configured for IMS PS Voice Preferred, CS Secondary in both HPLMN and VPLMN

IMS APN is configured with Ipv4v6.

DUT is in offline mode (Flight mode enabled / powered off).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Bring DUT online so it establishes “Default EPS Bearer Context Activation” procedures. | At DUT, check NAS protocol messages:  - DUT sends ATTACH REQUEST  - Network sends ATTACH ACCEPT containing “IMS VoPS: IMS voice over PS session in S1 mode=1 (supported) and Emergency Service Support Indicator=Y/N”  - Network sends ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST containing the APN and PDN type.  DUT sends ACTIVATE DEFAULT EPS BEARER CONTEXT ACCEPT to the network. |
| 2 | Observe that IMS Default Bearer Activation process occurs on DUT. | At DUT, check NAS protocol messages:  - DUT must request a PDN connection to the “IMS” APN since the network is supporting VxLTE. |
| 3 | Check the VxLTE service indication (If supported in DUT customization). | DUT correctly displays an icon to indicate it is registered for LTE and VxLTE services. |
| 4 | At DUT, receive MT voice call from Client-1. | Voice Call is successfully established via VoLTE with 2-way audio. |
| 5 | End the voice call. | At DUT, check in NAS protocol messages:  - Network sends DEACTIVATE EPS BEARER CONTEXT REQUEST  - DUT sends DEACTIVATE EPS BEARER CONTEXT ACCEPT  - Network sends DEACTIVATE EPS BEARER CONTEXT REQUEST  - DUT sends DEACTIVATE EPS BEARER CONTEXT ACCEPT  Call is ended. |
| 6 | At DUT, receive MT SMS | SMS is received over IMS |
| 7 | At DUT, interrogate CFY via \*#21# | DUT successfully interrogates CFU status.via PS |

#### 91.1.1.8 VxLTE Roaming Allowed by Network with video media restriction

Description

This test case checks that a VxLTE device with VxLTE roaming enabled behaves properly in a visited LTE network that is VxLTE capable for roaming subscribers and has media restriction configured for video service.

Related core specifications

GSMA IR.92, GSMA IR.94, 3GPP TS 24.167

Reason for test

It must be ensured that a VxLTE capable device with VxLTE roaming enabled can properly make and receive packet switched voice calls in VxLTE roaming NW and has correct ustomiza if the media restriction is in place in case of roaming scenarios.

Initial Configuration

HPLMN and DUT support IMS video calls.

VPLMN has an VxLTE roaming agreement with the HPLMN of the SIM card used in the DUT.

VPLMN is supporting VxLTE for roaming subscribers (VoPS = 1)

VPLMN can optionally support IMS emergency calls

DUT is configured for IMS PS Voice Preferred, CS Secondary in both HPLMN and VPLMN

DUT is configured with **Media\_type\_restriction\_policy** (Voice and/or Video over LTE allowed while roaming) with value “**video**”

IMS APN is configured with Ipv4v6.

DUT is in offline mode (Flight mode enabled / powered off).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Bring DUT online so it establishes “Default EPS Bearer Context Activation” procedures. | At DUT, check NAS protocol messages:  - DUT sends ATTACH REQUEST  - Network sends ATTACH ACCEPT containing “IMS VoPS: IMS voice over PS session in S1 mode=1 (supported) and Emergency Service Support Indicator=Y/N”  - Network sends ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST containing the APN and PDN type.  DUT sends ACTIVATE DEFAULT EPS BEARER CONTEXT ACCEPT to the network. |
| 2 | Observe that IMS Default Bearer Activation process occurs on DUT. | At DUT, check NAS protocol messages:  - DUT must request a PDN connection to the “IMS” APN since the network is supporting VxLTE.  - DUT shall not include “video” media feature tag in the Contact header field of the REGISTER request |
| 3 | Check the VxLTE service indication (If supported in DUT customization). | DUT correctly displays an icon to indicate it is registered for LTE and VxLTE services. |
| 4 | At DUT, receive MT voice call from Client-1. | Voice Call is successfully established via VoLTE with 2-way audio. |
| 5 | End the voice call. | At DUT, check in NAS protocol messages:  - Network sends DEACTIVATE EPS BEARER CONTEXT REQUEST  - DUT sends DEACTIVATE EPS BEARER CONTEXT ACCEPT  - Network sends DEACTIVATE EPS BEARER CONTEXT REQUEST  - DUT sends DEACTIVATE EPS BEARER CONTEXT ACCEPT  Call is ended. |
| 6 | At DUT attempt to perform video call | The user interface shall not allow video call establishment (grayed out icon/option or explicit error message). |

### 91.1.2 IMS SIP Registration

#### 91.1.2.1 IMS SIP Registration (Periodic, Out of Service during Server Timer Expiry)

Description

The DUT shall successfully perform the Periodic SIP re-registration procedure with authentication based on AKA and Digest with IMS.

Related core specifications

TS 24.229, 5.1.1.4., GSMA IR.51, Chapter 2.2.1

Reason for test

To verify the DUT is able to re-register after the Server timer has expired during out of service.

Initial configuration

DUT is successfully registered for IMS services (VxLTE).

Server Timer Expiry (X): The server timer expiry for Re-registration is known (This can be found in the MT REGISTER 200 OK message at Registration).

Re-registration Timer (Y):

For server timer expiry values <20, the re-registration timer shall take place when half of the server timer expiry time has elapsed.

For server timer expiry values >20, the re-registration timer shall take place 10 minutes before the server timer expires.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Move DUT to an area where it directly loses all coverage (such as a shielded box). | DUT displays “No Service” indication. |
| 2 | Keep DUT out of service for a time longer than the Server Timer Expiry (X). | DUT displays “No Service” indication. |
| 3 | Move DUT to its initial area where the IMS connection is available. | Confirm DUT performs an Initial Registration.  At DUT, check in SIP protocol messages:  - MO REGISTER message.  - MT REGISTER 401 Unauthorized message.  - MO REGISTER message.  - MT REGISTER 200 OK message. |
| 4 | Check the IMS service indication (if supported in DUT customization). | DUT correctly displays an icon to indicate it is registered for IMS as per the service applicable (VxLTE) |
| 5 | At DUT, receive MT voice call from Client-1. | Call is successfully established with 2-way audio. |
| 6 | At Client-1, end the voice call. | Call is ended. |

#### 91.1.2.2 IMS SIP Registration (Periodic, Out of Service during Re-registration Timer expiry but back in service before Server Timer Expiry)

Description

The DUT shall successfully perform the Periodic SIP re-registration procedure with authentication based on AKA and Digest with IMS.

Related core specifications

TS 24.229, 5.1.1.4., GSMA IR.51, Chapter 2.2.1

Reason for test

To verify the DUT is able to re-register after Re-registration timer expiry when DUT has temporarily lost coverage and returned to coverage before the Server timer has expired.

Initial configuration

DUT is successfully registered for IMS services (VxLTE).

Server Timer Expiry (X): The server timer expiry for Re-registration is known (This can be found in the MT REGISTER 200 OK message at Registration).

Re-registration Timer (Y):

For server timer expiry timer values <20, the re-registration timer shall take place when half of the server timer expiry time has elapsed.

For server timer expiry timer values >20, the re-registration timer shall take place 10 minutes before the server timer expires.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Move DUT to an area where it directly loses all coverage (such as a shielded box). | DUT displays “No Service” indication. |
| 2 | Keep DUT out of service for a time longer than the Re-registration Time (Y) but shorter than the Server Timer Expiry (X). | DUT displays “No Service” indication. |
| 3 | Move DUT to its initial area where the IMS connection is available. | The DUT may either perform initial registration or a re-registration over the existing set of security associations or TLS session.  At DUT, check in SIP protocol messages:  Initial Registration:  - MO REGISTER message.  - MT REGISTER 401 Unauthorized message.  - MO REGISTER message.  - MT REGISTER 200 OK message.  Or  Re-registration:  - MO REGISTER message.  - MT REGISTER 200 OK message. |
| 4 | Check the IMS service indication (if supported in DUT customization). | DUT correctly displays an icon to indicate it is registered for IMS as per the service applicable (VxLTE). |
| 5 | At DUT, receive MT voice call from Client-1. | Call is successfully established with 2-way audio. |
| 6 | At Client-1, end the voice call. | Call is ended. |

#### 91.1.2.3 IMS SIP Registration (Periodic, Out of Service but back in service before Re-registration Timer and Server Timer Expiry)

Description

The DUT shall successfully perform the Periodic SIP re-registration procedure with authentication based on AKA and Digest with IMS.

Related core specifications

TS 24.229, 5.1.1.4., GSMA IR.51, Chapter 2.2.1

Reason for test

To verify the DUT is able to re-register after Re-registration timer expiry when DUT has temporarily lost coverage and returned to coverage before the Re-Registration and Server timer has expired.

Initial configuration

DUT is successfully registered for IMS services (VxLTE).

Server Timer Expiry (X): The server timer expiry for Re-registration is known (This can be found in the MT REGISTER 200 OK message at Registration).

Re-registration Timer (Y):

For server timer expiry timer values <20, the re-registration timer shall take place when half of the server timer expiry time has elapsed.

For server timer expiry timer values >20, the re-registration timer shall take place 10 minutes before the server timer expires.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Move DUT to an area where it directly loses all coverage (such as a shielded box). | DUT displays “No Service” indication. |
| 2 | Keep DUT out of service for a time shorter than the Re-registration Time (Y) and Server Timer Expiry (X). | DUT displays “No Service” indication. |
| 3 | Move DUT to its initial area where the IMS connection is available.  Check the IMS service indication (if supported in DUT customization). | At DUT, check there is no MO REGISTER message in the SIP protocol.  DUT correctly displays an icon to indicate it is registered for IMS as per the service applicable (VxLTE). |
| 4 | At DUT, receive MT voice call from Client-1. | Call is successfully established with 2-way audio. |
| 5 | Observe DUT during expected re-registration time. | The DUT may either perform initial registration or a re-registration over the existing set of security associations or TLS session.  At DUT, check in SIP protocol messages:  Initial Registration:  - MO REGISTER message.  - MT REGISTER 401 Unauthorized message.  - MO REGISTER message.  - MT REGISTER 200 OK message.  Or  Re-registration:  - MO REGISTER message.  - MT REGISTER 200 OK message. |
| 6 | Check the IMS service indication (if supported in DUT customization). | DUT correctly displays an icon to indicate it is registered for IMS as per the service applicable (VxLTE). |
| 7 | At DUT, receive MT voice call from Client-1. | Call is successfully established with 2-way audio. |
| 8 | At Client-1, end the voice call. | Call is ended. |

## 91.2 VxLTE – Basic Calls

### 91.2.1 Voice Calls

#### 91.2.1.1 Dedicated Bearer Activation/Deactivation (MO Voice Call)

Description

The DUT shall successfully perform an MO VxLTE call.

Related 3GPP core specifications

GSMA IR.92

Reason for test

To verify the DUT establishes a dedicated bearer for MO VxLTE calls.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE)

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1. | At DUT, check in NAS protocol messages:  - Network sends ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST  - DUT sends ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT  Confirm 2-way audio between DUT and Client-1. |
| 2 | At DUT, end the voice call. | At DUT, check in NAS protocol messages:  - Network sends DEACTIVATE EPS BEARER CONTEXT REQUEST  - DUT sends DEACTIVATE EPS BEARER CONTEXT ACCEPT  Call is ended. |

#### 91.2.1.2 Dedicated Bearer Activation/Deactivation (MT Voice Call)

Description

The DUT shall successfully perform an MT VxLTE call.

Related 3GPP core specifications

GSMA IR.92

Reason for test

To verify the DUT establishes a Dedicated bearer for MT VxLTE calls.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE)

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | At DUT, check in NAS protocol messages:  - Network sends ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST  - DUT sends ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT  Confirm 2-way audio between DUT and Client-1. |
| 2 | At Client-1, end the voice call. | At DUT, check in NAS protocol messages:  - Network sends DEACTIVATE EPS BEARER CONTEXT REQUEST  - DUT sends DEACTIVATE EPS BEARER CONTEXT ACCEPT  Call is ended. |

#### 91.2.1.3 Dedicated Bearer Activation/Deactivation in roaming NW (MO Voice Call)

Description

The DUT shall successfully perform an MO VxLTE call when roaming in VxLTE.

Related 3GPP core specifications

GSMA IR.92

Reason for test

To verify the DUT establishes a dedicated bearer for MO VxLTE calls in VxLTE roaming NW.

Initial configuration

VPLMN has an VoLTE roaming agreement with the HPLMN of the SIM card used in the DUT.

VPLMN is supporting VoLTE for roaming subscribers

DUT is configured for IMS PS Voice Preferred, CS Secondary in both HPLMN and VPLMN

DUT and Client-1 are successfully registered for IMS services (VxLTE) in the HPMN

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1. | At DUT, check in NAS protocol messages:  - Network sends ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST  - DUT sends ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT  Confirm 2-way audio between DUT and Client-1. |
| 2 | At DUT, end the voice call. | At DUT, check in NAS protocol messages:  - Network sends DEACTIVATE EPS BEARER CONTEXT REQUEST  - DUT sends DEACTIVATE EPS BEARER CONTEXT ACCEPT  Call is ended. |

#### 91.2.1.4 Dedicated Bearer Activation/Deactivation in roaming NW (MT Voice Call)

Description

The DUT shall successfully perform an MT VxLTE call when roaming in VxLTE.

Related 3GPP core specifications

GSMA IR.92

Reason for test

To verify the DUT establishes a Dedicated bearer for MT VxLTE calls in VxLTE roaming NW.

Initial configuration

VPLMN has an VxLTE roaming agreement with the HPLMN of the SIM card used in the DUT.

VPLMN is supporting VxLTE for roaming subscribers

DUT is configured for IMS PS Voice Preferred, CS Secondary in both HPLMN and VPLMN

DUT and Client-1 are successfully registered for IMS services (VxLTE) in the roaming network

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | At DUT, check in NAS protocol messages:  - Network sends ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST  - DUT sends ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT  Confirm 2-way audio between DUT and Client-1. |
| 2 | At Client-1, end the voice call. | At DUT, check in NAS protocol messages:  - Network sends DEACTIVATE EPS BEARER CONTEXT REQUEST  - DUT sends DEACTIVATE EPS BEARER CONTEXT ACCEPT  Call is ended. |

### 91.2.2 Video Calls

#### 91.2.2.1 Dedicated Bearer Activation/Deactivation (MO Video Call)

Description

The DUT shall successfully perform an MO Video call.

Related 3GPP core specifications

GSMA IR.92

Reason for test

To verify the DUT establishes a Dedicated bearer for MO Video calls.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE)

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO video call to Client-1. | At DUT, check in NAS protocol messages:  - Network sends ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST  - DUT sends ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1. |
| 2 | At DUT, end the video call. | At DUT, check in NAS protocol messages:  - Network sends DEACTIVATE EPS BEARER CONTEXT REQUEST  - DUT sends DEACTIVATE EPS BEARER CONTEXT ACCEPT  Call is ended. |

#### 91.2.2.2 Dedicated Bearer Activation/Deactivation (MT Video Call)

Description

The DUT shall successfully perform an MT Video call.

Related 3GPP core specifications

GSMA IR.92

Reason for test

To verify the DUT establishes a Dedicated bearer for MT Video calls.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE)

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT video call from Client-1. | At DUT, check in NAS protocol messages:  - Network sends ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST  - DUT sends ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1. |
| 2 | At Client-1, end the video call. | At DUT, check in NAS protocol messages:  - Network sends DEACTIVATE EPS BEARER CONTEXT REQUEST  - DUT sends DEACTIVATE EPS BEARER CONTEXT ACCEPT  Call is ended. |

#### 91.2.2.3 Dedicated Bearer Activation/Deactivation in roaming NW (MO Video Call)

Description

The DUT shall successfully perform an MO Video call when roaming in VxLTE

Related 3GPP core specifications

GSMA IR.92, IR.94

Reason for test

To verify the DUT establishes a Dedicated bearer for MO Video calls when roaming in VxLTE.

Initial configuration

VPLMN has an VxLTE roaming agreement with the HPLMN of the SIM card used in the DUT.

VPLMN is supporting VxLTE for roaming subscribers

DUT is configured for IMS PS Voice Preferred, CS Secondary in both HPLMN and VPLMN

DUT and Client-1 are successfully registered for IMS services (VxLTE) in the HPMN

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO video call to Client-1. | At DUT, check in NAS protocol messages:  - Network sends ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST  - DUT sends ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1. |
| 2 | At DUT, end the video call. | At DUT, check in NAS protocol messages:  - Network sends DEACTIVATE EPS BEARER CONTEXT REQUEST  - DUT sends DEACTIVATE EPS BEARER CONTEXT ACCEPT  Call is ended. |

#### 91.2.2.4 Dedicated Bearer Activation/Deactivation in roaming NW (MT Video Call)

Description

The DUT shall successfully perform an MT Video call when roaming in VxLTE.

Related 3GPP core specifications

GSMA IR.92, IR.94

Reason for test

To verify the DUT establishes a Dedicated bearer for MT Video calls.

Initial configuration

VPLMN has an VxLTE roaming agreement with the HPLMN of the SIM card used in the DUT.

VPLMN is supporting VxLTE for roaming subscribers

DUT is configured for IMS PS Voice Preferred, CS Secondary in both HPLMN and VPLMN

DUT and Client-1 are successfully registered for IMS services (VxLTE) in the HPMN

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT video call from Client-1. | At DUT, check in NAS protocol messages:  - Network sends ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST  - DUT sends ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1. |
| 2 | At Client-1, end the video call. | At DUT, check in NAS protocol messages:  - Network sends DEACTIVATE EPS BEARER CONTEXT REQUEST  - DUT sends DEACTIVATE EPS BEARER CONTEXT ACCEPT  Call is ended. |

### 91.2.3 Emergency Call (EMS Supported by Network)

#### 91.2.3.1 Emergency Call (EMS Supported by Network)

##### 91.2.3.1.1 Emergency Call over VxLTE SoS APN

Description

The DUT shall successfully make Emergency Calls over VxLTE.

Related core specifications

3GPP TS 23.167, TS 24.229, TS 24.301, TS 24.237

IR.92 5.2

Reason for test

To verify the DUT is able to initiate an Emergency call via IMS when registered for VxLTE in a network supporting EM calls over IMS.

Initial configuration

Network is supporting E-UTRAN and UTRAN or GERAN.

Network is supporting Emergency Calls over VxLTE (EMC\_BS = 1) and IMS services (VoPS = 1)

DUT is configured to Automatic RAT mode.

DUT is configured for IMS PS Voice Preferred, CS Secondary, or IMS PS Voice only.

DUT is successfully registered for IMS services (VxLTE).

Note: The following test cases covering Emergency calls over VxLTE are written using the “SoS” APN.  However, some operators may use an alternative APN for Emergency calls.  Please clarify with the operator as to what the expected APN name will be in use for the Emergency Calls over VxLTE.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO EM call to Emergency Services (112 or 911). | DUT displays Emergency Call setup.  At DUT, check NAS protocol messages:  - DUT sends PDN CONNECTIVITY REQUEST to the network with Request type 4 “Emergency”.  - Network sends ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST to DUT with APN “SoS”.  - DUT sends ACTIVATE DEFAULT BEARER CONTEXT ACCEPT to the network.  - Network sends ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST  - DUT sends ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT  - DUT starts IMS Emergency registration procedure  - DUT sends INVITE with “From” identity being equal to public identity received during IMS emergency registration and “To” containing Emergency service URN  Confirm 2-way audio between DUT and Emergency Services operator. |
| 2 | End the EM call. | At DUT, check in NAS protocol messages:  - Network sends DEACTIVATE EPS BEARER CONTEXT REQUEST  - DUT sends DEACTIVATE EPS BEARER CONTEXT ACCEPT  - Network sends DEACTIVATE EPS BEARER CONTEXT REQUEST  - DUT sends DEACTIVATE EPS BEARER CONTEXT ACCEPT  Call is ended. |

##### 91.2.3.1.2 Emergency Call over VxLTE – SoS APN (enabled geolocation)

Description

The DUT shall successfully make Emergency Calls over VxLTE and send its Location information.

Related core specifications

3GPP TS 23.167, TS 24.229, TS 24.301, TS 24.237

IR.92 5.2.3

Reason for test

To verify the DUT is able to initiate an Emergency call via IMS when registered for VxLTE in a network supporting EM calls over IMS.

Initial configuration

Network is supporting E-UTRAN and UTRAN or GERAN.

Network is supporting Emergency Calls over VxLTE (EMC\_BS = 1) and IMS services (VoPS = 1)

Network is mandating UE to include “Geolocation” header field and the PIDF Location object.

DUT is configured to Automatic RAT mode.

DUT is configured for IMS PS Voice Preferred, CS Secondary, or IMS PS Voice only.

DUT is configured to include “Geolocation” header field and the PIDF location object.

DUT is successfully registered for IMS services (VxLTE).

Note: The following test cases covering Emergency calls over VxLTE are written using the “SoS” APN.  However, some operators may use an alternative APN for Emergency calls.  Please clarify with the operator as to what the expected APN name will be in use for the Emergency Calls over VxLTE

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO EM call to Emergency Services (112 or 911). | DUT displays Emergency Call setup.  At DUT, check NAS protocol messages:  - DUT sends PDN CONNECTIVITY REQUEST to the network with Request type 4 “Emergency”.  - Network sends ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST to DUT with APN “SoS”.  - DUT sends ACTIVATE DEFAULT BEARER CONTEXT ACCEPT to the network.  - Network sends ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST  - DUT sends ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT  - DUT starts IMS Emergency registration procedure  - DUT sends INVITE with “From” identity being equal to public identity received during IMS emergency registration and “To” containing Emergency service URN  - MO INVITE contains Geographical Location information.  Confirm 2-way audio between DUT and Emergency Services operator. |
| 2 | End the EM call. | At DUT, check in NAS protocol messages:  - Network sends DEACTIVATE EPS BEARER CONTEXT REQUEST  - DUT sends DEACTIVATE EPS BEARER CONTEXT ACCEPT  - Network sends DEACTIVATE EPS BEARER CONTEXT REQUEST  - DUT sends DEACTIVATE EPS BEARER CONTEXT ACCEPT  Call is ended. |

##### 91.2.3.1.3 Emergency Call over – invalid UICC

Description

The DUT shall successfully make Emergency Calls over VxLTE in case of invalid UICC (no USIM application or missing UICC)

Related core specifications

3GPP TS 23.167, TS 24.229, TS 24.301, TS 24.237

IR.92 5.2

Reason for test

To verify the DUT is able to initiate an Emergency call via IMS in case of invalid UICC in a network supporting EM calls over IMS in limited service mode.

Initial configuration

Only network supporting E-UTRAN is available

Network is supporting IMS Emergency Calls in limited service mode (SIB1 ims-emergency = true)

DUT is configured to Automatic RAT mode.

DUT is configured for IMS PS Voice Preferred, CS Secondary, or IMS PS Voice only.

DUT is in offline mode (Flight mode enabled / powered off).

Note: The following test cases covering Emergency calls over VxLTE are written using the “SoS” APN.  However, some operators may use an alternative APN for Emergency calls.  Please clarify with the operator as to what the expected APN name will be in use for the Emergency Calls over VxLTE

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Bring DUT online. | DUT is camping in limited service mode on the available LTE network |
| 1 | At DUT, make MO EM call to Emergency Services (112 or 911). | DUT displays Emergency Call setup.  At DUT, check NAS protocol messages:  - DUT sends ATTACH Request type “Emergency”  - Network sends ATTACH ACCEPT including ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST to DUT with APN “SoS”.  - DUT sends ACTIVATE DEFAULT BEARER CONTEXT ACCEPT to the network.  - Network sends ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST  - DUT sends ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT  - DUT sends INVITE with “From” identity being “anonymous” and “To” containing Emergency service URN  Confirm 2-way audio between DUT and Emergency Services operator. |
| 2 | End the EM call. | At DUT, check in NAS protocol messages:  - Network sends DEACTIVATE EPS BEARER CONTEXT REQUEST  - DUT sends DEACTIVATE EPS BEARER CONTEXT ACCEPT  - Network sends DEACTIVATE EPS BEARER CONTEXT REQUEST  - DUT sends DEACTIVATE EPS BEARER CONTEXT ACCEPT  Call is ended. |

##### 91.2.3.1.4 Emergency Call over VxLTE – limited service mode

Description

The DUT shall successfully make Emergency Calls over VxLTE in case of being camped in limited service mode

Related core specifications

3GPP TS 23.167, TS 24.229, TS 24.301, TS 24.237

IR.92 5.2

Reason for test

To verify the DUT is able to initiate an Emergency call via IMS in case of being camped in limited service mode (camped PLMN denies LTE registration) in a network supporting EM calls over IMS in limited service mode.

Initial configuration

PLMN network supporting only E-UTRAN is available and is not allowing LTE registration to the DUT.

Network is supporting IMS Emergency Calls in limited service mode (SIB1 ims-emergency = true)

DUT is configured to Automatic RAT mode.

DUT is configured for IMS PS Voice Preferred, CS Secondary, or IMS PS Voice only.

DUT is in offline mode (Flight mode enabled / powered off).

Note: The following test cases covering Emergency calls over VxLTE are written using the “SoS” APN.  However, some operators may use an alternative APN for Emergency calls.  Please clarify with the operator as to what the expected APN name will be in use for the Emergency Calls over VxLTE

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Bring DUT online. | DUT is camping on VPLMN and starts attach procedure which is denied by the network (e.g. ATTACH REJECT with cause 15) |
| 1 | At DUT, make MO EM call to Emergency Services (112 or 911). | DUT displays Emergency Call setup.  At DUT, check NAS protocol messages:  - DUT sends ATTACH Request type “Emergency”  - Network sends ATTACH ACCEPT including ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST to DUT with APN “SoS”.  - DUT sends ACTIVATE DEFAULT BEARER CONTEXT ACCEPT to the network.  - Network sends ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST  - DUT sends ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT  - DUT sends INVITE with “From” identity being “anonymous” and “To” containing Emergency service URN  Confirm 2-way audio between DUT and Emergency Services operator. |
| 2 | End the EM call. | At DUT, check in NAS protocol messages:  - Network sends DEACTIVATE EPS BEARER CONTEXT REQUEST  - DUT sends DEACTIVATE EPS BEARER CONTEXT ACCEPT  - Network sends DEACTIVATE EPS BEARER CONTEXT REQUEST  - DUT sends DEACTIVATE EPS BEARER CONTEXT ACCEPT  Call is ended. |

##### 91.2.3.1.5 Emergency Call over VxLTE – UE detectable – SoS APN (Roaming)

Description

The DUT shall successfully make Emergency Calls over VxLTE when roaming outside its HPLMN.

Note: In some networks anonymous IMS emergency calls are not allowed. However, if CS based emergency calls are not available, then anonymous IMS emergency calls must be permitted for inbound S8HR VoLTE roamers.

Related core specifications

3GPP TS 23.167, TS 24.229, TS 24.301, TS 24.237

IR.92 5.2

Reason for test

To verify the DUT is able to initiate an Emergency call via IMS when registered for VxLTE in a network from another country that is supporting EM calls over IMS.

Initial configuration

Network is supporting E-UTRAN and UTRAN or GERAN.

Network is supporting Emergency Calls over VxLTE (EMC\_BS=1).

DUT is roaming in a VPLMN.

DUT is configured to Automatic RAT mode.

DUT is configured for IMS PS Voice Preferred, CS Secondary, or IMS PS Voice only.

**Scenario A) DUT is registered for IMS services**

Network indicates support of IMS services (VoPS=1) in Attach Accept.

DUT has successfully registered for IMS services (VxLTE) in VPLMN.

Note: ATTACH ACCEPT for regular ATTACH REQUEST contains “IMS VoPS: IMS voice over PS session in S1 mode=1 (supported) and Emergency Service Support Indicator=Y”

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO EM call to Emergency Services (112 or 911). | DUT displays Emergency Call setup.  At DUT, check NAS protocol messages:  - DUT sends PDN CONNECTIVITY REQUEST to the network with Request type 4 “Emergency”.- Network sends ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST (PDU CONNECTIVITY REQUEST ACCEPT)  - DUT sends ACTIVATE DEFAULT EPS BEARER CONTEXT ACCEPT  At DUT, check SIP protocol messages:  - MO SIP REGISTER message: This message includes a “sos” SIP URI parameter in contact header  - MT REGISTER 200 OK Response message  The UE initiates IMS emergency call.  - Network sends ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST  - DUT sends ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT  Confirm 2-way audio between DUT and Emergency Services operator. |
| 2 | End the EM call. | At DUT, if PS emergency call, check SIP protocol messages:  - MO SIP BYE message  - MT 200 OK message  At DUT, check in NAS protocol messages:  - Network sends DEACTIVATE EPS BEARER CONTEXT REQUEST (for dedicated bearer)  - DUT sends DEACTIVATE EPS BEARER CONTEXT ACCEPT (for dedicated bearer)  Call is ended  After a N/W specific interval (to permit a further emergency call or a callback to the UE):-  - Network sends DEACTIVATE EPS BEARER CONTEXT REQUEST (default bearer)  - DUT sends DEACTIVATE EPS BEARER CONTEXT ACCEPT (default bearer). |

**Scenario B) DUT is not registered for IMS services**

Network indicates absence of support of IMS services (VoPS=0) in Attach Accept.

DUT has successfully registered only for PS services in VPLMN.

Note: ATTACH ACCEPT for regular ATTACH REQUEST contains “IMS VoPS: IMS voice over PS session in S1 mode=0 (not supported) and Emergency Service Support Indicator=Y”

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO EM call to Emergency Services (112 or 911). | DUT displays Emergency Call setup.  At DUT, check NAS protocol messages:  - DUT sends PDN CONNECTIVITY REQUEST to the network with Request type 4 “Emergency”.  - Network sends ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST (PDU CONNECTIVITY REQUEST ACCEPT)  - DUT sends ACTIVATE DEFAULT EPS BEARER CONTEXT ACCEPT  At DUT, check SIP protocol messages:  - MO SIP REGISTER message: This message includes a “sos” SIP URI parameter in contact header  - MT REGISTER 200 OK Response message  The UE initiates IMS emergency call.  - Network sends ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST  - DUT sends ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT  Confirm 2-way audio between DUT and Emergency Services operator. |
| 2 | End the EM call. | At DUT, if PS emergency call, check SIP protocol messages:  - MO SIP BYE message  - MT 200 OK message  At DUT, check in NAS protocol messages:  - Network sends DEACTIVATE EPS BEARER CONTEXT REQUEST (for dedicated bearer)  - DUT sends DEACTIVATE EPS BEARER CONTEXT ACCEPT (for dedicated bearer)  Call is ended  After a N/W specific interval (to permit a further emergency call or a callback to the UE):-  - Network sends DEACTIVATE EPS BEARER CONTEXT REQUEST (default bearer)  - DUT sends DEACTIVATE EPS BEARER CONTEXT ACCEPT (default bearer). |

##### 91.2.3.1.6 Emergency Call over VxLTE – non UE detectable – SoS APN (Roaming)

Description

The DUT shall successfully make non-UE detectabele Emergency Calls over VxLTE when roaming outside its HPLMN. In this case, the call is offered as a non-emergency call to the HPMN. The HPLMN shall be able to recognise emergency codes in the serving VPMN. The call attempt is rejected with an indication to the UE that an emergency call should be initiated in the VPMN.

**Note:** Some Home Short Service Codes (Voice Mail, Customer Care) are using the same codes as Visited “Non UE detectable” emergency codes. The HPMN must therefore check if a received short code is i) a HPMN service code, ii) a VPMN emergency code, or iii) Other. Local service codes are in the HPMN, emergency codes must be handled in the VPMN and other codes are handed as per N/W configuration (e.g. calls rejected).

Related core specifications

3GPP TS 23.167, TS 24.229, TS 24.301, TS 24.237

IR.92 5.2

Reason for test

To verify the DUT is able to initiate an non-UE detectable Emergency call (e.g. 110 – police) via IMS when registered for VxLTE in a network from another country that is supporting EM calls over IMS.

Initial configuration

Network is supporting E-UTRAN and UTRAN or GERAN.

Network is supporting Emergency Calls over VxLTE (EMC\_BS=1) and IMS services (VoPS=1).

Non UE detectable Emergency Calls are supportd by the NW

DUT is roaming in a VPLMN.

DUT is configured to Automatic RAT mode.

DUT is configured for IMS PS Voice Preferred, CS Secondary, or IMS PS Voice only.

DUT is successfully registered for IMS services (VxLTE) in HPLMN.

Editor’s Note – Rather than a comment, easier to do it this way. So, what happens is that the UE makes a “normal” call to the VPMN IMS. However, the HPMN IMS recognises that the short code is not a local service code and is a VPMN emergency code (HPMN IMS has a data table to spot all “strange” emergency codes on a per-MCC basis). The SIP INVITE is rejected with a 380 response (use Alternative Service) with an indicator that this is an emergency call. The UE (on receipt of 380) then behaves as for a UE-detected emergency call. See TS 24.229 section 5.1.3.1.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO non UE detectable EM call to Emergency Services (110, 101 or 999). | DUT displays Emergency Call setup.  At DUT, check NAS protocol messages:  - DUT sends PDN CONNECTIVITY REQUEST to the network with Request type 1 “Initial Request”. SIP INVITE includes non UE ustomizat emergency number, e.g. 110, 101 or 990.  - Network sends SIP 380 (Alternative Service – Emergency) with contact header information including emergency service URN (e.g. urn:service:sos:police)  - DUT sends PDN CONNECTIVITY REQUEST to the network with Request type 4 “Emergency”.  - Network sends ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST to DUT with APN “SOS”.  - DUT sends ACTIVATE DEFAULT BEARER CONTEXT ACCEPT to the network.  - Network sends ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST  - DUT sends ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT  At DUT, check SIP protocol messages:  - MO SIP REGISTER message: This message includes a “sos” SIP URI parameter in contact header  - MT 403/420 Response message, which may/may not indicate that an anonymous IMS emergency call is allowed. This is indicated via an XML body returned in the SIP response message.  a) anonymous IMS emergency call allowed  The UE initiates an anonymous IMS emergency call.  - Network sends ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST  - DUT sends ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT  b) anonymous IMS emergency call not allowed:  - Network sends PDN CONNECTIVITY REJECT to the DUT or Network rejects emergency REGISTER with cause 403 without any XML body  DUT reattempts emergency call in CS domain  Confirm 2-way audio between DUT and Emergency Services operator. |
| 2 | End the EM call. | At DUT, if it is PS emergency call, check SIP protocol messages:  - MO SIP BYE message  - MT 200 OK message  At DUT, check in NAS protocol messages:  - Network sends DEACTIVATE EPS BEARER CONTEXT REQUEST  - DUT sends DEACTIVATE EPS BEARER CONTEXT ACCEPT  - Network sends DEACTIVATE EPS BEARER CONTEXT REQUEST  - DUT sends DEACTIVATE EPS BEARER CONTEXT ACCEPT  Call is ended. |

#### 91.2.3.2 Emergency Call (EMS Not Supported by Network)

##### 91.2.3.2.1 Emergency Call over VxLTE (Not Supported by Network) – CS Fallback

Description

The DUT shall successfully make Emergency Calls via CS Fallback when the network is not supporting EM calls over VxLTE.

Related core specifications

3GPP TS 24.229; TS 23.167; TS 23.401; TS 23.272

GSMA IR.92 5.2; IR.92 A.5

Reason for test

To verify the DUT is able to initiate an Emergency call via CS Fallback when the network is not supporting EM calls over VxLTE.

Initial configuration

Network is supporting E-UTRAN and UTRAN or GERAN.

Network is not supporting Emergency Calls over VxLTE (EMC\_BS=0) but is supporting IMS services (VoPS=1).

DUT is configured to Automatic RAT mode.

DUT is configured for IMS PS Voice Preferred, CS Secondary, or IMS PS Voice only.

DUT is successfully registered for IMS services (VxLTE).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO EM call to Emergency Services (112 or 911). | DUT displays Emergency Call setup.  At DUT, check NAS protocol messages:  - DUT sends EXTENDED SERVICE REQUEST to the network with Service type 2 “Mobile originating CS fallback emergency call”.  CS Fallback to UTRAN or GERAN takes place.  At DUT, check NAS protocol messages:  - DUT sends EMERGENCY SETUP message.  Confirm 2-way audio between DUT and Emergency Services operator. |
| 2 | End the EM call. | Call is ended. |

##### 91.2.3.2.2 Emergency Call over VxLTE (Not Supported by Network) – CS Fallback (Acceptable Cell)

Description

The DUT shall successfully make Emergency Calls on an acceptable cell when the network is not supporting EM calls over VxLTE and no other CS cells are available in the HPLMN.

Related core specifications

3GPP TS 24.229; TS 23.167; TS 23.401; TS 23.272; TS 23.221

GSMA IR.92 5.2; IR.92 A.5

Reason for test

To verify the DUT is able to make Emergency Calls on an acceptable cell when the network is not supporting EM calls over VxLTE and no other CS cells are available in the HPLMN.

Initial configuration

Network is supporting E-UTRAN and UTRAN or GERAN.

Network is not supporting Emergency Calls over VxLTE (EMC\_BS=0) but is supporting IMS services (VoPS=1).

DUT is configured to Automatic RAT mode.

DUT is configured for IMS PS Voice Preferred, CS Secondary, or IMS PS Voice only.

DUT is successfully registered for IMS services (VxLTE).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Move DUT to an area where it remains registered for VxLTE but does not have any CS network available in the HPLMN. | DUT still displays the VxLTE icon to indicate VxLTE calls are available according to the customization requirement. |
| 2 | At DUT, make MO EM call to Emergency Services (112 or 911). | DUT displays Emergency Call setup.  At DUT, check NAS protocol messages:  - DUT sends EMERGENCY SETUP message.  Confirm 2-way audio between DUT and Emergency Services operator. |
| 3 | End the EM call. | Call is ended. |

##### 91.2.3.2.3 Emergency Call over VxLTE (Not Supported by Network) – CS Fallback (Non-UE detectable EC number)

Description

The DUT shall successfully make Emergency Calls via CS Fallback when the network is not supporting EM calls over VxLTE.

Related core specifications

3GPP TS 24.229; TS 23.167; TS 23.401; TS 23.272

GSMA IR.92 5.2; IR.92 A.5

Reason for test

To verify the DUT is able to initiate an Emergency call to a non UE detectable EM number via CS Fallback when the network is not supporting EM calls over VxLTE.

Initial configuration

Network is supporting E-UTRAN and UTRAN or GERAN.

Network is not supporting Emergency Calls over VxLTE (EMC\_BS=0) but is supporting IMS services (VoPS=1).

DUT is configured to Automatic RAT mode.

DUT is configured for IMS PS Voice Preferred, CS Secondary.

DUT is successfully registered for IMS services (VxLTE).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO EM call to Emergency Services by dialling a non-ue detectable EC number. | At DUT, check in SIP protocol:  - SIP 380 (Alternative Service) message from the network. This may include emergency service information.  If Included:  At DUT, check NAS protocol messages:  - DUT sends EMERGENCY SETUP message.  DUT establishes EM call over the CS network.  Confirm 2-way audio between DUT and Emergency Services operator.  If not Included:  At DUT, check NAS protocol messages:  - DUT sends SETUP message.  DUT establishes a normal call over the CS network.  Confirm 2-way audio between DUT and Emergency Services operator. |
| 2 | End the EM call. | Call is ended. |

##### 91.2.3.2.4 Emergency Call over VxLTE (Not supported by network) – CS Fallback (Roaming)

Description

The DUT shall successfully make Emergency Calls via CS Fallback when the network is not supporting EM calls over VxLTE when in roaming.

Related core specifications

3GPP TS 24.229; TS 23.167; TS 23.401; TS 23.272

GSMA IR.92 5.2; IR.92 A.5

Reason for test

To verify the DUT is able to initiate an Emergency call via CS Fallback when the network is not supporting EM calls over VxLTE when the DUT is roaming.

Initial configuration

Network is supporting E-UTRAN and UTRAN or GERAN.

Network is not supporting Emergency Calls over VxLTE (EMC\_BS=0) but is supporting IMS services (VoPS=1).

DUT is roaming in a VPLMN.

DUT is configured to Automatic RAT mode.

DUT is configured for IMS PS Voice Preferred, CS Secondary, or IMS PS Voice only.

DUT is successfully registered for IMS services (VxLTE).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO EM call to Emergency Services (112 or 911). | DUT displays Emergency Call setup.  At DUT, check NAS protocol messages:  - DUT sends EXTENDED SERVICE REQUEST to the network with Service type 2 “Mobile originating CS fallback emergency call”.  CS Fallback to UTRAN or GERAN takes place.  At DUT, check NAS protocol messages:  - DUT sends EMERGENCY SETUP message.  Confirm 2-way audio between DUT and Emergency Services operator.  Note: DUT must not attempt EM call over VoLTE using the SoS APN since the network is not supporting this EMC\_BS=0. |
| 2 | End the EM call. | Call is ended. |

#### 91.2.3.3 Emergency Call (VxLTE Not Supported by Network)

##### 91.2.3.3.1 Emergency Call (VxLTE Not Supported by Network) – CS Fallback

Description

The DUT shall successfully make Emergency Calls via CS Fallback when the network is not supporting VxLTE.

Related core specifications

3GPP TS 24.229; TS 23.167; TS 23.401; TS 23.272

GSMA IR.92 5.2; IR.92 A.5

Reason for test

To verify the DUT is able to initiate an Emergency call via CS Fallback when the network is not supporting VxLTE.

Initial configuration

Network is supporting E-UTRAN and UTRAN or GERAN.

VxLTE is not supported by the network.

DUT is configured for IMS PS Voice Preferred, CS Secondary

DUT is configured to Automatic RAT mode.

DUT is in offline mode (Flight mode enabled / powered off).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Bring DUT online so it establishes “Default EPS Bearer Context Activation” procedures. | DUT correctly displays an icon to indicate it is registered for LTE services but no VxLTE icon. |
| 2 | At DUT, make MO EM call to Emergency Services (112 or 911). | DUT displays Emergency Call setup.  At DUT, check NAS protocol messages:  - DUT sends EXTENDED SERVICE REQUEST to the network with Service type 2 “Mobile originating CS fallback emergency call”.  CS Fallback to UTRAN or GERAN takes place.  At DUT, check NAS protocol messages:  - DUT sends EMERGENCY SETUP message.  Confirm 2-way audio between DUT and Emergency Services operator. |

### 91.2.4 SIP Preconditions Required (Resource Available)

#### 91.2.4.1 MO Voice Call – SIP Preconditions required

Description

When Resource is available, the DUT should update the QoS status when preconditions are met.

Related core specifications

GSMA IR.92, section 2.4.1

3GPP TS 24.229, RFC 3312, RFC 4032

Reason for test

To confirm when Resource is available, the DUT should update the QoS status when preconditions are met.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE).

The DUT and Client-1 are both supporting SIP Precondition.

Network is supporting SIP Precondition.

QoS Resources are available.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO Voice call to Client-1. | At DUT, check in SIP protocol messages:  - MO INVITE message indicates “Precondition” within the “Supported” tag.  - MO INVITE message contains Local QoS setting: desired-status attribute (a=des)  - MO UPDATE message contains Local QoS setting: desired-status attribute (a=des) |
| 2 | Answer the call at Client-1. | Confirm the voice call is established.  Confirm 2-way audio between DUT and Client-1. |
| 3 | End the voice call between DUT and Client-1. | Call is ended. |

#### 91.2.4.2 MT Voice Call – SIP Preconditions required

Description

When Resource is available, the DUT should update the QoS status when preconditions are met.

Related core specifications

GSMA IR.92, section 2.4.1

3GPP TS 24.229, RFC 3312, RFC 4032

Reason for test

To confirm when Resource is available, the DUT should update the QoS status when preconditions are met.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE).

The DUT and Client-1 are both supporting SIP Precondition.

Network is supporting SIP Precondition.

QoS Resources are available.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT Voice call from Client-1. | At DUT, check in SIP protocol messages:  - MT INVITE message indicates “Precondition” within the “Supported” tag.  - MT INVITE message contains Local QoS setting: desired-status attribute (a=des)  - MO SESSION PROGRESS message indicates “Precondition” within the “Required” tag.  - |
| 2 | Answer the call at DUT. | Confirm the voice call is established.  Confirm 2-way audio between DUT and Client-1. |
| 3 | End the voice call between DUT and Client-1. | Call is ended. |

#### 91.2.4.3 MO Voice Call – SIP Preconditions required - DUT upgrades call to Video

Description

When Resource is available, the DUT should update the QoS status when preconditions are met.

Related core specifications

GSMA IR.92, section 2.4.1

3GPP TS 24.229, RFC 3312, RFC 4032

Reason for test

To confirm when Resource is available, the DUT should update the QoS status when preconditions are met.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE).

The DUT and Client-1 are both supporting SIP Precondition.

Network is supporting SIP Precondition.

QoS Resources are available.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO Voice call to Client-1. | Confirm the voice call is established.  Confirm 2-way audio between DUT and Client-1. |
| 2 | At DUT, select the in-call menu option to upgrade to a video call. | Video Stream is successfully added.  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1.  At DUT, check in SIP protocol messages:  - MO INVITE message indicates “Precondition” within the “Supported” tag.  - MO INVITE message contains Local QoS setting: desired-status attribute (a=des)  - MO UPDATE message contains Local QoS setting: desired-status attribute (a=des) |
| 3 | End the video call between DUT and Client-1. | Call is ended. |

#### 91.2.4.4 MT Voice Call – SIP Preconditions required – Client upgrades call to Video

Description

When Resource is available, the DUT should update the QoS status when preconditions are met.

Related core specifications

GSMA IR.92, section 2.4.1

3GPP TS 24.229, RFC 3312, RFC 4032

Reason for test

To confirm when Resource is available, the DUT should update the QoS status when preconditions are met.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE).

The DUT and Client-1 are both supporting SIP Precondition.

Network is supporting SIP Precondition.

QoS Resources are available.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT Voice call from Client-1. | Confirm the voice call is established.  Confirm 2-way audio between DUT and Client-1. |
| 2 | At Client-1, select the in-call menu option to upgrade to a video call. | Video Stream is successfully added.  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1.  At DUT, check in SIP protocol messages:  - MT INVITE message contains Local QoS setting: desired-status attribute (a=des)  - MO SESSION PROGRESS message indicates “Precondition” within the “Required” tag.  - MO OK message indicates “Precondition” within the “Supported” tag. |
| 3 | End the video call between DUT and Client-1. | Call is ended. |

#### 91.2.4.5 MO Video Call – SIP Preconditions required

Description

When Resource is available, the DUT should update the QoS status when preconditions are met.

Related core specifications

GSMA IR.92, section 2.4.1

3GPP TS 24.229, RFC 3312, RFC 4032

Reason for test

To confirm when Resource is available, the DUT should update the QoS status when preconditions are met.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE).

The DUT and Client-1 are both supporting SIP Precondition.

Network is supporting SIP Precondition.

QoS Resources are available.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO Video call to Client-1. | At DUT, check in SIP protocol messages:  - MO INVITE message indicates “Precondition” within the “Supported” tag.  - MO INVITE message contains Local QoS setting: desired-status attribute (a=des)  - MO UPDATE message contains Local QoS setting: desired-status attribute (a=des) |
| 2 | Answer the call at Client-1. | Confirm the video call is established.  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1. |
| 3 | End the video call between DUT and Client-1. | Call is ended. |

#### 91.2.4.6 MT Video Call – SIP Preconditions required

Description

When Resource is available, the DUT should update the QoS status when preconditions are met.

Related core specifications

GSMA IR.92, section 2.4.1

3GPP TS 24.229, RFC 3312, RFC 4032

Reason for test

To confirm when Resource is available, the DUT should update the QoS status when preconditions are met.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE).

The DUT and Client-1 are both supporting SIP Precondition.

Network is supporting SIP Precondition.

QoS Resources are available.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT Video call from Client-1. | At DUT, check in SIP protocol messages:  - MT INVITE message indicates “Precondition” within the “Supported” tag.  - MT INVITE message contains Local QoS setting: desired-status attribute (a=des)  - MO SESSION PROGRESS message indicates “Precondition” within the “Required” tag. |
| 2 | Answer the call at DUT. | Confirm the video call is established.  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1. |
| 3 | End the video call between DUT and Client-1. | Call is ended. |

### 91.2.5 SIP Preconditions Required (Resource Unavailable)

#### 91.2.5.1 MO Voice Call – SIP Preconditions required – Resource Unavailable

Description

Confirm the DUT sends MO CANCEL message when QoS resource is unavailable for the voice call.

Related core specifications

GSMA IR.92, sub clause 2.4.1

3GPP TS 24.229, RFC 3312, RFC 4032

Reason for test

Ensure that DUT sends MO CANCEL message when QoS resource is unavailable for the voice call.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE)

DUT and Client-1 are supporting SIP Precondition.

Network is supporting SIP Precondition.

QoS Resources unavailable for voice call.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO Voice call to Client-1. | At DUT, check in SIP protocol messages:  - MO INVITE message indicates “Precondition” within the “Supported” tag.  - MO INVITE message contains a=des: qos mandatory local “sendrecv”  - MO INVITE message contains a=des: qos optional remote “sendrecv” |
| 2 | Observe the call setup fails to establish. | At DUT, check NAS protocol messages:  Dedicated bearer is not established.  At DUT, check in SIP protocol messages:  - MO CANCEL message.  Call setup is ended. |

#### 91.2.5.2 MT Voice Call – SIP Preconditions required – Resource Unavailable

Description

Confirm the DUT sends 580 PRECONDITION FAILURE message when QoS resource is unavailable for the voice call.

Related core specifications

GSMA IR.92, sub clause 2.4.1

3GPP TS 24.229, RFC 3312, RFC 4032

Reason for test

Ensure that DUT sends 580 PRECONDITION FAILURE message when QoS resource is unavailable for the voice call.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE)

DUT and Client-1 are supporting SIP Precondition.

Network is supporting SIP Precondition.

QoS Resources unavailable for voice call.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, Receive MT Voice call from Client-1. | At DUT, check in SIP protocol messages:  - MO SESSION PROGRESS message indicates “Precondition” within the “Required” tag. |
| 2 | Observe the call setup fails to establish. | At DUT, check NAS protocol messages:  Dedicated bearer is not established.  At DUT, check in SIP protocol messages:  - MO 580 PRECONDITION FAILURE message.  No missed call is indicated at DUT. |

#### 91.2.5.3 MO Voice Call – SIP Preconditions required – Resource Insufficient

Description

Confirm the DUT sends MO UPDATE message when QoS resource is insufficient for the voice call.

Related core specifications

GSMA IR.92, sub clause 2.4.1

3GPP TS 24.229, RFC 3312, RFC 4032

Reason for test

Ensure that DUT sends MO UPDATE message when QoS resource is insufficient for the voice call.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE)

DUT and Client-1 are supporting SIP Precondition.

Network is supporting SIP Precondition.

QoS Resources insufficient for requested voice call codec.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO Voice call to Client-1. | At DUT, check in SIP protocol messages:  - MO INVITE message indicates “Precondition” within the “Supported” tag.  - MO INVITE message contains a=des: qos mandatory local “sendrecv”  - MO INVITE message contains a=des: qos optional remote “sendrecv”  QoS is insufficient to setup the call.  - MO UPDATE message is sent to downgrade the codec to the bitrate that matches the bandwidth allocated for the dedicated bearer |
| 2 | Answer the call at Client-1. | Confirm the voice call is established.  Confirm 2-way audio between DUT and Client-1. |
| 3 | End the voice call between DUT and Client-1. | Call is ended. |

#### 91.2.5.4 MT Voice Call – SIP Preconditions required – Resource Insufficient

Description

Confirm the DUT sends MO UPDATE message when QoS resource is insufficient for the voice call.

Related core specifications

GSMA IR.92, sub clause 2.4.1

3GPP TS 24.229, RFC 3312, RFC 4032

Reason for test

Ensure that DUT sends MO UPDATE message when QoS resource is insufficient for the voice call.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE)

DUT and Client-1 are supporting SIP Precondition.

Network is supporting SIP Precondition.

QoS Resources insufficient for requested voice call codec.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, Receive MT Voice call from Client-1. | At DUT, check in SIP protocol messages:  - MO SESSION PROGRESS message indicates “Precondition” within the “Required” tag.  QoS is insufficient to setup the call.  - MO UPDATE message is sent to downgrade the codec to the bitrate that matches the bandwidth allocated for the dedicated bearer |
| 2 | Answer the call at DUT. | Confirm the voice call is established.  Confirm 2-way audio between DUT and Client-1. |
| 3 | End the voice call between DUT and Client-1. | Call is ended. |

#### 91.2.5.5 MO Video Call – SIP Preconditions required – Resource Unavailable

Description

Confirm the DUT sends MO UPDATE message when QoS resource is unavailable for the video call and establishes a voice call.

Related core specifications

GSMA IR.92, sub clause 2.4.1

3GPP TS 24.229, RFC 3312, RFC 4032

Reason for test

Ensure that DUT sends MO UPDATE message when QoS resource is unavailable for the video call and establishes a voice call.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE)

DUT and Client-1 are supporting SIP Precondition.

Network is supporting SIP Precondition.

QoS Resources unavailable for a video call.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO Video call to Client-1. | At DUT, check in SIP protocol messages:  - MO INVITE message indicates “Precondition” within the “Supported” tag.  - MO INVITE message contains a=des: qos mandatory local “sendrecv”  - MO INVITE message contains a=des: qos optional remote “sendrecv”  QoS is unavailable to setup the call.  - MO UPDATE message is sent to downgrade the call to a voice call. |
| 2 | Answer the call at Client-1. | Confirm the voice call is established.  Confirm 2-way audio between DUT and Client-1. |
| 3 | End the voice call between DUT and Client-1. | Call is ended. |

#### 91.2.5.6 MT Video Call – SIP Preconditions required – Resource Unavailable

Description

Confirm the DUT sends MO UPDATE message when QoS resource is unavailable for the video call and establishes a voice call.

Related core specifications

GSMA IR.92, sub clause 2.4.1

3GPP TS 24.229, RFC 3312, RFC 4032

Reason for test

Ensure that DUT sends MO UPDATE message when QoS resource is unavailable for the video call and establishes a voice call.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE)

DUT and Client-1 are supporting SIP Precondition.

Network is supporting SIP Precondition.

QoS Resources unavailable for a video call.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, Receive MT Video call from Client-1. | At DUT, check in SIP protocol messages:  - MO SESSION PROGRESS message indicates “Precondition” within the “Required” tag.  QoS is unavailable to setup the call.  - MO UPDATE message is sent to downgrade the call to a voice call. |
| 2 | Answer the call at DUT. | Confirm the voice call is established.  Confirm 2-way audio between DUT and Client-1. |
| 3 | End the voice call between DUT and Client-1. | Call is ended. |

#### 91.2.5.7 MO Video Call – SIP Preconditions required – Resource Insufficient

Description

Confirm the DUT sends MO UPDATE message when QoS resource is insufficient for the video call.

Related core specifications

GSMA IR.92, sub clause 2.4.1

3GPP TS 24.229, RFC 3312, RFC 4032

Reason for test

Ensure that DUT sends MO UPDATE message when QoS resource is insufficient for the video call.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE)

DUT and Client-1 are supporting SIP Precondition.

Network is supporting SIP Precondition.

QoS Resources insufficient for requested video call codec.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO Video call to Client-1. | At DUT, check in SIP protocol messages:  - MO INVITE message indicates “Precondition” within the “Supported” tag.  - MO INVITE message contains a=des: qos mandatory local “sendrecv”  - MO INVITE message contains a=des: qos optional remote “sendrecv”  QoS is insufficient to setup the call.  - MO UPDATE message is sent to downgrade the video codec to a bitrate that matches the bandwidth allocated for the dedicated bearer. |
| 2 | Answer the call at Client-1. | Confirm the video call is established.  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1. |
| 3 | End the video call between DUT and Client-1. | Call is ended. |

#### 91.2.5.8 MT Video Call – SIP Preconditions required – Resource Insufficient

Description

Confirm the DUT sends MO UPDATE message when QoS resource is insufficient for the voice call.

Related core specifications

GSMA IR.92, sub clause 2.4.1

3GPP TS 24.229, RFC 3312, RFC 4032

Reason for test

Ensure that DUT sends MO UPDATE message when QoS resource is insufficient for the voice call.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE)

DUT and Client-1 are supporting SIP Precondition.

Network is supporting SIP Precondition.

QoS Resources insufficient for requested voice call codec.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, Receive MT Video call from Client-1. | At DUT, check in SIP protocol messages:  - MO SESSION PROGRESS message indicates “Precondition” within the “Required” tag.  QoS is insufficient to setup the call.  - MO UPDATE message is sent to downgrade video codec to a bitrate that matches the bandwidth allocated for the dedicated bearer. |
| 2 | Answer the call at DUT. | Confirm the video call is established.  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1. |
| 3 | End the video call between DUT and Client-1. | Call is ended. |

### 91.2.6 Call Establishment Performance

#### 91.2.6.1 MO Voice Call – Establishment Setup time (Relative measurement)

Description

The DUT shall successfully establish an MO VxLTE call within a sufficient setup time.

Related 3GPP core specifications

GSMA IR.92

Reason for test

To verify the DUT establishes an MO VxLTE call within a sufficient setup time.

Initial configuration

DUT is successfully registered for IMS services (VxLTE)

Reference-1, with similar capabilities to DUT is available and also registered for IMS services (VxLTE)

Client-1 is any device that can receive MT voice calls.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1.  At DUT, measure the time from pressing the call button to when the ringing tone can be heard on DUT. | DUT establishes MO call setup and is ringing to indicate the call to Client-1 has been successfully negotiated.  The call setup time is recorded. |
| 2 | At DUT, end the call setup. | Call setup is ended. |
| 3 | At DUT, repeat steps 1 and 2 for 9 more attempts. | 10 call setup times in total are recorded on DUT.  Calculate an average call setup time. |
| 4 | At Reference-1, perform steps 1 and 2 for 10 attempts. | 10 call setup times in total are recorded on Reference-1.  Calculate an average call setup time. |
| 5 | Compare the setup time between DUT and Reference-1. | Call setup time is comparable between DUT and Reference-1 (DUT is no worse than 10% slower in call setup time). |

#### 91.2.6.2 MO Voice Call – Establishment Setup time (Absolute measurement)

Description

The DUT shall successfully establish an MO VxLTE call within a sufficient setup time.

Related 3GPP core specifications

GSMA IR.92

Reason for test

To verify the DUT establishes an MO VxLTE call within a sufficient setup time.

Initial configuration

Test is done under lab conditions (optimum RF signal, no contention with other devices, and sufficient bandwidth of eNodeB).

DUT is successfully registered for IMS services (VxLTE)

Reference-1, with similar capabilities to DUT is available and also registered for IMS services (VxLTE)

Client-1 is any device that can receive MT voice calls.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1.  At DUT, measure the time from pressing the call button to when the ringing tone can be heard on DUT. | DUT establishes MO call setup and is ringing to indicate the call to Client-1 has been successfully negotiated.  The call setup time is recorded. |
| 2 | At DUT, end the call setup. | Call setup is ended. |
| 3 | At DUT, repeat steps 1 and 2 for 9 more attempts. | 10 call setup times in total are recorded on DUT.  Calculate an average call setup time. |
| 4 | At Reference-1, perform steps 1 and 2 for 10 attempts. | 10 call setup times in total are recorded on Reference-1.  Calculate an average call setup time. |
| 5 | Compare the setup time between DUT and Reference-1. | Call setup time is comparable between DUT and Reference-1 (DUT is no worse than 10% slower in call setup time). |

#### 91.2.6.3 MO Voice Call – Establishment Success Rate (Relative measurement)

Description

The DUT shall successfully establish an MO VxLTE call.

Related 3GPP core specifications

GSMA IR.92

Reason for test

To verify the DUT establishes an MO VxLTE call over multiple attempts.

Initial configuration

DUT is successfully registered for IMS services (VxLTE)

Reference-1, with similar capabilities to DUT is available and also registered for IMS services (VxLTE)

Client-1 is any device that can receive MT voice calls.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1.  Answer call at Client-1. | Confirm the voice call is established.  Confirm 2-way audio between DUT and Client-1. |
| 2 | At DUT, end the call. | Call is ended. |
| 3 | At DUT, repeat steps 1 and 2 for 9 more attempts. | 10 calls in total are recorded on DUT. |
| 4 | At Reference-1, perform steps 1 and 2 for 10 attempts. | 10 calls in total are recorded on Reference-1. |
| 5 | Compare the success rate between DUT and Reference-1. | Call success rate is comparable between DUT and Reference-1 (DUT is no worse than 10% in call success rate). |

#### 91.2.6.4 MO Voice Call – Establishment Success Rate (Absolute measurement)

Description

The DUT shall successfully establish an MO VxLTE call.

Related 3GPP core specifications

GSMA IR.92

Reason for test

To verify the DUT establishes an MO VxLTE call over multiple attempts.

Initial configuration

Test is done under lab conditions (optimum RF signal, no contention with other devices, and sufficient bandwidth of eNodeB).

DUT is successfully registered for IMS services (VxLTE)

Reference-1, with similar capabilities to DUT is available and also registered for IMS services (VxLTE)

Client-1 is any device that can receive MT voice calls.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1.  Answer call at Client-1. | Confirm the voice call is established.  Confirm 2-way audio between DUT and Client-1. |
| 2 | At DUT, end the call. | Call is ended. |
| 3 | At DUT, repeat steps 1 and 2 for 9 more attempts. | 10 calls in total are recorded on DUT. |
| 4 | At Reference-1, perform steps 1 and 2 for 10 attempts. | 10 calls in total are recorded on Reference-1. |
| 5 | Compare the success rate between DUT and Reference-1. | Call success rate is comparable between DUT and Reference-1 (DUT is no worse than 10% in call success rate). |

#### 91.2.6.5 MT Voice Call – Establishment Success Rate (Relative measurement)

Description

The DUT shall successfully establish an MT VxLTE call.

Related 3GPP core specifications

GSMA IR.92

Reason for test

To verify the DUT establishes an MT VxLTE call over multiple attempts.

Initial configuration

DUT is successfully registered for IMS services (VxLTE)

Reference-1, with similar capabilities to DUT is available and also registered for IMS services (VxLTE)

Client-1 is any device that can make MO voice calls.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1.  Answer call at DUT. | Confirm the voice call is established.  Confirm 2-way audio between DUT and Client-1. |
| 2 | At Client-1, end the call. | Call is ended. |
| 3 | At DUT, repeat steps 1 and 2 for 9 more attempts. | 10 calls in total are recorded on DUT. |
| 4 | At Reference-1, perform steps 1 and 2 for 10 attempts. | 10 calls in total are recorded on Reference-1. |
| 5 | Compare the success rate between DUT and Reference-1. | Call success rate is comparable between DUT and Reference-1 (DUT is no worse than 10% in call success rate). |

#### 91.2.6.6 MT Voice Call – Establishment Success Rate (Absolute measurement)

Description

The DUT shall successfully establish an MT VxLTE call.

Related 3GPP core specifications

GSMA IR.92

Reason for test

To verify the DUT establishes an MT VxLTE call over multiple attempts.

Initial configuration

Test is done under lab conditions (optimum RF signal, no contention with other devices, and sufficient bandwidth of eNodeB).

DUT is successfully registered for IMS services (VxLTE)

Reference-1, with similar capabilities to DUT is available and also registered for IMS services (VxLTE)

Client-1 is any device that can make MO voice calls.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1.  Answer call at DUT. | Confirm the voice call is established.  Confirm 2-way audio between DUT and Client-1. |
| 2 | At Client-1, end the call. | Call is ended. |
| 3 | At DUT, repeat steps 1 and 2 for 9 more attempts. | 10 calls in total are recorded on DUT. |
| 4 | At Reference-1, perform steps 1 and 2 for 10 attempts. | 10 calls in total are recorded on Reference-1. |
| 5 | Compare the success rate between DUT and Reference-1. | Call success rate is comparable between DUT and Reference-1 (DUT is no worse than 10% in call success rate). |

#### 91.2.6.7 MO Video Call – Establishment Setup Time (Relative measurement)

Description

The DUT shall successfully establish an MO video call within a sufficient setup time.

Related 3GPP core specifications

GSMA IR.94

Reason for test

To verify the DUT establishes an MO video call within a sufficient setup time.

Initial configuration

Reference-1 with similar capabilities to DUT is available

DUT, Client-1and Reference-1 are successfully registered for IMS services (VxLTE).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO video call to Client-1.  At DUT, measure the time from pressing the call button to when the ringing tone can be heard on DUT. | Ringing tone is heard on DUT.  The video call setup time is recorded. |
| 2 | At DUT, end the video call setup. | Call setup is ended. |
| 3 | At DUT, repeat steps 1 and 2 for 9 more attempts. | Calculate an average video call setup time of 10 times on DUT. |
| 4 | At Reference-1, perform steps 1 and 2 for 10 attempts. | Video call setup times are recorded on Reference-1.  Calculate an average video call setup time of 10 times. |
| 5 | Compare the setup time between DUT and Reference-1. | Video call setup time is comparable between DUT and Reference-1 (DUT is no worse than 10% slower in video call setup time). |

#### 91.2.6.8 MT Video Call –Codec Establishment Time (Relative measurement)

Description

The DUT shall successfully encode/decode and display the video stream within an acceptable time after answering the video call.

Related 3GPP core specifications

GSMA IR.94

Reason for test

To verify the DUT encode/decode and display the video stream within an acceptable time.

Initial configuration

Reference-1 with similar capabilities to DUT is available

DUT, Client-1 and Reference-1 are successfully registered for IMS services (VxLTE).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT video call from Client-1.  Answer the video call at DUT.  At DUT, measure the time from pressing the video call accept button to when the 2-way video media stream is presented between DUT and Client. | An incoming video call is indicated to DUT.  2-way video is presented.  The codec establishment time is recorded. |
| 2 | At DUT, end the video call. | Video call is ended. |
| 3 | At DUT, repeat steps 1 and 2 for 9 more attempts. | Calculate an average codec establishment time of 10 times on DUT. |
| 4 | At Reference-1, perform steps 1 and 2 for 10 attempts. | Calculate an average codec establishment time of 10 times on Reference-1. |
| 5 | Compare the establishment time between DUT and Reference-1. | Codec establishment time is comparable between DUT and Reference-1 (DUT is no worse than 10% slower in video displaying delay). |

#### 91.2.6.9 MO Video Call – Establishment Success Rate (Relative measurement)

Description

The DUT shall successfully establish an MO video call.

Related 3GPP core specifications

GSMA IR.94

Reason for test

To verify the DUT establishes an MO video call over multiple attempts.

Initial configuration

Reference-1 with similar capabilities to DUT is available

DUT, Client-1and Reference-1 are successfully registered for IMS services (VxLTE).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO video call to Client-1.  Answer the call at Client-1. | Confirm 2-way video stream between DUT and Client-1 |
| 2 | At DUT, end the video call. | Video call is ended. |
| 3 | At DUT, repeat steps 1 and 2 for 9 more attempts. | Calculate video call success rate on DUT. |
| 4 | At Reference-1, perform steps 1 and 2 for 10 attempts. | Calculate video call success rate on Reference-1. |
| 5 | Compare the call success rate between DUT and Reference-1. | Video call success rate is comparable between DUT and Reference-1 (DUT is no worse than 10% in video call success rate). |

#### 91.2.6.10 MT Video Call – Establishment Success Rate (Relative measurement)

Description

The DUT shall successfully establish an MT video call.

Related 3GPP core specifications

GSMA IR.94

Reason for test

To verify the DUT establishes an MT video call over multiple attempts.

Initial configuration

Reference-1 with similar capabilities to DUT is available

DUT, Client-1and Reference-1 are successfully registered for IMS services (VxLTE).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT video call from Client-1.  Answer the call at DUT. | Confirm 2-way video stream between DUT and Client-1 |
| 2 | At Client-1, end the video call. | Video call is ended. |
| 3 | At DUT, repeat steps 1 and 2 for 9 more attempts. | Calculate video call success rate on DUT. |
| 4 | At Reference-1, perform steps 1 and 2 for 10 attempts. | Calculate video call success rate on Reference-1. |
| 5 | Compare the call success rate between DUT and Reference-1. | Video call success rate is comparable between DUT and Reference-1 (DUT is no worse than 10% in video call success rate). |

#### 91.2.6.11 MO Video Call – Establishment Setup Time (Absolute measurement)

Description

The DUT shall successfully establish an MO video call within a sufficient setup time.

Related 3GPP core specifications

GSMA IR.94

Reason for test

To verify the DUT establishes an MO video call within a sufficient setup time.

Initial configuration

Test is done under lab conditions (optimum RF signal and sufficient bandwidth of eNodeB).

DUT and Client-1 are successfully registered for IMS services (VxLTE).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO video call to Client-1.  At DUT, measure the time from pressing the call button to when the ringing tone can be heard on DUT. | Ringing tone is heard on DUT.  The video call setup time is recorded. |
| 2 | At DUT, end the video call setup. | Call setup is ended. |
| 3 | At DUT, repeat steps 1 and 2 for 9 more attempts. | Record the video call setup time for each attempt on DUT.  Calculate and record an average video call setup time of 10 times on DUT. |

#### 91.2.6.12 MT Video Call –Codec Establishment Time (Absolute measurement)

Description

The DUT shall successfully encode/decode and display the video stream within an acceptable time after answering the video call.

Related 3GPP core specifications

GSMA IR.94

Reason for test

To verify the DUT encode/decode and display the video stream within an acceptable time.

Initial configuration

Test is done under lab conditions (optimum RF signal and sufficient bandwidth of eNodeB).

DUT and Client-1 are successfully registered for IMS services (VxLTE).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT video call from Client-1.  Answer the video call at DUT.  At DUT, measure the time from pressing the video call accept button to when the 2-way video media stream is presented between DUT and Client. | An incoming video call is indicated to DUT.  2-way video is presented.  The codec establishment time is recorded. |
| 2 | At DUT, end the video call. | Video call is ended. |
| 3 | At DUT, repeat steps 1 and 2 for 9 more attempts. | Record the video call setup time for each attempt on DUT.  Calculate and record an average codec establishment time of 10 times on DUT. |

## 91.3 VxLTE – SMS

### 91.3.1 SMS over VxLTE (Supported by Network)

#### 91.3.1.1 SMS over VxLTE (Supported by Network) – MO SMS over VxLTE – Roaming

Description

Verify the DUT can successfully send an MO SMS over VxLTE when roaming.

Related core specifications

3GPP TS 24.341

GSMA IR.92 2.5

Reason for test

To verify the DUT is able to send an MO SMS over VxLTE when roaming.

Initial configuration

The DUT is roaming outside of its HPLMN.

DUT and Client-1 are successfully registered for IMS services (VxLTE).

The DUT supports MO SMS over IMS and MO SMS over SG.

The IMS server supports MO SMS over IMS.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Using the DUT messaging application, create a new SMS and enter the MSISDN of Client-1 as the recipient.  Enter 160 characters (1 segment) in the SMS text. | The SMS is created. |
| 2 | Send the SMS to Client-1 | At DUT, check in SIP protocol messages:  - MO MESSAGE.  SMS is successfully received on Client 1.  The message content is identical to the message prepared on DUT. |

#### 91.3.1.2 SMS over VxLTE (Supported by Network) – MT SMS over VxLTE – Roaming

Description

Verify the DUT can successfully receive an MT SMS over VxLTE when roaming.

Related core specifications

3GPP TS 24.341

GSMA IR.92 2.5

Reason for test

To verify the DUT is able to receive an MT SMS over VxLTE when roaming.

Initial configuration

The DUT is roaming outside of its HPLMN.

DUT and Client-1 are successfully registered for IMS services (VxLTE).

The DUT supports MT SMS over IMS and MT SMS over SG.

The IMS server supports MT SMS over IMS.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At Client-1, create a new SMS and enter the MSISDN of DUT as the recipient.  Enter 160 characters (1 segment) in the SMS text. | The SMS is created. |
| 2 | Send the SMS to DUT | At DUT, check in SIP protocol messages:  - MT MESSAGE.  SMS is successfully received on DUT.  The message content is identical to the message prepared on Client-1. |

### 91.3.2 SMS over VxLTE (Not supported by Network)

#### 91.3.2.1 SMS over VxLTE (Not supported by Network) – MO SMS over SG – Idle

Description

Verify the DUT can successfully send an MO SMS via SG when the IMS server is not supporting MO SMS over IMS.

Related core specifications

3GPP TS 24.341; TS 23.272; TS 23.221; TS 24.301; TS 24.167

GSMA IR.92 2.5

Reason for test

To verify the DUT is able to send an MO SMS over SG when the IMS server is not supporting MO SMS over IMS.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE).

The DUT supports MO SMS over IMS and MO SMS over SG.

The IMS server does not support MO SMS over IMS.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Using the DUT messaging application, create a new SMS and enter the MSISDN of Client-1 as the recipient.  Enter 160 characters (1 segment) in the SMS text. | The SMS is created. |
| 2 | Send the SMS to Client-1 | At DUT, check in SIP protocol messages:  - There is no MO MESSAGE.  SMS is successfully received on Client 1.  The message content is identical to the message prepared on DUT. |

#### 91.3.2.2 SMS over VxLTE (Not supported by Network) – MO SMS over SG – During Voice Call

Description

Verify the DUT can successfully send an MO SMS via SG when the IMS server is not supporting MO SMS over IMS, even though the DUT is in an active VxLTE call.

Related core specifications

3GPP TS 24.341; TS 23.272; TS 23.221; TS 24.301; TS 24.167

GSMA IR.92 2.5

Reason for test

To verify the DUT is able to send an MO SMS over SG when the IMS server is not supporting MO SMS over IMS, even though the DUT is in an active VxLTE call.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE).

The DUT supports MO SMS over IMS and MO SMS over SG.

The IMS server does not support MO SMS over IMS.

The DUT is in an active voice call with Client-1 over VxLTE.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Using the DUT messaging application, create a new SMS and enter the MSISDN of Client-1 as the recipient.  Enter 160 characters (1 segment) in the SMS text. | The SMS is created. |
| 2 | Send the SMS to Client-1 | At DUT, check in SIP protocol messages:  - There is no MO MESSAGE.  SMS is successfully received on Client 1.  The message content is identical to the message prepared on DUT. |

#### 91.3.2.3 SMS over VxLTE (Not supported by Network) – MO SMS over SG – Roaming

Description

Verify the DUT can successfully send an MO SMS via SG when the IMS server is not supporting MO SMS over IMS in roaming.

Related core specifications

3GPP TS 24.341; TS 23.272; TS 23.221; TS 24.301; TS 24.167

GSMA IR.92 2.5

Reason for test

To verify the DUT is able to send an MO SMS over SG when the IMS server is not supporting MO SMS over IMS in roaming.

Initial configuration

The DUT is roaming outside of its HPLMN.

DUT and Client-1 are successfully registered for IMS services (VxLTE).

The DUT supports MO SMS over IMS and MO SMS over SG.

The IMS server does not support MO SMS over IMS.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Using the DUT messaging application, create a new SMS and enter the MSISDN of Client-1 as the recipient.  Enter 160 characters (1 segment) in the SMS text. | The SMS is created. |
| 2 | Send the SMS to Client-1 | At DUT, check in SIP protocol messages:  - There is no MO MESSAGE.  SMS is successfully received on Client 1.  The message content is identical to the message prepared on DUT. |

#### 91.3.2.4 SMS over VxLTE (Not supported by Network) – MT SMS over SG – Idle

Description

Verify the DUT can successfully receive an MT SMS via SG when the IMS server is not supporting MT SMS over IMS.

Related core specifications

3GPP TS 24.341; TS 23.272; TS 23.221; TS 24.301; TS 24.167

GSMA IR.92 2.5

Reason for test

To verify the DUT is able to receive an MT SMS over SG when the IMS server is not supporting MT SMS over IMS.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE).

The DUT supports MT SMS over IMS and MT SMS over SG.

The IMS server does not support MT SMS over IMS.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At Client-1, create a new SMS and enter the MSISDN of DUT as the recipient.  Enter 160 characters (1 segment) in the SMS text. | The SMS is created. |
| 2 | Send the SMS to DUT | At DUT, check in SIP protocol messages:  - There is no MT MESSAGE.  SMS is successfully received on DUT.  The message content is identical to the message prepared on Client-1. |

#### 91.3.2.5 SMS over VxLTE (Not supported by Network) – MT SMS over SG – During Voice Call

Description

Verify the DUT can successfully receive an MT SMS via SG when the IMS server is not supporting MT SMS over IMS, even though the DUT is in an active VxLTE call.

Related core specifications

3GPP TS 24.341; TS 23.272; TS 23.221; TS 24.301; TS 24.167

GSMA IR.92 2.5

Reason for test

To verify the DUT is able to receive an MT SMS over SG when the IMS server is not supporting MT SMS over IMS, even though the DUT is in an active VxLTE call.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE).

The DUT supports MT SMS over IMS and MT SMS over SG.

The IMS server does not support MT SMS over IMS.

The DUT is in an active voice call with Client-1 over VxLTE.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At Client-1, create a new SMS and enter the MSISDN of DUT as the recipient.  Enter 160 characters (1 segment) in the SMS text. | The SMS is created. |
| 2 | Send the SMS to DUT | At DUT, check in SIP protocol messages:  - There is no MT MESSAGE.  SMS is successfully received on DUT.  The message content is identical to the message prepared on Client-1. |

#### 91.3.2.6 SMS over VxLTE (Not supported by Network) – MT SMS over SG – Roaming

Description

Verify the DUT can successfully receive an MT SMS via SG when the IMS server is not supporting MT SMS over IMS in roaming.

Related core specifications

3GPP TS 24.341; TS 23.272; TS 23.221; TS 24.301; TS 24.167

GSMA IR.92 2.5

Reason for test

To verify the DUT is able to receive an MT SMS over SG when the IMS server is not supporting MT SMS over IMS in roaming.

Initial configuration

The DUT is roaming outside of its HPLMN.

DUT and Client-1 are successfully registered for IMS services (VxLTE).

The DUT supports MT SMS over IMS and MT SMS over SG.

The IMS server does not support MT SMS over IMS.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At Client-1, create a new SMS and enter the MSISDN of DUT as the recipient.  Enter 160 characters (1 segment) in the SMS text. | The SMS is created. |
| 2 | Send the SMS to DUT | At DUT, check in SIP protocol messages:  - There is no MT MESSAGE.  SMS is successfully received on DUT.  The message content is identical to the message prepared on Client-1. |

## 91.4 VxLTE – Supplementary Services

### 91.4.1 Supplementary Services via VxLTE (Supported by network)

### 91.4.2 Supplementary Services via VxLTE (Not Supported by network)

#### 91.4.2.1 IMS Registered – USSD over CS (Idle)

Description

This test case checks if the DUT is IMS registered in a network not supporting USSD over IMS, the device will perform CS Fallback to UTRAN or GERAN when a USSD command is requested.

Related core specifications

GSMA IR.92,

3GPP TS 23.272

Reason for test

The DUT must be able to perform USSD commands via CS Fallback when USSD over IMS is not supported by the network.

Initial Configuration

Network is not supporting USSD over IMS.

Network is supporting a CS infrastructure (UTRAN or GERAN).

DUT is supporting USSD over IMS.

DUT is successfully registered for IMS services (VxLTE).

No additional IMS transactions are ongoing (e.g. MO/MT call)

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, enter and send a USSD command (for example \*100# to check the prepaid balance). | USSD command is successfully sent to the network over the CS network (UTRAN/GERAN) and an appropriate response is displayed on the DUT. |

#### 91.4.2.2 IMS Registered – USSD over CS (During Voice Call)

Description

This test case checks if the DUT is in an ongoing IMS voice call and a USSD command is sent, the device will not perform CS Fallback to UTRAN or GERAN.

Related core specifications

GSMA IR.92, Annex A.9

3GPP TS 23.272

Reason for test

The DUT must be able to prioritise USSD commands so that no CS Fallback takes place when in an ongoing IMS call.

Initial Configuration

Network is not supporting USSD over IMS.

Network is supporting a CS infrastructure (UTRAN or GERAN).

DUT is supporting USSD over IMS.

DUT is successfully registered for IMS services (VxLTE).

DUT is in an ongoing IMS call with Client-1.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, enter and send a USSD command (for example \*100# to check the prepaid balance). | DUT does not perform CS Fallback to a CS network (UTRAN or GERAN).  USSD command fails.  Ongoing voice call between DUT and Client-1 continues unaffected with 2-way audio. |

## 91.5 VxLTE – Service Interworking

### 91.5.1 Voice with Data Transfer

#### 91.5.1.1 Voice Call setup during Active Data Transfer

Description

The DUT shall successfully setup a VxLTE call during an active data transfer.

Related 3GPP core specifications

3GPP TS 24.229

Reason for test

To verify the DUT can successfully setup a VxLTE call during an active data transfer Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE).

If the DUT is supporting a Carrier Aggregation combination of the network then this shall be used when performing the active data transfer.

|  |  |  |
| --- | --- | --- |
|  | **Test procedure** | Expected behaviour |
| 1 | At DUT, download a large file from an external server.  Note:  This can be via an internal FTP application or via a tethered laptop connection. | Data transfer is ongoing on DUT.  (If DUT is supporting a Carrier Aggregation of the network then CA is successfully established). |
| 2 | At DUT, make MO voice call to Client-1. | Call is successfully established over VxLTE.  Confirm 2-way audio between DUT and Client-1.  Data transfer is ongoing on DUT. |
| 3 | At DUT, end the voice call with Client-1. | Call is ended.  Data transfer is ongoing on DUT. |
| 4 | At DUT, receive MT voice call from Client-1. | Call is successfully established over VxLTE.  Confirm 2-way audio between DUT and Client-1.  Data transfer is ongoing on DUT. |
| 5 | At Client-1, end the voice call with DUT. | Call is ended.  Data transfer is ongoing on DUT. |
| 6 | End the data download. | Data transfer is stopped. |

#### 91.5.1.2 Data Transfer setup during Active Voice Call

Description

The DUT shall successfully perform data transfer during an ongoing VxLTE call.

Related 3GPP core specifications

3GPP TS 24.229

Reason for test

To verify the DUT can perform data transfer during an ongoing VxLTE call

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE).

If the DUT is supporting a Carrier Aggregation combination of the network then this shall be used when performing the active data transfer.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1. | Call is successfully established over VxLTE.  Confirm 2-way audio between DUT and Client-1. |
| 2 | At DUT, download a large file from an external server.  Note:  This can be via an internal FTP application or via a tethered laptop connection. | Data transfer is ongoing on DUT.  (If DUT is supporting a Carrier Aggregation of the network then CA is successfully established).  Call is ongoing with Client-1. |
| 3 | End the data download. | Data transfer is stopped.  Call is ongoing with Client-1. |
| 4 | At DUT, end the voice call with Client-1. | Call is ended. |

#### 91.5.1.3 Voice Call setup during Active Data Transfer over Wi-Fi

Description

The DUT shall successfully setup a VxLTE call during an active data transfer over Wi-Fi.

Related 3GPP core specifications

3GPP TS 24.229

Reason for test

To verify the DUT can successfully setup a VxLTE call during an active data transfer over Wi-Fi.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE).

DUT preference for internet is access is Wi-Fi preferred, Mobile data secondary.

DUT has VxWi-Fi calling disabled in the menu (or is not supporting VxWi-Fi).

Wi-Fi hotspot that provides a connection to the internet is available.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT open the browser and load the page “www.whatismyip.com”.  This will display the IP address and ISP for the LTE network the DUT is registered on.  Make a note of these. | IP address and ISP is displayed. |
| 2 | At DUT, enable Wi-Fi and connect to the Wi-Fi hotspot. | DUT displays the Wi-Fi connection icon to indicate it is connected to the Wi-Fi hotspot.  DUT still displays the VxLTE icon to indicate VxLTE calls are available according to the customization requirement. |
| 3 | At DUT open the browser and load the page “www.whatismyip.com”.  This will display the IP address and ISP for the Wi-Fi network the DUT is registered on.  Make a note of these. | IP address and ISP is displayed.  The IP and ISP in this step should be different to that in step 1. |
| 4 | At DUT, download a large file from an external server. | Data transfer is ongoing over Wi-Fi on DUT. |
| 5 | At DUT, make MO voice call to Client-1. | Call is successfully established over VxLTE.  Confirm 2-way audio between DUT and Client-1.  Data transfer over Wi-Fi is ongoing on DUT. |
| 6 | At DUT, end the voice call with Client-1. | Call is ended.  Data transfer over Wi-Fi is ongoing on DUT. |
| 7 | End the data download. | Data transfer is stopped. |
| 8 | At DUT, disable Wi-Fi. | Wi-Fi connection icon disappears.  DUT still displays the VxLTE icon to indicate VxLTE calls are available according to the customization requirement. |

#### 91.5.1.4 Data Transfer over Wi-Fi setup during Active Voice Call

Description

The DUT shall successfully perform data transfer over Wi-Fi during an ongoing VxLTE call.

Related 3GPP core specifications

3GPP TS 24.229

Reason for test

To verify the DUT can perform data transfer over Wi-Fi during an ongoing VxLTE call.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE).

DUT preference for internet is access is Wi-Fi preferred, Mobile data secondary.

DUT has VxWi-Fi calling disabled in the menu (or is not supporting VxWi-Fi).

Wi-Fi hotspot that provides a connection to the internet is available.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT open the browser and load the page “www.whatismyip.com”.  This will display the IP address and ISP for the LTE network the DUT is registered on.  Make a note of these. | IP address and ISP is displayed. |
| 2 | At DUT, make MO voice call to Client-1. | Call is successfully established over VxLTE.  Confirm 2-way audio between DUT and Client-1. |
| 3 | At DUT, enable Wi-Fi and connect to the Wi-Fi hotspot. | DUT displays the Wi-Fi connection icon to indicate it is connected to the Wi-Fi hotspot.  Call is ongoing with Client-1. |
| 4 | At DUT open the browser and load the page “www.whatismyip.com”.  This will display the IP address and ISP for the Wi-Fi network the DUT is registered on.  Make a note of these. | IP address and ISP is displayed.  The IP and ISP in this step should be different to that in step 1. |
| 5 | At DUT, download a large file from an external server. | Data transfer is ongoing over Wi-Fi on DUT.  Call is ongoing with Client-1. |
| 6 | End the data download. | Data transfer is stopped.  Call is ongoing with Client-1. |
| 7 | At DUT, disable Wi-Fi. | Wi-Fi connection icon disappears.  Call is ongoing with Client-1. |
| 8 | At DUT, end the voice call with Client-1. | Call is ended.  DUT still displays the VxLTE icon to indicate VxLTE calls are available according to the customization requirement. |

### 91.5.2 Video with Data Transfer

#### 91.5.2.1 Video Call setup during Active Data Transfer

Description

The DUT shall successfully setup a VxLTE call during an active data transfer.

Related 3GPP core specifications

3GPP TS 24.229

Reason for test

To verify the DUT can successfully setup a VxLTE call during an active data transfer.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE).

If the DUT is supporting a Carrier Aggregation combination of the network then this shall be used when performing the active data transfer.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, download a large file from an external server.  Note:  This can be via an internal FTP application or via a tethered laptop connection. | Data transfer is ongoing on DUT.  (If DUT is supporting a Carrier Aggregation of the network then CA is successfully established). |
| 2 | At DUT, make MO video call to Client-1. | Call is successfully established over VxLTE.  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1.  Data transfer is ongoing on DUT. |
| 3 | At DUT, end the video call with Client-1. | Call is ended.  Data transfer is ongoing on DUT. |
| 4 | At DUT, receive MT video call from Client-1. | Call is successfully established over VxLTE.  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1.  Data transfer is ongoing on DUT. |
| 5 | At Client-1, end the video call with DUT. | Call is ended.  Data transfer is ongoing on DUT. |
| 6 | End the data download. | Data transfer is stopped. |

#### 91.5.2.2 Data Transfer setup during Active Video Call

Description

The DUT shall successfully perform data transfer during an ongoing VxLTE call.

Related 3GPP core specifications

3GPP TS 24.229

Reason for test

To verify the DUT can perform data transfer during an ongoing VxLTE call.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE).

If the DUT is supporting a Carrier Aggregation combination of the network then this shall be used when performing the active data transfer.

|  |  |  |
| --- | --- | --- |
|  | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO video call to Client-1. | Call is successfully established over VxLTE.  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1. |
| 2 | At DUT, download a large file from an external server.  Note:  This can be via an internal FTP application or via a tethered laptop connection. | Data transfer is ongoing on DUT.  (If DUT is supporting a Carrier Aggregation of the network then CA is successfully established).  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1. |
| 3 | End the data download. | Data transfer is stopped.  Call is ongoing with Client-1. |
| 4 | At DUT, end the video call with Client-1. | Call is ended. |

#### 91.5.2.3 Video Call setup during Active Data Transfer over Wi-Fi

Description

The DUT shall successfully setup a VxLTE call during an active data transfer over Wi-Fi.

Related 3GPP core specifications

3GPP TS 24.229

Reason for test

To verify the DUT can successfully setup a VxLTE call during an active data transfer over Wi-Fi.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE).

DUT preference for internet is access is Wi-Fi preferred, Mobile data secondary.

DUT has VxWi-Fi calling disabled in the menu (or is not supporting VxWi-Fi).

Wi-Fi hotspot that provides a connection to the internet is available.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT open the browser and load the page “www.whatismyip.com”.  This will display the IP address and ISP for the LTE network the DUT is registered on.  Make a note of these. | IP address and ISP is displayed. |
| 2 | At DUT, enable Wi-Fi and connect to the Wi-Fi hotspot. | DUT displays the Wi-Fi connection icon to indicate it is connected to the Wi-Fi hotspot.  DUT still displays the VxLTE icon to indicate VxLTE calls are available according to the customization requirement. |
| 3 | At DUT open the browser and load the page “www.whatismyip.com”.  This will display the IP address and ISP for the Wi-Fi network the DUT is registered on.  Make a note of these. | IP address and ISP is displayed.  The IP and ISP in this step should be different to that in step 1. |
| 4 | At DUT, download a large file from an external server. | Data transfer is ongoing over Wi-Fi on DUT. |
| 5 | At DUT, make MO video call to Client-1. | Call is successfully established over VxLTE.  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1.  Data transfer over Wi-Fi is ongoing on DUT. |
| 6 | At DUT, end the video call with Client-1. | Call is ended.  Data transfer over Wi-Fi is ongoing on DUT. |
| 7 | End the data download. | Data transfer is stopped. |
| 8 | At DUT, disable Wi-Fi. | Wi-Fi connection icon disappears.  DUT still displays the VxLTE icon to indicate VxLTE calls are available according to the customization requirement. |

#### 91.5.2.4 Data Transfer over Wi-Fi setup during Active Video Call

Description

The DUT shall successfully perform data transfer over Wi-Fi during an ongoing VxLTE call.

Related 3GPP core specifications

3GPP TS 24.229

Reason for test

To verify the DUT can perform data transfer over Wi-Fi during an ongoing VxLTE call.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE).

DUT preference for internet is access is Wi-Fi preferred, Mobile data secondary.

DUT has VxWi-Fi calling disabled in the menu (or is not supporting VxWi-Fi).

Wi-Fi hotspot that provides a connection to the internet is available.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT open the browser and load the page “www.whatismyip.com”.  This will display the IP address and ISP for the LTE network the DUT is registered on.  Make a note of these. | IP address and ISP is displayed. |
| 2 | At DUT, make MO video call to Client-1. | Call is successfully established over VxLTE.  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1. |
| 3 | At DUT, enable Wi-Fi and connect to the Wi-Fi hotspot. | DUT displays the Wi-Fi connection icon to indicate it is connected to the Wi-Fi hotspot.  Call is ongoing with Client-1. |
| 4 | At DUT open the browser and load the page “www.whatismyip.com”.  This will display the IP address and ISP for the Wi-Fi network the DUT is registered on.  Make a note of these. | IP address and ISP is displayed.  The IP and ISP in this step should be different to that in step 1. |
| 5 | At DUT, download a large file from an external server. | Data transfer is ongoing over Wi-Fi on DUT.  Call is ongoing with Client-1. |
| 6 | End the data download. | Data transfer is stopped.  Call is ongoing with Client-1. |
| 7 | At DUT, disable Wi-Fi. | Wi-Fi connection icon disappears.  Call is ongoing with Client-1. |
| 8 | At DUT, end the video call with Client-1. | Call is ended.  DUT still displays the VxLTE icon to indicate VxLTE calls are available according to the customization requirement. |

## 91.6 VxLTE – Mobility

### 91.6.1 Service Reselection

#### 91.6.1.1 Service Reselection – VxLTE to CS Service – Idle (UTRAN)

Description

This test case checks if the DUT is VxLTE registered and moves to an area where E-UTRAN network is not available, it can successfully establish MO and MT voice calls over CS.

Related core specifications

GSMA IR.92 A.4

3GPP TS 23.221, 7

3GPP TS 23.060, 5.3.8

3GPP TS 24.008, Annex P

Reason for test

The DUT must be able to perform MO and MT voice calls when changing RAT between E-UTRAN and UTRAN.

Initial Configuration

Network is supporting E-UTRAN and UTRAN.

DUT is configured to LTE/3G mode (or tested in an area where the only available networks are E-UTRAN and UTRAN).

DUT is successfully registered for IMS services (VxLTE).

DUT is in IDLE state.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Move DUT to an area where no E-UTRAN network is available so it reselects to a UTRAN network. | DUT reselects from E-UTRAN to UTRAN and performs a Location Area Update and Routing Area Update.  DUT no longer displays VxLTE service indication. |
| 2 | At DUT, Receive MT voice call Client-1. | Call is successfully established in CS domain with 2-way audio. |
| 3 | End the voice call between DUT and Client-1. | Call is ended. |
| 4 | At DUT, make MO voice call to Client-1. | Call is successfully established in CS domain with 2-way audio. |
| 5 | End the voice call between DUT and Client-1. | Call is ended. |

#### 91.6.1.2 Service Reselection – VxLTE to CS Service – Idle (GERAN)

Description

This test case checks if the DUT is VxLTE registered and moves to an area where E-UTRAN network is not available, it can successfully establish MO and MT voice calls over CS.

Related core specifications

GSMA IR.92 A.4

3GPP TS 23.221, 7

3GPP TS 23.060, 5.3.8

3GPP TS 24.008, Annex P

Reason for test

The DUT must be able to perform MO and MT voice calls when changing RAT between E-UTRAN and GERAN.

Initial Configuration

Network is supporting E-UTRAN and GERAN.

DUT is configured to LTE/2G mode (or tested in an area where the only available networks are E-UTRAN and GERAN).

DUT is successfully registered for IMS services (VxLTE).

DUT is in IDLE state.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Move DUT to an area where no E-UTRAN network is available so it reselects to a UTRAN network. | DUT reselects from E-UTRAN to GERAN and performs a Location Area Update and Routing Area Update.  DUT no longer displays VxLTE service indication. |
| 2 | At DUT, Receive MT voice call Client-1. | Call is successfully established in CS domain with 2-way audio. |
| 3 | End the voice call between DUT and Client-1. | Call is ended. |
| 4 | At DUT, make MO voice call to Client-1. | Call is successfully established in CS domain with 2-way audio. |
| 5 | End the voice call between DUT and Client-1. | Call is ended. |

#### 91.6.1.3 Service Reselection – CS to VxLTE Service – Idle (UTRAN)

Description

This test case checks if the DUT moves from UTRAN to a VxLTE supported E-UTRAN network, it successfully registers for VxLTE. Making and receiving calls are handled over VxLTE and do not fallback to CS.

Related core specifications

GSMA IR.92 A.4

3GPP TS 23.221, 7

3GPP TS 23.060, 5.3.8

3GPP TS 24.008, Annex P

Reason for test

The DUT must be able to perform MO and MT voice calls when changing RAT between UTRAN and E-UTRAN.

Initial Configuration

Network is supporting E-UTRAN and UTRAN.

DUT is configured to LTE/3G mode (or tested in an area where the only available networks are E-UTRAN and UTRAN).

DUT is in UTRAN network registered for CS and PS services.

DUT is in PCH or IDLE state.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Move DUT to an area where E-UTRAN network is available so it reselects to E-UTRAN network. | DUT reselects from UTRAN to E-UTRAN and performs a Tracking Area Update procedure.  DUT successfully registers for VxLTE services. |
| 2 | At DUT, Receive MT voice call Client-1. | Call is successfully established in VxLTE with 2-way audio. |
| 3 | End the voice call between DUT and Client-1. | Call is ended. |
| 4 | At DUT, make MO voice call to Client-1. | Call is successfully established in VxLTE with 2-way audio. |
| 5 | End the voice call between DUT and Client-1. | Call is ended. |

#### 91.6.1.4 Service Reselection – CS to VxLTE Service – Idle (GERAN)

Description

This test case checks if the DUT moves from GERAN to a VxLTE supported E-UTRAN network, it successfully registers for VxLTE. Making and receiving calls are handled over VxLTE and do not fallback to CS.

Related core specifications

GSMA IR.92 A.4

3GPP TS 23.221, 7

3GPP TS 23.060, 5.3.8

3GPP TS 24.008, Annex P

Reason for test

The DUT must be able to perform MO and MT voice calls when changing RAT between GERAN and E-UTRAN.

**Initial Configuration**

Network is supporting E-UTRAN and GERAN.

DUT is configured to LTE/2G mode (or tested in an area where the only available networks are E-UTRAN and GERAN).

DUT is in GERAN network registered for CS and GPRS services.

DUT is in GMM STANDBY state.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Move DUT to an area where E-UTRAN network is available so it reselects to E-UTRAN network. | DUT reselects from GERAN to E-UTRAN and performs a Tracking Area Update procedure.  DUT successfully registers for VxLTE services. |
| 2 | At DUT, Receive MT voice call Client-1. | Call is successfully established in VxLTE with 2-way audio. |
| 3 | End the voice call between DUT and Client-1. | Call is ended. |
| 4 | At DUT, make MO voice call to Client-1. | Call is successfully established in VxLTE with 2-way audio. |
| 5 | End the voice call between DUT and Client-1. | Call is ended. |

### 91.6.2 Handover/Release redirect

#### 91.6.2.1 Service Selection after Handover/Release redirect – VxLTE to CS Service – During Data Transfer (UTRAN)

Description

This test case checks if the DUT is VxLTE registered with an active data transfer ongoing, moves to an area where E-UTRAN network is not available, it can successfully establish MO and MT voice calls over CS.

Related core specifications

GSMA IR.92 A.4

3GPP TS 23.221, 7

3GPP TS 23.060, 5.3.8

3GPP TS 24.008, Annex P

Reason for test

The DUT must be able to perform MO and MT voice calls when changing RAT between E-UTRAN and UTRAN.

**Initial Configuration**

Network is supporting E-UTRAN and UTRAN.

DUT is configured to LTE/3G mode (or tested in an area where the only available networks are E-UTRAN and UTRAN).

DUT is successfully registered for IMS services (VxLTE).

DUT is in CONNECTED state with an ongoing data transfer.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Move DUT to an area where no E-UTRAN network is available so it performs a Handover / Release redirect to a UTRAN network. | DUT performs Handover / Release redirect from E-UTRAN to UTRAN.  Confirm data transfer continues in the UTRAN network. |
| 2 | At DUT, Receive MT voice call Client-1. | Call is successfully established in CS domain with 2-way audio. |
| 3 | End the voice call between DUT and Client-1. | Call is ended. |
| 4 | At DUT, make MO voice call to Client-1. | Call is successfully established in CS domain with 2-way audio. |
| 5 | End the voice call between DUT and Client-1. | Call is ended. |
| 6 | End the data transfer at DUT. | Data transfer is stopped. |

#### 91.6.2.2 Service Selection after Handover/Release redirect – VxLTE to CS Service – During Data Transfer (GERAN)

Description

This test case checks if the DUT is VxLTE registered with an active data transfer ongoing, moves to an area where E-UTRAN network is not available, it can successfully establish MO and MT voice calls over CS.

Related core specifications

GSMA IR.92 A.4

3GPP TS 23.221, 7

3GPP TS 23.060, 5.3.8

3GPP TS 24.008, Annex P

Reason for test

The DUT must be able to perform MO and MT voice calls when changing RAT between E-UTRAN and GERAN.

**Initial Configuration**

Network is supporting E-UTRAN and GERAN.

DUT is configured to LTE/2G mode (or tested in an area where the only available networks are E-UTRAN and GERAN).

DUT is successfully registered for IMS services (VxLTE).

DUT is in CONNECTED state with an ongoing data transfer.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Move DUT to an area where no E-UTRAN network is available so it performs a Handover / Release redirect to a GERAN network. | DUT performs Handover / Release redirect from E-UTRAN to GERAN.  Confirm data transfer continues in the GERAN network. |
| 2 | At DUT, Receive MT voice call Client-1. | Call is successfully established in CS domain with 2-way audio.  Note:  If network and DUT are supporting DTM, the data transfer shall continue during the voice call.  If network or DUT are not supporting DTM, then data transfer shall be suspended during the voice call. |
| 3 | End the voice call between DUT and Client-1. | Call is ended. |
| 4 | At DUT, make MO voice call to Client-1. | Call is successfully established in CS domain with 2-way audio.  Note:  If network and DUT are supporting DTM, the data transfer shall continue during the voice call.  If network or DUT are not supporting DTM, then data transfer shall be suspended during the voice call. |
| 5 | End the voice call between DUT and Client-1. | Call is ended. |
| 6 | End the data transfer at DUT. | Data transfer is stopped. |

#### 91.6.2.3 Service Selection after Handover/Release redirect – CS to VxLTE Service – During Data Transfer (UTRAN)

Description

This test case checks if the DUT moves from UTRAN to a VxLTE supported E-UTRAN network during an active data transfer, it successfully registers for VxLTE. Making and receiving calls are handled over VxLTE and do not fallback to CS.

Related core specifications

GSMA IR.92 A.4

3GPP TS 23.221, 7

3GPP TS 23.060, 5.3.8

3GPP TS 24.008, Annex P

Reason for test

The DUT must be able to perform MO and MT voice calls when changing RAT between UTRAN and E-UTRAN.

Initial Configuration

Network is supporting E-UTRAN and UTRAN.

DUT is configured to LTE/3G mode (or tested in an area where the only available networks are E-UTRAN and UTRAN).

DUT is in UTRAN network registered for CS and PS services.

DUT is in DCH state with an ongoing data transfer.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Move DUT to an area where E-UTRAN network is available so it performs a Handover / Release redirect to E-UTRAN network. | DUT performs Handover / Release redirect from UTRAN to E-UTRAN.  Confirm data transfer continues in the E-UTRAN network. |
| 2 | At DUT, Receive MT voice call Client-1. | Call is successfully established in VxLTE with 2-way audio. |
| 3 | End the voice call between DUT and Client-1. | Call is ended. |
| 4 | At DUT, make MO voice call to Client-1. | Call is successfully established in VxLTE with 2-way audio. |
| 5 | End the voice call between DUT and Client-1. | Call is ended. |
| 6 | End the data transfer at DUT. | Data transfer is stopped. |

#### 91.6.2.4 Service Selection after Handover/Release redirect – CS to VxLTE Service – During Data Transfer (GERAN)

Description

This test case checks if the DUT moves from GERAN to a VxLTE supported E-UTRAN network during an active data transfer, it successfully registers for VxLTE. Making and receiving calls are handled over VxLTE and do not fallback to CS.

Related core specifications

GSMA IR.92 A.4

3GPP TS 23.221, 7

3GPP TS 23.060, 5.3.8

3GPP TS 24.008, Annex P

Reason for test

The DUT must be able to perform MO and MT voice calls when changing RAT between GERAN and E-UTRAN.

Initial Configuration

Network is supporting E-UTRAN and GERAN.

DUT is configured to LTE/2G mode (or tested in an area where the only available networks are E-UTRAN and GERAN).

DUT is in UTRAN network registered for CS and PS services.

DUT is in GMM Ready state with an ongoing data transfer.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Move DUT to an area where E-UTRAN network is available so it performs a Handover / Release redirect to E-UTRAN network. | DUT performs Handover / Release redirect from GERAN to E-UTRAN.  Confirm data transfer continues in the E-UTRAN network. |
| 2 | At DUT, Receive MT voice call Client-1. | Call is successfully established in VxLTE with 2-way audio. |
| 3 | End the voice call between DUT and Client-1. | Call is ended. |
| 4 | At DUT, make MO voice call to Client-1. | Call is successfully established in VxLTE with 2-way audio. |
| 5 | End the voice call between DUT and Client-1. | Call is ended. |
| 6 | End the data transfer at DUT. | Data transfer is stopped. |

### 91.6.3 E-UTRA Handover

#### 91.6.3.1 E-UTRA Handover – Active Voice Call

Description

The DUT shall maintain the VxLTE call after E-UTRA Handovers.

Related 3GPP core specifications

3GPP TS 24.229

Reason for test

To verify the DUT can maintain a VxLTE call along a test route which covers multiple Handover procedures.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE)

Client-1 is in a static location where no cell changes will occur.

Ideally, the test route should contain as many of the scenarios as possible:

* Cells within the same Tracking Area.
* Cells in different Tracking Areas.
* Cells sharing the same eNodeB.
* Cells not sharing the same eNodeB.
* Cells using X2 handover.
* Cells using S1 handover.
* Cells using a different MME.
* Cells using the same frequency.
* Areas of poor signal strength.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1. | Call is successfully established over VxLTE.  Confirm 2-way audio between DUT and Client-1. |
| 2 | Move DUT along the test route | VxLTE call remains active with 2-way audio throughout the route.  No call drops are observed. |
| 3 | At the end of the route, end the voice call between DUT and Client-1. | Call is ended. |

#### 91.6.3.2 E-UTRA Handover – Active Voice Call, Data Transfer

Description

The DUT shall maintain the VxLTE call after E-UTRA Handovers.

Related 3GPP core specifications

3GPP TS 24.229

Reason for test

To verify the DUT can maintain a VxLTE call and FTP download along a test route which covers multiple Handover procedures.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE)

Client-1 is in a static location where no cell changes will occur.

Ideally, the test route should contain as many of the scenarios as possible:

* Cells within the same Tracking Area.
* Cells in different Tracking Areas.
* Cells sharing the same eNodeB.
* Cells not sharing the same eNodeB.
* Cells using X2 handover.
* Cells using S1 handover.
* Cells using a different MME.
* Cells using the same frequency.
* Areas of poor signal strength.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1. | Call is successfully established over VxLTE.  Confirm 2-way audio between DUT and Client-1. |
| 2 | At DUT, download a large file from an external server.  Note:  This can be via an internal FTP application or via a tethered laptop connection. | Data transfer is ongoing on DUT. |
| 3 | Move DUT along the test route | VxLTE call remains active with 2-way audio throughout the route.  No call drops are observed.  Data transfer is stable throughout the route. |
| 4 | At the end of the route, end the voice call between DUT and Client-1. | Call is ended. |
| 5 | At the end of the route, end the data download. | Data transfer is stopped. |

#### 91.6.3.3 E-UTRA Handover – Active Video Call

Description

The DUT shall maintain the Video call after E-UTRA Handovers.

Related 3GPP core specifications

3GPP TS 24.229

Reason for test

To verify the DUT can maintain a Video call along a test route which covers multiple Handover procedures.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE)

Client-1 is in a static location where no cell changes will occur.

Ideally, the test route should contain as many of the scenarios as possible:

* Cells within the same Tracking Area.
* Cells in different Tracking Areas.
* Cells sharing the same eNodeB.
* Cells not sharing the same eNodeB.
* Cells using X2 handover.
* Cells using S1 handover.
* Cells using a different MME.
* Cells using the same frequency.
* Areas of poor signal strength.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO video call to Client-1. | Call is successfully established over VxLTE.  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1. |
| 2 | Move DUT along the test route | Video call remains active with 2-way audio / video media stream throughout the route.  No call drops are observed. |
| 3 | At the end of the route, end the video call between DUT and Client-1. | Call is ended. |

#### 91.6.3.4 E-UTRA Handover – Active Video Call, Data Transfer

Description

The DUT shall maintain the Video call after E-UTRA Handovers.

Related 3GPP core specifications

3GPP TS 24.229

Reason for test

To verify the DUT can maintain a Video call and FTP download along a test route which covers multiple Handover procedures.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxLTE)

Client-1 is in a static location where no cell changes will occur.

Ideally, the test route should contain as many of the scenarios as possible:

* Cells within the same Tracking Area.
* Cells in different Tracking Areas.
* Cells sharing the same eNodeB.
* Cells not sharing the same eNodeB.
* Cells using X2 handover.
* Cells using S1 handover.
* Cells using a different MME.
* Cells using the same frequency.
* Areas of poor signal strength.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO video call to Client-1. | Call is successfully established over VxLTE.  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1. |
| 2 | At DUT, download a large file from an external server.  Note:  This can be via an internal FTP application or via a tethered laptop connection. | Data transfer is ongoing on DUT. |
| 3 | Move DUT along the test route | Video call remains active with 2-way audio / video media stream throughout the route.  No call drops are observed.  Data transfer is stable throughout the route. |
| 4 | At the end of the route, end the video call between DUT and Client-1. | Call is ended. |
| 5 | At the end of the route, end the data download. | Data transfer is stopped. |

### 91.6.4 SRVCC (Voice Call)

#### 91.6.4.1 SRVCC (Voice Call) – Active Call (EVS codec) – To UTRAN

Description

The DUT shall successfully perform SRVCC handover to the CS network and the call shall continue without losing service.

Related 3GPP core specifications

3GPP TS 23.216

3GPP TS 24.008

3GPP TS 24.237

3GPP TS 24.301

Reason for test

To verify the DUT can perform SRVCC handover to the CS network correctly.

Initial configuration

Network is supporting E-UTRAN and UTRAN.

The network supports EVS voice codec in VxLTE.

The DUT and Client-1 are supporting EVS voice codec in VxLTE.

DUT is configured to LTE/3G mode (or tested in an area where the only available networks are E-UTRAN and UTRAN).

DUT is successfully registered for IMS services (VxLTE).

Client-1 is in a static location where no cell changes will occur.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1. | Call is successfully established over VxLTE.  Confirm 2-way audio between DUT and Client-1.  At DUT, check in SIP protocol messages:  - Confirm EVS voice codec has been successfully negotiated. |
| 2 | Move DUT to an area where no E-UTRAN network is available so the network commands a Handover to UTRAN. | DUT performs Handover from E-UTRAN to UTRAN.  Call continues in CS domain.  Confirm 2-way audio between DUT and Client-1.  DUT no longer displays VxLTE service indication. |
| 3 | End the voice call between DUT and Client-1. | Call is ended. |

#### 91.6.4.2 SRVCC (Voice Call) – Active Call (WB codec) – To UTRAN

Description

The DUT shall successfully perform SRVCC handover to the CS network and the call shall continue without losing service.

Related 3GPP core specifications

3GPP TS 23.216

3GPP TS 24.008

3GPP TS 24.237

3GPP TS 24.301

Reason for test

To verify the DUT can perform SRVCC handover to the CS network correctly.

Initial configuration

Network is supporting E-UTRAN and UTRAN.

The network supports WB-AMR voice codec in VxLTE.

The DUT and Client-1 are supporting WB-AMR voice codec in VxLTE.

DUT is configured to LTE/3G mode (or tested in an area where the only available networks are E-UTRAN and UTRAN).

DUT is successfully registered for IMS services (VxLTE).

Client-1 is in a static location where no cell changes will occur.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1. | Call is successfully established over VxLTE.  Confirm 2-way audio between DUT and Client-1.  At DUT, check in SIP protocol messages:  - Confirm WM-AMR voice codec has been successfully negotiated. |
| 2 | Move DUT to an area where no E-UTRAN network is available so the network commands a Handover to UTRAN. | DUT performs Handover from E-UTRAN to UTRAN.  Call continues in CS domain.  Confirm 2-way audio between DUT and Client-1.  DUT no longer displays VxLTE service indication. |
| 3 | End the voice call between DUT and Client-1. | Call is ended. |

#### 91.6.4.3 SRVCC (Voice Call) – Active Call (EVS codec) – To GERAN

Description

The DUT shall successfully perform SRVCC handover to the CS network and the call shall continue without losing service.

Related 3GPP core specifications

3GPP TS 23.216

3GPP TS 24.008

3GPP TS 24.237

3GPP TS 24.301

Reason for test

To verify the DUT can perform SRVCC handover to the CS network correctly.

Initial configuration

Network is supporting E-UTRAN and GERAN.

The network supports EVS voice codec in VxLTE.

The DUT and Client-1 are supporting EVS voice codec in VxLTE.

DUT is configured to LTE/2G mode (or tested in an area where the only available networks are E-UTRAN and GERAN).

DUT is successfully registered for IMS services (VxLTE).

Client-1 is in a static location where no cell changes will occur.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1. | Call is successfully established over VxLTE.  Confirm 2-way audio between DUT and Client-1.  At DUT, check in SIP protocol messages:  - Confirm EVS voice codec has been successfully negotiated. |
| 2 | Move DUT to an area where no E-UTRAN network is available so the network commands a Handover to GERAN. | DUT performs Handover from E-UTRAN to GERAN.  Call continues in CS domain.  Confirm 2-way audio between DUT and Client-1.  DUT no longer displays VxLTE service indication. |
| 3 | End the voice call between DUT and Client-1. | Call is ended. |

#### 91.6.4.4 SRVCC (Voice Call) – Active Call (WB codec) – To GERAN

Description

The DUT shall successfully perform SRVCC handover to the CS network and the call shall continue without losing service.

Related 3GPP core specifications

3GPP TS 23.216

3GPP TS 24.008

3GPP TS 24.237

3GPP TS 24.301

Reason for test

To verify the DUT can perform SRVCC handover to the CS network correctly.

Initial configuration

Network is supporting E-UTRAN and GERAN.

The network supports WB-AMR voice codec in VxLTE.

The DUT and Client-1 are supporting WB-AMR voice codec in VxLTE.

DUT is configured to LTE/2G mode (or tested in an area where the only available networks are E-UTRAN and GERAN).

DUT is successfully registered for IMS services (VxLTE).

Client-1 is in a static location where no cell changes will occur.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1. | Call is successfully established over VxLTE.  Confirm 2-way audio between DUT and Client-1.  At DUT, check in SIP protocol messages:  - Confirm WB-AMR voice codec has been successfully negotiated. |
| 2 | Move DUT to an area where no E-UTRAN network is available so the network commands a Handover to GERAN. | DUT performs Handover from E-UTRAN to GERAN.  Call continues in CS domain.  Confirm 2-way audio between DUT and Client-1.  DUT no longer displays VxLTE service indication. |
| 3 | End the voice call between DUT and Client-1. | Call is ended. |

#### 91.6.4.5 SRVCC (Voice Call) – Active Call, Data Transfer – To UTRAN

Description

The DUT shall successfully perform SRVCC handover to the CS network and the call shall continue without losing service while in an ongoing data transfer.

Related 3GPP core specifications

3GPP TS 23.216

3GPP TS 24.008

3GPP TS 24.237

3GPP TS 24.301

Reason for test

To verify the DUT can perform SRVCC handover to the CS network correctly.

Initial configuration

Network is supporting E-UTRAN and UTRAN.

DUT is configured to LTE/3G mode (or tested in an area where the only available networks are E-UTRAN and UTRAN).

DUT is successfully registered for IMS services (VxLTE).

Client-1 is in a static location where no cell changes will occur.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1. | Call is successfully established over VxLTE.  Confirm 2-way audio between DUT and Client-1. |
| 2 | At DUT, download a large file from an external server.  Note:  This can be via an internal FTP application or via a tethered laptop connection. | Data transfer is ongoing on DUT. |
| 3 | Move DUT to an area where no E-UTRAN network is available so the network commands a Handover to UTRAN. | DUT performs Handover from E-UTRAN to UTRAN.  Call continues in CS domain.  Confirm 2-way audio between DUT and Client-1.  DUT no longer displays VxLTE service indication.  Data transfer is stable after the handover. |
| 4 | End the voice call between DUT and Client-1. | Call is ended. |
| 5 | End the data download. | Data transfer is stopped. |

#### 91.6.4.6 SRVCC (Voice Call) – Active Call, Data Transfer – To GERAN (w/o DTM)

Description

The DUT shall successfully perform SRVCC handover to the CS network and the call shall continue without losing service while in an ongoing data transfer.

Related 3GPP core specifications

3GPP TS 23.216

3GPP TS 24.008

3GPP TS 24.237

3GPP TS 24.301

Reason for test

To verify the DUT can perform SRVCC handover to the CS network correctly.

Initial configuration

Network is supporting E-UTRAN and GERAN.

DUT is configured to LTE/2G mode (or tested in an area where the only available networks are E-UTRAN and GERAN).

Network is not supporting Dual Transfer Mode (DTM) in the 2G network.

DUT is successfully registered for IMS services (VxLTE).

Client-1 is in a static location where no cell changes will occur.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1. | Call is successfully established over VxLTE.  Confirm 2-way audio between DUT and Client-1. |
| 2 | At DUT, download a large file from an external server.  Note:  This can be via an internal FTP application or via a tethered laptop connection. | Data transfer is ongoing on DUT. |
| 3 | Move DUT to an area where no E-UTRAN network is available so the network commands a Handover to GERAN. | DUT performs Handover from E-UTRAN to GERAN.  Call continues in CS domain.  Confirm 2-way audio between DUT and Client-1.  DUT no longer displays VxLTE service indication.  Data transfer is suspended after the handover since DTM is not supported by the network. |
| 4 | End the voice call between DUT and Client-1. | Call is ended.  Once the call has ended, a PDP CONTEXT ACTIVATION procedure takes place and the data transfer continues in the GERAN network. |
| 5 | End the data download. | Data transfer is stopped. |

#### 91.6.4.7 SRVCC (Voice Call) – Active Call, Data Transfer – To GERAN (with DTM)

Description

The DUT shall successfully perform SRVCC handover to the CS network and the call shall continue without losing service while in an ongoing data transfer.

Related 3GPP core specifications

3GPP TS 23.216

3GPP TS 24.008

3GPP TS 24.237

3GPP TS 24.301

Reason for test

To verify the DUT can perform SRVCC handover to the CS network correctly.

Initial configuration

Network is supporting E-UTRAN and GERAN.

DUT is configured to LTE/2G mode (or tested in an area where the only available networks are E-UTRAN and GERAN).

Network is supporting Dual Transfer Mode (DTM) in the 2G network.

DUT is successfully registered for IMS services (VxLTE).

Client-1 is in a static location where no cell changes will occur.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1. | Call is successfully established over VxLTE.  Confirm 2-way audio between DUT and Client-1. |
| 2 | At DUT, download a large file from an external server.  Note:  This can be via an internal FTP application or via a tethered laptop connection. | Data transfer is ongoing on DUT. |
| 3 | Move DUT to an area where no E-UTRAN network is available so the network commands a Handover to GERAN. | DUT performs Handover from E-UTRAN to GERAN.  Call continues in CS domain.  Confirm 2-way audio between DUT and Client-1.  DUT no longer displays VxLTE service indication.  Data transfer is stable after the handover. |
| 4 | End the voice call between DUT and Client-1. | Call is ended. |
| 5 | End the data download. | Data transfer is stopped. |

#### 91.6.4.8 SRVCC (Voice Call) – During Alerting

Description

The DUT shall successfully perform SRVCC handover to the CS network and the call shall continue alerting without losing service.

Related 3GPP core specifications

3GPP TS 23.216

3GPP TS 24.008

3GPP TS 24.237

3GPP TS 24.301

Reason for test

To verify the DUT can perform SRVCC handover to the CS network correctly.

Initial configuration

Network is supporting E-UTRAN and UTRAN or GERAN.

DUT is configured to Automatic RAT mode.

DUT is successfully registered for IMS services (VxLTE).

Client-1 is in a static location where no cell changes will occur.

**Scenario A: MT alerting**

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | DUT is alerting as an incoming VxLTE call. |
| 2 | Move DUT to an area where no E-UTRAN network is available so the network commands a Handover to UTRAN/GERAN. | DUT performs Handover from E-UTRAN to UTRAN/GERAN.  Alerting continues in CS domain.  DUT no longer displays VxLTE service indication. |
| 3 | At DUT, accept the MT voice call. | Confirm 2-way audio between DUT and Client-1. |
| 4 | End the voice call between DUT and Client-1. | Call is ended. |

**Scenario B: MO alerting**

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1. | DUT can hear the alerting tone.  Note: if Client-1 is configured with video customized alerting tone, the DUT should receive and play video alerting tone. |
| 2 | Move DUT to an area where no E-UTRAN network is available so the network commands a Handover to UTRAN/GERAN. | DUT performs Handover from E-UTRAN to UTRAN/GERAN.  Normal alerting tone continues in CS domain.  DUT no longer displays VxLTE service indication. |
| 3 | At Client-1, accept the MT voice call. | Confirm 2-way audio between DUT and Client-1. |
| 4 | End the voice call between DUT and Client-1. | Call is ended. |

#### 91.6.4.9 SRVCC (Voice Call) – Held Call

Description

The DUT shall successfully perform SRVCC handover to the CS network while the call is held.

Related 3GPP core specifications

3GPP TS 23.216

3GPP TS 24.008

3GPP TS 24.237

3GPP TS 24.301

Reason for test

To verify the DUT can perform SRVCC handover to the CS network correctly.

Initial configuration

Network is supporting E-UTRAN and UTRAN or GERAN.

DUT is configured to Automatic RAT mode.

DUT is successfully registered for IMS services (VxLTE).

Client-1 is in a static location where no cell changes will occur.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1. | Call is successfully established over VxLTE.  Confirm 2-way audio between DUT and Client-1. |
| 2 | At DUT, place Client-1 on hold using the menu option. | Confirm there is a visible indication on the DUT that the call is held.  Confirm there is no audio in either direction. |
| 3 | Move DUT to an area where no E-UTRAN network is available so the network commands a Handover to UTRAN/GERAN. | DUT performs Handover from E-UTRAN to UTRAN/GERAN.  Call remains held in CS domain.  DUT no longer displays VxLTE service indication. |
| 4 | At DUT, retrieve the call using the menu option. | Confirm the call with Client-1 is restored.  Confirm 2-way audio between DUT and Client-1. |
| 5 | End the voice call between DUT and Client-1. | Call is ended. |

#### 91.6.4.10 SRVCC (Voice Call) – 1 Active Call, 1 Alerting

Description

The DUT shall successfully perform SRVCC handover to the CS network while the call is active and a 2nd incoming call is alerting.

Related 3GPP core specifications

3GPP TS 23.216

3GPP TS 24.008

3GPP TS 24.237

3GPP TS 24.301

Reason for test

To verify the DUT can perform SRVCC handover to the CS network correctly.

Initial configuration

Communication Waiting is activated in the network.

Communication Waiting is activated in the DUT.

Network is supporting E-UTRAN and UTRAN or GERAN.

DUT is configured to Automatic RAT mode.

DUT is successfully registered for IMS services (VxLTE).

Client-1 and Client-2 are in a static location where no cell changes will occur.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1. | Call is successfully established with Client-1 over VxLTE.  Confirm 2-way audio between DUT and Client-1. |
| 2 | At DUT, receive MT voice call from Client-2. | DUT is alerting with incoming VxLTE call from Client-2. |
| 3 | Move DUT to an area where no E-UTRAN network is available so the network commands a Handover to UTRAN/GERAN. | DUT performs Handover from E-UTRAN to UTRAN/GERAN.  Call with Client-1 remains active with 2-way audio in CS domain.  Alerting continues in CS domain with Client-2.  DUT no longer displays VxLTE service indication. |
| 4 | At DUT, accept the Voice call from Client-2 and put the Voice call with Client-1 on hold. | Confirm DUT puts Client-1 on hold.  Confirm Voice call with Client-2 is established. Confirm 2-way audio. |
| 6 | At Client-1, end the call with DUT. | Confirm the held call with Client-1 is released.  Confirm the active call with Client-2 is stable with 2-way audio. |
| 7 | End the voice call between DUT and Client-2. | Call is ended. |

#### 91.6.4.11 SRVCC (Voice Call) – 1 Held Call, 1 Alerting

Description

The DUT shall successfully perform SRVCC handover to the CS network while the call is held and a 2nd incoming call is alerting.

Related 3GPP core specifications

3GPP TS 23.216

3GPP TS 24.008

3GPP TS 24.237

3GPP TS 24.301

Reason for test

To verify the DUT can perform SRVCC handover to the CS network correctly.

Initial configuration

Communication Waiting is activated in the network.

Communication Waiting is activated in the DUT.

Network is supporting E-UTRAN and UTRAN or GERAN.

DUT is configured to Automatic RAT mode.

DUT is successfully registered for IMS services (VxLTE).

Client-1 and Client-2 are in a static location where no cell changes will occur.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1. | Call is successfully established with Client-1 over VxLTE.  Confirm 2-way audio between DUT and Client-1. |
| 2 | At DUT, place Client-1 on hold using the menu option. | Confirm there is a visible indication on the DUT that the call is held.  Confirm there is no audio in either direction. |
| 3 | At DUT, receive MT voice call from Client-2. | DUT is alerting with incoming VxLTE call from Client-2. |
| 4 | Move DUT to an area where no E-UTRAN network is available so the network commands a Handover to UTRAN/GERAN. | DUT performs Handover from E-UTRAN to UTRAN/GERAN.  Call with Client-1 remains held in CS domain.  Alerting continues in CS domain with Client-2.  DUT no longer displays VxLTE service indication. |
| 5 | At DUT, accept the Voice call from Client-2 and put the Voice call with Client-1 on hold. | Confirm DUT puts Client-1 on hold.  Confirm Voice call with Client-2 is established. Confirm 2-way audio. |
| 6 | At Client-1, end the call with DUT. | Confirm the held call with Client-1 is released.  Confirm the active call with Client-2 is stable with 2-way audio. |
| 7 | End the voice call between DUT and Client-2. | Call is ended. |

#### 91.6.4.12 SRVCC (Voice Call) – 1 Active Call, 1 Held Call

Description

The DUT shall successfully perform SRVCC handover to the CS network while a call is held and a 2nd call is active.

Related 3GPP core specifications

3GPP TS 23.216

3GPP TS 24.008

3GPP TS 24.237

3GPP TS 24.301

Reason for test

To verify the DUT can perform SRVCC handover to the CS network correctly.

Initial configuration

Communication Waiting is activated in the network.

Communication Waiting is activated in the DUT.

Network is supporting E-UTRAN and UTRAN or GERAN.

DUT is configured to Automatic RAT mode.

DUT is successfully registered for IMS services (VxLTE).

Client-1 and Client-2 are in a static location where no cell changes will occur.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1. | Call is successfully established with Client-1 over VxLTE.  Confirm 2-way audio between DUT and Client-1. |
| 2 | At DUT, receive MT voice call from Client-2. | DUT is alerting with incoming VxLTE call from Client-2. |
| 3 | At DUT, accept the Voice call from Client-2 and put the Voice call with Client-1 on hold. | Confirm DUT puts Client-1 on hold.  Confirm Voice call with Client-2 is established. Confirm 2-way audio. |
| 4 | Move DUT to an area where no E-UTRAN network is available so the network commands a Handover to UTRAN/GERAN. | DUT performs Handover from E-UTRAN to UTRAN/GERAN.  Call with Client-1 remains held in CS domain.  Call with Client-2 remains active with 2-way audio in CS domain.  DUT no longer displays VxLTE service indication. |
| 5 | At Client-1, end the call with DUT. | Confirm the held call with Client-1 is released.  Confirm the active call with Client-2 is stable with 2-way audio. |
| 6 | End the voice call between DUT and Client-2. | Call is ended. |

#### 91.6.4.13 SRVCC (Voice Call) – Conference Call – no mid-call support

Description

The DUT shall successfully perform SRVCC handover to the CS network during a conference call.

Related 3GPP core specifications

3GPP TS 23.216

3GPP TS 24.008

3GPP TS 24.237

3GPP TS 24.301

Reason for test

To verify the DUT can perform SRVCC handover to the CS network correctly.

Initial configuration

Communication Waiting is activated in the network.

Communication Waiting is activated in the DUT.

Network is supporting E-UTRAN and UTRAN or GERAN.

“Mid-call support” is not available in the network.

DUT is configured to Automatic RAT mode.

DUT is successfully registered for IMS services (VxLTE).

Client-1 and Client-2 are in a static location where no cell changes will occur.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1.  Answer the call at Client-1. | Call is successfully established between DUT and Client-1 with 2-way audio. |
| 2 | At DUT, use the menu option to make a “new call” to Client-2.  Answer the call at Client-2. | Call with Client-1 is on hold.  Call is successfully established between DUT and Client-2 with 2-way audio. |
| 3 | At DUT, use the menu option to “merge” the calls. | Conference call is successfully established between DUT, Client-1 and Client-2 with 3-way audio. |
| 4 | Move DUT to an area where no E-UTRAN network is available so the network commands a Handover to UTRAN/GERAN. | DUT performs Handover from E-UTRAN to UTRAN/GERAN.  Conference call with Client-1 and Client-2 remains active with 3-way audio in CS domain.  DUT no longer displays VxLTE service indication. |
| 5 | At DUT, Check the “Manage” conference call is not offering any possibility to release any participant from the call. | Conference Call functionality is not available to the user. |
| 6 | End the Conference call on DUT. | Calls are ended. |

#### 91.6.4.14 SRVCC (Voice Call) – Conference Call – mid-call feature support

Description

The DUT shall successfully perform SRVCC handover to the CS network during a conference call.

Related 3GPP core specifications

3GPP TS 23.216

3GPP TS 24.008

3GPP TS 24.237

3GPP TS 24.301

Reason for test

To verify the DUT can perform SRVCC handover to the CS network correctly.

Initial configuration

Communication Waiting is activated in the network.

Communication Waiting is activated in the DUT.

Network is supporting E-UTRAN and UTRAN or GERAN.

“Mid-call support” is available in the network.

DUT is configured to Automatic RAT mode.

DUT is successfully registered for IMS services (VxLTE).

Client-1 and Client-2 are in a static location where no cell changes will occur.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1.  Answer the call at Client-1. | Call is successfully established between DUT and Client-1 with 2-way audio. |
| 2 | At DUT, use the menu option to make a “new call” to Client-2.  Answer the call at Client-2. | Call with Client-1 is on hold.  Call is successfully established between DUT and Client-2 with 2-way audio. |
| 3 | At DUT, use the menu option to “merge” the calls. | Conference call is successfully established between DUT, Client-1 and Client-2 with 3-way audio. |
| 4 | Move DUT to an area where no E-UTRAN network is available so the network commands a Handover to UTRAN/GERAN. | DUT performs Handover from E-UTRAN to UTRAN/GERAN.  Conference call with Client-1 and Client-2 remains active with 3-way audio in CS domain.  DUT no longer displays VxLTE service indication. |
| 5 | At DUT, use the menu option to remove and end the call with Client-1. | Client-1 is successfully removed from the conference and the call is ended.  Call remains active between DUT and Client-2 with 2-way audio. |
| 6 | End the voice call between DUT and Client-2. | Call is ended. |

#### 91.6.4.15 SRVCC (Voice Call) – before Alerting

Description

The DUT shall successfully perform SRVCC handover to the CS network before alerting and the call shall start alerting in CS domain without losing service.

Related core specifications

3GPP TS 23.216, TS 24.008, TS 24.237, TS 24.301

Reason for test

To verify the DUT can perform SRVCC handover to the CS network before alerting correctly.

Initial configuration

Network is supporting E-UTRAN and UTRAN or GERAN.

Network supports pre-alerting.

Proper test environment should be ensured to perform this test case in the field, otherwise it should be executed in the lab.

DUT is configured to Automatic RAT mode.

DUT is successfully registered for IMS services (VxLTE).

Client-1 is in a static location where no cell changes will occur.

|  |  |  |
| --- | --- | --- |
| - | Test procedure | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1. | At DUT, confirm in SIP protocol messages:  -DUT has received 183 SESSION PROGRESS successfully.  -DUT has not received 180 RINGING yet. |
| 2 | Change the radio conditions that E-UTRAN network becomes unsuitable and UTRAN/ GERAN becomes visible. By moving DUT to an area where no E-UTRAN network is available so the network commands a Handover to UTRAN/GERAN or through attenuator. | DUT performs Handover from E-UTRAN to UTRAN/GERAN.  Alerting starts in CS domain.  DUT no longer displays VxLTE service indication. |
| 3 | At Client-1, accept the MT voice call. | Confirm 2-way audio between DUT and Client-1. |
| 4 | End the voice call between DUT and Client-1. | Call is ended. |

### 91.6.5 SRVCC (Video Call)

#### 91.6.5.1 SRVCC (Video Call) – Active Call – To UTRAN – Voice only

Description

The DUT shall successfully perform SRVCC handover to the CS network and the video call shall continue as a voice call.

Related 3GPP core specifications

GSMA IR.92

Reason for test

To verify the DUT can perform SRVCC handover to the CS network correctly.

Initial configuration

Network is supporting E-UTRAN and UTRAN.

Network is supporting Video calls over IMS.

DUT is configured to LTE/3G mode (or tested in an area where the only available networks are E-UTRAN and UTRAN).

DUT is successfully registered for IMS services (VxLTE).

Client-1 is in a static location where no cell changes will occur.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO video call to Client-1. | Call is successfully established over VxLTE.  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1. |
| 2 | Move DUT to an area where no E-UTRAN network is available so the network commands a Handover to UTRAN. | DUT performs Handover from E-UTRAN to UTRAN.  Video call continues as a voice only call in CS domain (Video media stream is deactivated between DUT and Client-1).  Confirm 2-way audio between DUT and Client-1.  DUT no longer displays VxLTE service indication. |
| 3 | End the voice call between DUT and Client-1. | Call is ended. |

#### 91.6.5.2 SRVCC (Video Call) – Active Call – To GERAN – Voice only

Description

The DUT shall successfully perform SRVCC handover to the CS network and the video call shall continue as a voice call.

Related 3GPP core specifications

GSMA IR.92

Reason for test

To verify the DUT can perform SRVCC handover to the CS network correctly.

Initial configuration

Network is supporting E-UTRAN and GERAN.

Network is supporting Video calls over IMS.

DUT is configured to LTE/2G mode (or tested in an area where the only available networks are E-UTRAN and GERAN).

DUT is successfully registered for IMS services (VxLTE).

Client-1 is in a static location where no cell changes will occur.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO video call to Client-1. | Call is successfully established over VxLTE.  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1. |
| 2 | Move DUT to an area where no E-UTRAN network is available so the network commands a Handover to GERAN. | DUT performs Handover from E-UTRAN to GERAN.  Video call continues as a voice only call in CS domain (Video media stream is deactivated between DUT and Client-1).  Confirm 2-way audio between DUT and Client-1.  DUT no longer displays VxLTE service indication. |
| 3 | End the voice call between DUT and Client-1. | Call is ended. |

### 91.6.6 SRVCC (Emergency Call)

#### 91.6.6.1 SRVCC (Emergency Call) – Active Call – To UTRAN

Description

The DUT shall successfully perform SRVCC handover to the CS network during an Emergency Call.

Related 3GPP core specifications

3GPP TS 23.228

3GPP TS 24.229

3GPP TS 23.221

3GPP TS 36.331

3GPP TS 23.216

Reason for test

To verify the DUT can perform SRVCC handover to the CS network correctly.

Initial configuration

Network is supporting E-UTRAN and UTRAN.

Network is supporting Emergency Calls over VxLTE.

DUT is configured to LTE/3G mode (or tested in an area where the only available networks are E-UTRAN and UTRAN).

DUT is successfully registered for IMS services (VxLTE).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO EM call to Emergency Services (112 or 911). | DUT displays Emergency Call setup.  EM Call is successfully established over VxLTE.  Confirm 2-way audio between DUT and Emergency Services operator. |
| 2 | Move DUT to an area where no E-UTRAN network is available so the network commands a Handover to UTRAN. | DUT performs Handover from E-UTRAN to UTRAN.  EM Call continues in CS domain.  DUT displays Emergency Call screen to indicate EM call.  Confirm 2-way audio between DUT and Emergency Services operator.  DUT no longer displays VxLTE service indication. |
| 3 | End the EM call. | Call is ended. |

#### 91.6.6.2 SRVCC (Emergency Call) – Active Call – To GERAN

Description

The DUT shall successfully perform SRVCC handover to the CS network during an Emergency Call.

Related 3GPP core specifications

3GPP TS 23.228

3GPP TS 24.229

3GPP TS 23.221

3GPP TS 36.331

3GPP TS 23.216

Reason for test

To verify the DUT can perform SRVCC handover to the CS network correctly.

Initial configuration

Network is supporting E-UTRAN and GERAN.

Network is supporting Emergency Calls over VxLTE.

DUT is configured to LTE/2G mode (or tested in an area where the only available networks are E-UTRAN and GERAN).

DUT is successfully registered for IMS services (VxLTE).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO EM call to Emergency Services (112 or 911). | DUT displays Emergency Call setup.  EM Call is successfully established over VxLTE.  Confirm 2-way audio between DUT and Emergency Services operator. |
| 2 | Move DUT to an area where no E-UTRAN network is available so the network commands a Handover to GERAN. | DUT performs Handover from E-UTRAN to GERAN.  EM Call continues in CS domain.  DUT displays Emergency Call screen to indicate EM call.  Confirm 2-way audio between DUT and Emergency Services operator.  DUT no longer displays VxLTE service indication. |
| 3 | End the EM call. | Call is ended. |

# 92 IP Multimedia Subsystem (IMS)-VxWi-Fi

For the purpose of VxWi-Fi testing, there are 2 implementations used by the networks.

- Wi-Fi preferred: This offers VxWi-Fi calls as preference when Wi-Fi is available.

- Cellular preferred: This offers VxWi-Fi calls only when the cellular network is either not available or the signal level is weaker than the server’s predetermined low signal threshold.

During the test cases, there will be references to the following states:

|  |  |  |
| --- | --- | --- |
| - | **State** | Test Location details |
| 1 | Good Cellular + Good Wi- Fi coverage | Good Cellular coverage is available.  Good Wi-Fi coverage is available. |
| 2 | Good Cellular + Weak Wi- Fi coverage | Good Cellular coverage is available.  Weak Wi-Fi coverage is available. |
| 3 | Good Cellular + No Wi- Fi coverage | Good Cellular coverage is available.  No Wi-Fi coverage is available. |
| 4 | Weak Cellular + Good Wi- Fi coverage | Weak Cellular coverage is available.  Good Wi-Fi coverage is available. |
| 5 | No Service coverage | No Cellular coverage is available.  No Wi-Fi coverage is available. |

## 92.1 VxWi-Fi – System Access & Registration

### 92.1.1 VxWi-Fi Bearer Activation/Deactivation

#### 92.1.1.1 VxWi-Fi Bearer Activation/Deactivation – Private IP

Description

DUT shall correctly register for VxWi-Fi services with a private IP address.

The DUT shall establish a connection to the IMS APN based on IKEv2 and Ipsec (Network address translation (NAT) support), and perform SIP registration.

Related core specifications

GSMA IR.51, section 4.2, 4.3 and 4.4; GSMA IR.61, section 5.3

Reason for test

To verify the DUT correctly registers for VxWi-Fi services with a private IP address.

Initial configuration

Wi-Fi hotspot (AP1) that provides a connection to the internet is available. This is a hotspot assigning a private IP address.

DUT has VxWi-Fi calling enabled in the menu.

DUT has Wi-Fi disabled.

DUT environment at time of testing:

Wi-Fi preferred: “Good Cellular + Good Wi-Fi coverage” or “Weak Cellular + Good Wi-Fi coverage”.

Cellular preferred: “Weak Cellular + Good Wi-Fi coverage”.

Additional Protocol Information:

- IKE\_SA: ims to destination [D] IP address x.x.x.x

- IKE\_SA\_INIT request for source [S] and destination [D] IP -> NATD\_S\_IP NATD\_D\_IP

- “sending packet” uses port [500]

- “receiving packet” uses port [500]

- parsed IKE\_SA\_INIT response from source [S] and destination [D] IP -> NATD\_S\_IP NATD\_D\_IP

Since this is a Private IP address using NAT, it is expected that all further packets are sent over port [4500].

- “sending packet” uses port [4500]

- “receiving packet” uses port [4500]

Session is established:

- IKE\_SA ims established between source and destination (x.x.x.x and x.x.x.x)

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, enable Wi-Fi. | At DUT, check in Wi-Fi Trace protocol messages:  - IKE\_INIT  - IKE\_AUTH containing the IMS APN name and P-CSCF Address Attributes  - DUT registers for VxWi-Fi successfully and displays the appropriate icon to indicate to the user that Wi-Fi calling is available. |
| 2 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call over AP1 is successfully established with 2-way audio. |
| 3 | At Client-1, end the voice call. | Call is ended. |
| 4 | At DUT, disable Wi-Fi. | DUT deregisters from VxWi-Fi successfully and Wi-Fi calling icon is no longer available.  At DUT, check in Wi-Fi Trace protocol messages:  - INFORMATIONAL request message including a “DELETE” payload |

#### 92.1.1.2 VxWi-Fi Bearer Activation/Deactivation – Public IP

Description

DUT shall correctly register for VxWi-Fi services with a public IP address.

The DUT shall establish a connection to the IMS APN based on IKEv2 and Ipsec (Network address translation (NAT) not support), and perform SIP registration.

Related core specifications

GSMA IR.51, section 4.2, 4.3 and 4.4; GSMA IR.61, section 5.3

Reason for test

To verify the DUT correctly registers for VxWi-Fi services with a public IP address.

Initial configuration

Wi-Fi hotspot (AP1) that provides a connection to the internet is available. This is a hotspot assigning a public IP address.

DUT has VxWi-Fi calling enabled in the menu.

DUT has Wi-Fi disabled.

DUT environment at time of testing:

Wi-Fi preferred: “Good Cellular + Good Wi-Fi coverage” or “Weak Cellular + Good Wi-Fi coverage”.

Cellular preferred: “Weak Cellular + Good Wi-Fi coverage”.

Additional Protocol Information:

- IKE\_SA: ims to destination [D] IP address x.x.x.x

- IKE\_SA\_INIT request for source [S] and destination [D] IP -> NATD\_S\_IP NATD\_D\_IP

- “sending packet” uses port [500]

- “receiving packet” uses port [500]

- parsed IKE\_SA\_INIT response from source [S] and destination [D] IP -> NATD\_S\_IP NATD\_D\_IP

Since this is a Public IP address that is not using NAT, it is expected that all further packets are sent over port [500].

- “sending packet” uses port [500]

- “receiving packet” uses port [500]

Session is established:

- IKE\_SA ims established between source and destination (x.x.x.x and x.x.x.x)

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, enable Wi-Fi. | At DUT, check in Wi-Fi Trace protocol messages:  - IKE\_INIT  - IKE\_AUTH containing the IMS APN name and P-CSCF Address Attributes  DUT registers for VxWi-Fi successfully and displays the appropriate icon to indicate to the user that Wi-Fi calling is available. |
| 2 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call over AP1 is successfully established with 2-way audio. |
| 3 | At Client-1, end the voice call. | Call is ended. |
| 4 | At DUT, disable Wi-Fi. | DUT deregisters from VxWi-Fi successfully and Wi-Fi calling icon is no longer available.  At DUT, check in Wi-Fi Trace protocol messages:  INFORMATIONAL request message including a “DELETE” payload |

#### 92.1.1.3 VxWi-Fi Bearer Activation/Deactivation – Flight Mode

Description

DUT shall correctly register for VxWi-Fi services when in Flight Mode.

Related core specifications

GSMA IR.51, section 4.2, 4.3 and 4.4; GSMA IR.61, section 5.3

Reason for test

To verify the DUT correctly registers for VxWi-Fi services when in Flight Mode.

Initial configuration

Wi-Fi hotspot (AP1) that provides a connection to the internet is available.

DUT has Flight Mode enabled.

DUT has VxWi-Fi calling enabled in the menu.

DUT has Wi-Fi disabled.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, enable Wi-Fi. | At DUT, check in Wi-Fi Trace protocol messages:  - IKE\_INIT  - IKE\_AUTH containing the IMS APN name and P-CSCF Address Attributes  DUT registers for VxWi-Fi successfully and displays the appropriate icon to indicate to the user that Wi-Fi calling is available. |
| 2 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call over AP1 is successfully established with 2-way audio. |
| 3 | At Client-1, end the voice call. | Call is ended. |
| 4 | At DUT, disable Wi-Fi. | DUT deregisters from VxWi-Fi successfully and Wi-Fi calling icon is no longer available.  At DUT, check in Wi-Fi Trace protocol messages:  INFORMATIONAL request message including a “DELETE” payload |

#### 92.1.1.4 VxWi-Fi Bearer Activation/Deactivation – Roaming (Cellular-Preferred)

Description

DUT shall correctly register for VxWi-Fi services when in roaming if the cellular network becomes weak.

Related core specifications

3GPP TS 24.229

Reason for test

To verify the DUT correctly registers for VxWi-Fi services when in roaming if the cellular network becomes weak.

Initial configuration

DUT is roaming outside its HPLMN in a VPLMN allowing international roaming.

Visited network is supporting E-UTRAN and UTRAN or GERAN.

Visited network is not supporting VxLTE in roaming.

Visited network is supporting VxWi-Fi in roaming.

Home network is supporting Cellular preferred in Roaming.

DUT is camping to the VPLMN E-UTRAN network for cellular service.

Wi-Fi hotspot (AP1) that provides a connection to the internet is available.

DUT has Wi-Fi enabled.

DUT environment at time of testing: “Good Cellular + Good Wi-Fi coverage”.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | Voice Call is successfully established via CS Fallback with 2-way audio. |
| 2 | At Client-1, end the voice call. | Call is ended. |
| 3 | Move the DUT to “Weak Cellular + Good Wi-Fi coverage” | DUT registers for VxWi-Fi successfully on AP1 and displays the appropriate icon to indicate to the user that Wi-Fi calling is available. |
| 4 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call over AP1 is successfully established with 2-way audio. |
| 5 | At Client-1, end the voice call. | Call is ended. |
| 6 | Move the DUT to “Good Cellular + Good Wi-Fi coverage” | DUT deregisters from VxWi-Fi successfully and Wi-Fi calling icon is no longer available.  DUT no longer displays the Wi-Fi icon. |
| 7 | At DUT, receive MT voice call from Client-1. | Voice Call is successfully established via CS Fallback with 2-way audio. |
| 8 | At Client-1, end the voice call. | Call is ended. |

#### 92.1.1.5 VxWi-Fi Bearer Activation/Deactivation – Roaming (Wi-Fi-Preferred)

Description

DUT shall correctly register for VxWi-Fi services when in roaming.

Related core specifications

3GPP TS 24.229

Reason for test

To verify the DUT correctly registers for VxWi-Fi services when in roaming.

Initial configuration

DUT is roaming outside its HPLMN in a VPLMN allowing international roaming.

Visited network is supporting E-UTRAN and UTRAN or GERAN.

Visited network is not supporting VxLTE in roaming.

Visited network is supporting VxWi-Fi in roaming.

Home network is supporting Wi-Fi preferred in Roaming.

DUT is camping to the VPLMN E-UTRAN network for cellular service.

Wi-Fi hotspot (AP1) that provides a connection to the internet is available.

DUT has Wi-Fi enabled.

DUT environment at time of testing: “Good Cellular + Good Wi-Fi coverage”.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call over AP1 is successfully established with 2-way audio. |
| 2 | At Client-1, end the voice call. | Call is ended. |
| 3 | Move the DUT to “Weak Cellular + Good Wi-Fi coverage” | DUT remains registered for VxWi-Fi. |
| 4 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call over AP1 is successfully established with 2-way audio. |
| 5 | At Client-1, end the voice call. | Call is ended. |
| 6 | Move the DUT to “Good Cellular + Good Wi-Fi coverage” | DUT remains registered for VxWi-Fi. |
| 7 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call over AP1 is successfully established with 2-way audio. |
| 8 | At Client-1, end the voice call. | Call is ended. |

#### 92.1.1.6 VxWi-Fi Bearer Activation/Deactivation – Default PDN over LTE

Description

Verify the DUT can support multiple concurrently-active PDN connections.

Related core specifications

GSMA IR.51, section 4.5

Reason for test

To ensure the DUT is able to establish one PDN connection over VxWi-Fi and one PDN connection over LTE access.

Initial configuration

Wi-Fi hotspot (AP1) that provides a connection to the internet is available.

DUT is configured as Wi-Fi preferred.

Network is supporting E-UTRAN.

Network is supporting MAPCON (Default PDN over LTE – IMS PDN over VxWi-Fi)

DUT is supporting MAPCON.

DUT has VxWi-Fi calling enabled in the menu.

DUT has Flight Mode enabled.

DUT has Wi-Fi disabled.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Bring DUT online so it establishes “Default EPS Bearer Context Activation” procedures. | At DUT, check NAS protocol messages:  - DUT sends ATTACH REQUEST.  - Network sends ATTACH ACCEPT.  - Network sends ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST containing the APN and PDN type.  DUT sends ACTIVATE DEFAULT EPS BEARER CONTEXT ACCEPT to the network. |
| 2 | At DUT, enable Wi-Fi and connect to the Wi-Fi hotspot. | At DUT, check in Wi-Fi Trace protocol messages:  - IKE\_INIT  - IKE\_AUTH containing the |MS APN name and P-CSCF Address Attributes  DUT registers for VxWi-Fi successfully and displays the appropriate icon to indicate to the user that Wi-Fi calling is available.  At DUT, check in NAS messages:  Confirm there have been no PDN DISCONNECT messages for the default PDN |
| 3 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call over AP1 is successfully established with 2-way audio. |
| 4 | At DUT open the browser and load a page. | Page is loaded correctly over LTE. |
| 5 | At Client-1, end the voice call. | Call is ended. |
| 6 | At DUT, disable Wi-Fi. | DUT deregisters from VxWi-Fi successfully and Wi-Fi calling icon is no longer available.  DUT is no longer connected to Wi-Fi hotspot AP1.  Wi-Fi icon is not available.  At DUT, check in Wi-Fi Trace protocol messages:  INFORMATIONAL request message including a “DELETE” payload At DUT, check in NAS messages:  Confirm there have been no PDN DISCONNECT messages sent by UE for IMS PDN |
| 7 | At DUT open the browser and load a page. | Page is loaded correctly over LTE. |

#### 92.1.1.7 VxWi-Fi Bearer Activation/Deactivation – Unsuccessful – UICC Not Provisioned for VxWi-Fi

Description

DUT shall not register for VxWi-Fi services when the UICC is not provisioned for VxWi-Fi.

Related core specifications

GSMA IR.51, section 4.2, 4.3 and 4.4; GSMA IR.61, section 5.3

Reason for test

To verify the DUT does not register for VxWi-Fi services when the UICC is not provisioned for VxWi-Fi.

Initial configuration

UICC used for this test is not VxWi-Fi provisioned.

Network is supporting UTRAN or GERAN.

Wi-Fi hotspot (AP1) that provides a connection to the internet is available.

DUT has VxWi-Fi calling enabled in the menu.

DUT has Wi-Fi disabled.

DUT is camping to the UTRAN/GERAN network for cellular service.

DUT environment at time of testing:

Wi-Fi preferred: “Good Cellular + Good Wi-Fi coverage” or “Weak Cellular + Good Wi-Fi coverage”.

Cellular preferred: “Weak Cellular + Good Wi-Fi coverage”.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, enable Wi-Fi. | At DUT, check in Wi-Fi Trace protocol messages:  - IKE\_INIT  - IKE\_AUTH containing the |MS APN name and P-CSCF Address Attributes  - IKE\_AUTH Failure sent by the network  DUT does not register for VxWi-Fi. |
| 2 | At DUT, receive MT voice call from Client-1. | CS Call is successfully established on UTRAN/GERAN with 2-way audio. |
| 3 | At Client-1, end the voice call. | Call is ended. |

#### 92.1.1.8 VxWi-Fi Bearer Activation/Deactivation – Unsuccessful – VxWi-Fi Roaming Not Allowed by Network

Description

The DUT roams in a VPLMN and is configured for VxWi-Fi use. This test case ensures that the DUT does not endlessly try to register for VxWi-Fi service if connection requests over Wi-Fi are rejected by the home network.

Related core specifications

GSMA IR.51, section 4.2, 4.3 and 4.4; GSMA IR.61, section 5.3

Reason for test

Ensure the device does not end up in an endless registration failure loop. And implements finite amount of retries

Initial configuration

Wi-Fi hotspot (AP1) that provides a connection to the internet is available.

DUT has Flight Mode enabled.

DUT has VxWi-Fi calling enabled in the menu.

DUT has Wi-Fi disabled.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, enable Wi-Fi.  Trace the Wi-Fi signalling on DUT for 5 minutes. | During the 5 minutes, DUT does not register for VxWi-Fi.  At DUT, check in Wi-Fi Trace protocol messages and ensure there are finite amount of tunnel establishment attempts containing following sequence:  - IKE\_INIT  - IKE\_AUTH containing the |MS APN name and P-CSCF Address Attributes  - IKE\_AUTH Failure sent by the network  Note: Number of retries and the time between retries is operator specific configuration. |
| 2 | Trace the Wi-Fi signalling on DUT for a further 15 minutes. | During the next 15 minutes, DUT does not register for VxWi-Fi.  At DUT, check in Wi-Fi Trace protocol messages and ensure there are no more than 1 further APN Attach request:  - APN\_ATTACH\_REQ  - apnName: ims  - IPSEC\_CONN\_FAIL |

### 92.1.2 VxWi-Fi Connection Management

#### 92.1.2.1 VxWi-Fi Connection Management – Enable/Disable VxWi-Fi

Description

Verify that the DUT can successfully register and de-register from VxWi-Fi when using the VxWi-Fi calling menu option.

Related core specifications

GSMA IR.51, TS.22 section4.1

Reason for test

To ensure the DUT is able to register and de-register from VxWi-Fi when using the VxWi-Fi calling menu option.

Initial configuration

Wi-Fi hotspot (AP1) that provides a connection to the internet is available.

DUT has Wi-Fi enabled.

DUT is connected to Wi-Fi hotspot (AP1).

DUT has VxWi-Fi calling disabled in the menu.

DUT environment at time of testing:

Wi-Fi preferred: “Good Cellular + Good Wi-Fi coverage” or “Weak Cellular + Good Wi-Fi coverage”.

Cellular preferred: “Weak Cellular + Good Wi-Fi coverage”.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, enable VxWi-Fi calling via the menu. | DUT registers for VxWi-Fi successfully and displays the appropriate icon to indicate to the user that Wi-Fi calling is available. |
| 2 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call over AP1 is successfully established with 2-way audio. |
| 3 | At Client-1, end the voice call. | Call is ended. |
| 4 | At DUT, disable VxWi-Fi calling via the menu. | DUT deregisters from VxWi-Fi successfully and Wi-Fi calling icon is no longer available. |

#### 92.1.2.2 VxWi-Fi Connection Management – Enable/Disable Wi-Fi

Description

Verify that the DUT can successfully register and de-register from VxWi-Fi when Wi-Fi is enabled and disabled.

Related core specifications

GSMA IR.51, TS.22 section4.1

Reason for test

To ensure the DUT is able to register and de-register from VxWi-Fi when Wi-Fi is enabled and disabled.

Initial configuration

Wi-Fi hotspot (AP1) that provides a connection to the internet is available.

DUT has Wi-Fi disabled.

DUT has previously connected to AP1 hotspot, but is not currently connected.

DUT has VxWi-Fi calling enabled in the menu.

DUT environment at time of testing:

Wi-Fi preferred: “Good Cellular + Good Wi-Fi coverage” or “Weak Cellular + Good Wi-Fi coverage”.

Cellular preferred: “Weak Cellular + Good Wi-Fi coverage”.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, enable Wi-Fi. | DUT connects to Wi-Fi hotspot AP1 and displays an indication that Wi-Fi is available.  DUT registers for VxWi-Fi successfully and displays the appropriate icon to indicate to the user that Wi-Fi calling is available. |
| 2 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call over AP1 is successfully established with 2-way audio. |
| 3 | At Client-1, end the voice call. | Call is ended. |
| 4 | At DUT, disable Wi-Fi. | DUT deregisters from VxWi-Fi successfully and Wi-Fi calling icon is no longer available.  DUT is no longer connected to Wi-Fi hotspot AP1.  Wi-Fi icon is not available. |

#### 92.1.2.3 VxWi-Fi Connection Management – Access Point Selection (Automatic)

Description

Verify that the DUT can successfully automatically register to another Wi-Fi hotspot when the initial hotspot is no longer available.

Related core specifications

GSMA IR.51

Reason for test

To ensure the DUT is able to automatically register to another Wi-Fi hotspot when the initial hotspot is no longer available.

Initial configuration

Wi-Fi hotspot (AP1) that provides a connection to the internet is available.

DUT has Wi-Fi disabled.

DUT has previously connected to AP1 hotspot, but is not currently connected.

DUT has VxWi-Fi calling enabled in the menu.

DUT environment at time of testing:

Wi-Fi preferred: “Good Cellular + Good Wi-Fi coverage” or “Weak Cellular + Good Wi-Fi coverage”.

Cellular preferred: “Weak Cellular + Good Wi-Fi coverage”.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, enable Wi-Fi. | DUT Automatically connects to Wi-Fi hotspot AP1 and displays an indication that Wi-Fi is available.  DUT registers for VxWi-Fi successfully and displays the appropriate icon to indicate to the user that Wi-Fi calling is available. |
| 2 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call over AP1 is successfully established with 2-way audio. |
| 3 | At Client-1, end the voice call. | Call is ended. |

#### 92.1.2.4 VxWi-Fi Connection Management – Access Point Selection (Manual)

Description

Verify that the DUT can successfully register to VxWi-Fi when connected to a new Wi-Fi hotspot.

Related core specifications

GSMA IR.51

Reason for test

To ensure the DUT is able to register to VxWi-Fi when connected to a new Wi-Fi hotspot.

Initial configuration

Wi-Fi hotspot (AP1) that provides a connection to the internet is available.

DUT has Wi-Fi disabled.

DUT has not previously connected to AP1 hotspot.

DUT has VxWi-Fi calling enabled in the menu.

DUT environment at time of testing:

Wi-Fi preferred: “Good Cellular + Good Wi-Fi coverage” or “Weak Cellular + Good Wi-Fi coverage”.

Cellular preferred: “Weak Cellular + Good Wi-Fi coverage”.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, enable Wi-Fi. | DUT displays a list of the available Wi-Fi networks.  Hotspot AP1 is shown as available. |
| 2 | Select AP1 (enter hotspot PW if required) | DUT connects to Wi-Fi hotspot AP1 and displays an indication that Wi-Fi is available.  DUT registers for VxWi-Fi successfully and displays the appropriate icon to indicate to the user that Wi-Fi calling is available. |
| 3 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call over AP1 is successfully established with 2-way audio. |
| 4 | At Client-1, end the voice call. | Call is ended. |

#### 92.1.2.5 VxWi-Fi Connection Management – Access Point Selection (Hidden SSID)

Description

Verify that the DUT can successfully register to VxWi-Fi when connected to a new Hidden Wi-Fi hotspot.

Related core specifications

GSMA IR.51

Reason for test

To ensure the DUT is able to register to VxWi-Fi when connected to a new Hidden Wi-Fi hotspot.

Initial configuration

Wi-Fi hotspot (AP1) that provides a connection to the internet is available but is Hidden.

DUT has Wi-Fi disabled.

DUT has not previously connected to AP1 hotspot.

DUT has VxWi-Fi calling enabled in the menu.

DUT environment at time of testing:

Wi-Fi preferred: “Good Cellular + Good Wi-Fi coverage” or “Weak Cellular + Good Wi-Fi coverage”.

Cellular preferred: “Weak Cellular + Good Wi-Fi coverage”.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, enable Wi-Fi. | DUT displays a list of the available Wi-Fi networks.  Hotspot AP1 is not shown as available. |
| 2 | Select the option to “Add network” and enter the SSID of AP1 (enter hotspot PW if required) | DUT connects to Wi-Fi hotspot AP1 and displays an indication that Wi-Fi is available.  DUT registers for VxWi-Fi successfully and displays the appropriate icon to indicate to the user that Wi-Fi calling is available. |
| 3 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call over AP1 is successfully established with 2-way audio. |
| 4 | At Client-1, end the voice call. | Call is ended. |
| 5 | At DUT, disable Wi-Fi. | DUT deregisters from VxWi-Fi successfully and Wi-Fi calling icon is no longer available.  DUT is no longer connected to Wi-Fi hotspot AP1.  Wi-Fi icon is not available. |
| 6 | At DUT, enable Wi-Fi. | DUT connects to Wi-Fi hotspot AP1 and displays an indication that Wi-Fi is available.  DUT registers for VxWi-Fi successfully and displays the appropriate icon to indicate to the user that Wi-Fi calling is available. |

#### 92.1.2.6 VxWi-Fi Connection Management – Long Duration Tunnel Stability

Description

Verify the Ipsec tunnel between DUT and ePDG remains established for several hours.

Related core specifications

GSMA IR.51

Reason for test

To ensure the Ipsec tunnel between DUT and ePDG remains established for several hours.

Initial configuration

Wi-Fi hotspot (AP1) that provides a connection to the internet is available.

DUT has Wi-Fi disabled.

DUT has previously connected to AP1 hotspot, but is not currently connected.

DUT has VxWi-Fi calling enabled in the menu.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Start a PCAP trace (or similar) of the Wi-Fi interface. | Trace is ongoing. |
| 2 | At DUT, enable Wi-Fi. | DUT connects to Wi-Fi hotspot AP1 and displays an indication that Wi-Fi is available.  DUT registers for VxWi-Fi successfully and displays the appropriate icon to indicate to the user that Wi-Fi calling is available. |
| 3 | At DUT, short press the power button to turn off the screen.  Wait for at least 6 hours. | During the period, no user interaction or communication over VxWi-Fi should take place. |
| 4 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call over AP1 is successfully established with 2-way audio. |
| 5 | At Client-1, end the voice call. | Call is ended. |
| 6 | Check the PCAP trace (or similar log) to ensure the connection has remained stable throughout the test. | At DUT, check in trace:  - Only one IPSEC tunnel establishment is seen in the trace (from step 2).  - There are no IPSEC tunnel disconnection messages seen in the trace. |

## 92.2 VxWi-Fi – Basic Calls

### 92.2.1 Voice Call

#### 92.2.1.1 MO Voice Call – Flight Mode

Description

The DUT shall successfully perform an MO VxWi-Fi call when in Flight Mode.

Related core specifications

3GPP TS 24.229, TS 24.234

Reason for test

To ensure the DUT can perform an MO VxWi-Fi call when in Flight Mode.

Initial configuration

DUT has Flight Mode enabled.

DUT has Wi-Fi disabled.

DUT has previously connected to AP1 hotspot, but is not currently connected.

Client-1 is successfully registered for IMS services (VxWi-Fi)

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, enable Wi-Fi. | DUT connects to Wi-Fi hotspot AP1 and displays an indication that Wi-Fi is available.  DUT registers for VxWi-Fi successfully and displays the appropriate icon to indicate to the user that Wi-Fi calling is available. |
| 2 | At DUT, make MO voice call to Client-1. | Confirm the voice call is established.  Confirm 2-way audio between DUT and Client-1. |
| 3 | At DUT, end the voice call. | Call is ended. |

#### 92.2.1.2 MT Voice Call – Flight Mode

Description

The DUT shall successfully perform an MT VxWi-Fi call when in Flight Mode.

Related core specifications

3GPP TS 24.229, TS 24.234

Reason for test

To ensure the DUT can perform an MT VxWi-Fi call when in Flight Mode.

Initial configuration

DUT has Flight Mode enabled.

DUT has Wi-Fi disabled.

DUT has previously connected to AP1 hotspot, but is not currently connected.

Client-1 is successfully registered for IMS services (VxWi-Fi)

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, enable Wi-Fi. | DUT connects to Wi-Fi hotspot AP1 and displays an indication that Wi-Fi is available.  DUT registers for VxWi-Fi successfully and displays the appropriate icon to indicate to the user that Wi-Fi calling is available. |
| 2 | At DUT, receive MT voice call from Client-1. | Confirm the voice call is established.  Confirm 2-way audio between DUT and Client-1. |
| 3 | At Client-1, end the voice call. | Call is ended. |

#### 92.2.1.3 MO Voice Call – Long Call duration

Description

The DUT shall successfully perform an MO VxWi-Fi call for an extended amount of time.

Related core specifications

TS 24.229, GSMA IR.51

Reason for test

To ensure the DUT can perform an MO VxWi-Fi call for an extended amount of time.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxWi-Fi).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1. | Confirm the voice call is established.  Confirm 2-way audio between DUT and Client-1. |
| 2 | Maintain the call for at least 62 minutes. | Call is ongoing with Client-1.  Confirm 2-way audio between DUT and Client-1 throughout. |
| 3 | At DUT, end the voice call. | Call is ended. |

### 92.2.2 Video Call

#### 92.2.2.1 MO Video Call – Flight Mode

Description

The DUT shall successfully perform an MO Video Call over Wi-Fi when in Flight Mode.

Related core specifications

3GPP TS 24.229, TS 24.234

Reason for test

To ensure the DUT can perform an MO Video Call over Wi-Fi when in Flight Mode.

Initial configuration

DUT has Flight Mode enabled.

DUT has Wi-Fi disabled.

DUT has previously connected to AP1 hotspot, but is not currently connected.

Client-1 is successfully registered for IMS services (VxWi-Fi)

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, enable Wi-Fi. | DUT connects to Wi-Fi hotspot AP1 and displays an indication that Wi-Fi is available.  DUT registers for VxWi-Fi successfully and displays the appropriate icon to indicate to the user that Wi-Fi calling is available. |
| 2 | At DUT, make MO video call to Client-1. | Confirm the video call is established.  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1. |
| 3 | At DUT, end the video call. | Call is ended. |

#### 92.2.2.2 MT Video Call – Flight Mode

Description

The DUT shall successfully perform an MT Video Call over Wi-Fi when in Flight Mode.

Related core specifications

3GPP TS 24.229, TS 24.234

Reason for test

To ensure the DUT can perform an MT Video Call over Wi-Fi when in Flight Mode.

Initial configuration

DUT has Flight Mode enabled.

DUT has Wi-Fi disabled.

DUT has previously connected to AP1 hotspot, but is not currently connected.

Client-1 is successfully registered for IMS services (VxWi-Fi)

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, enable Wi-Fi. | DUT connects to Wi-Fi hotspot AP1 and displays an indication that Wi-Fi is available.  DUT registers for VxWi-Fi successfully and displays the appropriate icon to indicate to the user that Wi-Fi calling is available. |
| 2 | At DUT, receive MT video call from Client-1. | Confirm the video call is established.  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1. |
| 3 | At Client-1, end the video call. | Call is ended. |

#### 92.2.2.3 MO Video Call – Long Call duration

Description

The DUT shall successfully perform an MO Video Call over Wi-Fi for an extended amount of time.

Related core specifications

TS 24.229, GSMA IR.51

Reason for test

To ensure the DUT can perform an MO Video Call over Wi-Fi for an extended amount of time.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxWi-Fi).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO video call to Client-1. | Confirm the video call is established.  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1. |
| 2 | Maintain the call for at least 62 minutes. | Call is ongoing with Client-1.  Confirm 2-way audio between DUT and Client-1 throughout.  Confirm 2-way video media stream between DUT and Client-1 throughout. |
| 3 | At DUT, end the video call. | Call is ended. |

### 92.2.3 Emergency Call

### 92.2.3.1 Emergency Call (EMS Supported by Network)

#### 92.2.3.1.1 Emergency Call over VxWi-Fi (Supported by Network) – SoS APN (Cellular network not available)

Description

The DUT shall successfully make Emergency Calls over VxWi-Fi even when the cellular network is not available.

Related core specifications

3GPP TS 24.229; TS 24.302; TS 24.234

GSMA IR.51 5.3

Reason for test

To verify the DUT is able to initiate an Emergency call via IMS when registered for VxWi-Fi in a network supporting EM calls over IMS, even when the cellular network is not available.

Initial configuration

Network is supporting Emergency Calls over VxWi-Fi.

DUT is configured for IMS PS Voice Preferred, CS Secondary, or IMS PS Voice only.

DUT is successfully registered for IMS services (VxWi-Fi).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Move DUT to an area where it directly loses all cellular coverage (E-UTRAN/UTRAN/GERAN) but Wi-Fi hotspot is still available. | DUT displays “No Service” indication.  DUT is still connected to Wi-Fi hotspot AP1.  VxWi-Fi icon is still displayed. |
| 2 | At DUT, make MO EM call to Emergency Services (112 or 911). | DUT displays Emergency Call setup.  DUT makes EM call over VxWi-Fi.  Confirm 2-way audio between DUT and Emergency Services operator. |
| 3 | End the EM call. | Call is ended. |

#### 92.2.3.2 Emergency Call (EMS Not Supported by Network)

#### 92.2.3.2.1 Emergency Call over VxWi-Fi (Not Supported by Network) – Call over VxLTE

Description

The DUT shall successfully make Emergency Calls via VxLTE when the network is not supporting EM calls over VxWi-Fi.

Related core specifications

3GPP TS 24.229; TS 24.302; TS 24.234; TS.23.167; TS 24.301; TS 24.237

GSMA IR.51 5.3

Reason for test

To verify the DUT is able to initiate an Emergency Calls via VxLTE when the network is not supporting EM calls over VxWi-Fi.

Initial configuration

DUT is camping to the E-UTRAN network.

Network is not supporting Emergency Calls over VxWi-Fi.

Network is supporting Emergency Calls over VxLTE.

DUT is configured for IMS PS Voice Preferred, CS Secondary, or IMS PS Voice only.

DUT is successfully registered for IMS services (VxWi-Fi).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO EM call to Emergency Services (112 or 911). | DUT displays Emergency Call setup.  At DUT, check NAS protocol messages:  - DUT sends PDN CONNECTIVITY REQUEST to the network with Request type 4 “Emergency”.  - Network sends ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST to DUT with APN “SoS”.  - DUT sends ACTIVATE DEFAULT BEARER CONTEXT ACCEPT to the network.  - Network sends ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST  - DUT sends ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT  Confirm 2-way audio between DUT and Emergency Services operator. |
| 2 | End the EM call. | At DUT, check in NAS protocol messages:  - Network sends DEACTIVATE EPS BEARER CONTEXT REQUEST  - DUT sends DEACTIVATE EPS BEARER CONTEXT ACCEPT  - Network sends DEACTIVATE EPS BEARER CONTEXT REQUEST  - DUT sends DEACTIVATE EPS BEARER CONTEXT ACCEPT  Call is ended. |

#### 92.2.3.2.2 Emergency Call over VxWi-Fi (Not Supported by Network) – Call over CS

Description

The DUT shall successfully make Emergency Calls via CS Fallback when the network is not supporting EM calls over VxWi-Fi.

Related core specifications

3GPP TS 24.229; TS 24.302; TS 24.234

GSMA IR.51 5.3

Reason for test

To verify the DUT is able to initiate an Emergency call via CS Fallback when the network is not supporting EM calls over VxWi-Fi.

Initial configuration

DUT is camping to the UTRAN or GERAN network for CS services.

Network is not supporting Emergency Calls over VxWi-Fi.

DUT is configured for IMS PS Voice Preferred, CS Secondary, or IMS PS Voice only.

DUT is successfully registered for IMS services (VxWi-Fi).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO EM call to Emergency Services (112 or 911). | DUT displays Emergency Call setup.  At DUT, check NAS protocol messages:  - DUT sends EMERGENCY SETUP message.  DUT establishes a normal call over the CS network.  Confirm 2-way audio between DUT and Emergency Services operator. |
| 2 | End the EM call. | Call is ended. |

#### 92.2.3.2.3 Emergency Call over VxWi-Fi (Not Supported by Network) – Call over CS (Non-UE detectable EC number)

Description

The DUT shall successfully make Emergency Calls via CS Fallback when the network is not supporting EM calls over VxWi-Fi.

Related core specifications

3GPP TS 24.229; TS 24.302; TS 24.234; TS 23.167

GSMA IR.51 5.3

Reason for test

To verify the DUT is able to initiate an Emergency call via CS Fallback when the network is not supporting EM calls over VxWi-Fi.

Initial configuration

DUT is camping to the UTRAN or GERAN network for CS services.

Network is not supporting Emergency Calls over VxWi-Fi.

DUT is configured for IMS PS Voice Preferred, CS Secondary, or IMS PS Voice only.

DUT is successfully registered for IMS services (VxWi-Fi).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO EM call to Emergency Services by dialling a non-ue detectable EC number. | DUT displays Emergency Call setup.  At DUT, check in SIP protocol:  - SIP 380 (Alternative Service) message from the network. This may include emergency service information.  If Included:  At DUT, check NAS protocol messages:  - DUT sends EMERGENCY SETUP message.  DUT establishes EM call over the CS network.  Confirm 2-way audio between DUT and Emergency Services operator.  If not Included:  At DUT, check NAS protocol messages:  - DUT sends SETUP message.  DUT establishes a normal call over the CS network.  Confirm 2-way audio between DUT and Emergency Services operator. |
| 2 | End the EM call. | Call is ended. |

#### 92.2.3.2.4 Emergency Call over VxWi-Fi (Not Supported by Network) – Call over CS (Flight Mode)

Description

The DUT shall successfully make Emergency Calls via CS Fallback when the network is not supporting EM calls over VxWi-Fi.

Related core specifications

3GPP TS 24.229; TS 24.302; TS 24.234

GSMA IR.51 5.3

Reason for test

To verify the DUT is able to initiate an Emergency call via CS Fallback when the network is not supporting EM calls over VxWi-Fi.

Initial configuration

Network is supporting UTRAN or GERAN for CS services.

Network is supporting Emergency Calls over VxWi-Fi.

DUT is configured for IMS PS Voice Preferred, CS Secondary, or IMS PS Voice only.

DUT has Flight Mode enabled.

DUT is successfully registered for IMS services (VxWi-Fi).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO EM call to Emergency Services (112 or 911). | DUT disables Flight Mode.  DUT performs a LAU registration to the CS network (UTRAN or GERAN).  DUT displays Emergency Call setup.  At DUT, check NAS protocol messages:  - DUT sends EMERGENCY SETUP message.  Confirm 2-way audio between DUT and Emergency Services operator. |
| 2 | End the EM call. | Call is ended. |

### 92.2.4 Call Establishment Performance

#### 92.2.4.1 MO Voice Call – Establishment Success Rate (Relative measurement)

Description

The DUT shall successfully establish an MO VxWi-Fi call.

Related 3GPP core specifications

TS 24.229, GSMA IR.51

Reason for test

To verify the DUT establishes an MO VxWi-Fi call over multiple attempts.

Initial configuration

DUT is successfully registered for IMS services (VxWi-Fi).

Reference-1, with similar capabilities to DUT is available and also registered for IMS services (VxWi-Fi)

Client-1 is any device that can receive MT voice calls.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1.  Answer call at Client-1. | Confirm the voice call is established.  Confirm 2-way audio between DUT and Client-1. |
| 2 | At DUT, end the call. | Call is ended. |
| 3 | At DUT, repeat steps 1 and 2 for 9 more attempts. | 10 calls in total are recorded on DUT. |
| 4 | At Reference-1, perform steps 1 and 2 for 10 attempts. | 10 calls in total are recorded on Reference-1. |
| 5 | Compare the success rate between DUT and Reference-1. | Call success rate is comparable between DUT and Reference-1 (DUT is no worse than 10% in call success rate). |

#### 92.2.4.2 MT Voice Call – Establishment Success Rate (Relative measurement)

Description

The DUT shall successfully establish an MT VxWi-Fi call.

Related 3GPP core specifications

TS 24.229, GSMA IR.51

Reason for test

To verify the DUT establishes an MT VxWi-Fi call over multiple attempts.

Initial configuration

DUT is successfully registered for IMS services (VxWi-Fi).

Reference-1, with similar capabilities to DUT is available and also registered for IMS services (VxWi-Fi)

Client-1 is any device that can make MO voice calls.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1.  Answer call at DUT. | Confirm the voice call is established.  Confirm 2-way audio between DUT and Client-1. |
| 2 | At Client-1, end the call. | Call is ended. |
| 3 | At DUT, repeat steps 1 and 2 for 9 more attempts. | 10 calls in total are recorded on DUT. |
| 4 | At Reference-1, perform steps 1 and 2 for 10 attempts. | 10 calls in total are recorded on Reference-1. |
| 5 | Compare the success rate between DUT and Reference-1. | Call success rate is comparable between DUT and Reference-1 (DUT is no worse than 10% in call success rate). |

#### 92.2.4.3 MO Video Call – Establishment Success Rate (Relative measurement)

Description

The DUT shall successfully establish an MO VxWi-Fi video call.

Related 3GPP core specifications

TS 24.229, GSMA IR.51, GSMA IR.94

Reason for test

To verify the DUT establishes an MO VxWi-Fi video call over multiple attempts.

Initial configuration

DUT is successfully registered for IMS services (VxWi-Fi).

Reference-1, with similar capabilities to DUT is available and also registered for IMS services (VxWi-Fi)

Client-1 is any device that can receive MT video calls.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO video call to Client-1.  Answer call at Client-1. | Confirm the video call is established.  Confirm 2-way video and audio between DUT and Client-1. |
| 2 | At DUT, end the call. | Call is ended. |
| 3 | At DUT, repeat steps 1 and 2 for 9 more attempts. | 10 calls in total are recorded on DUT. |
| 4 | At Reference-1, perform steps 1 and 2 for 10 attempts. | 10 calls in total are recorded on Reference-1. |
| 5 | Compare the success rate between DUT and Reference-1. | Call success rate is comparable between DUT and Reference-1 (DUT is no worse than 10% in call success rate). |

#### 92.2.4.4 MT Video Call – Establishment Success Rate (Relative measurement)

Description

The DUT shall successfully establish an MT VxWi-Fi video call.

Related 3GPP core specifications

TS 24.229, GSMA IR.51, GSMA IR.94

Reason for test

To verify the DUT establishes an MT VxWi-Fi video call over multiple attempts.

Initial configuration

DUT is successfully registered for IMS services (VxWi-Fi).

Reference-1, with similar capabilities to DUT is available and also registered for IMS services (VxWi-Fi)

Client-1 is any device that can make MO video calls.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT video call from Client-1.  Answer call at DUT. | Confirm the video call is established.  Confirm 2-way video and audio between DUT and Client-1. |
| 2 | At Client-1, end the call. | Call is ended. |
| 3 | At DUT, repeat steps 1 and 2 for 9 more attempts. | 10 calls in total are recorded on DUT. |
| 4 | At Reference-1, perform steps 1 and 2 for 10 attempts. | 10 calls in total are recorded on Reference-1. |
| 5 | Compare the success rate between DUT and Reference-1. | Call success rate is comparable between DUT and Reference-1 (DUT is no worse than 10% in call success rate). |

## 92.3 VxWi-Fi – SMS

### 92.3.1 SMS over VxWi-Fi (Supported by Network)

#### 92.3.1.1 SMS over VxWi-Fi (Supported by Network) – MO SMS over VxWi-Fi – Flight Mode

Description

Verify the DUT can successfully send an MO SMS via IMS when registered for VxWi-Fi with Flight Mode enabled.

Related core specifications

3GPP TS 24.341

GSMA IR.92 2.5; IR.51 2.5

Reason for test

To verify the DUT is able to send an MO SMS over IMS when registered for VxWi-Fi with Flight Mode enabled.

Initial configuration

The DUT has Flight Mode enabled. Once Flight Mode is enabled, enable Wi-Fi and connect to a hotspot.

DUT and Client-1 are successfully registered for IMS services (VxWi-Fi).

The DUT supports MO SMS over IMS.

The IMS server supports MO SMS over IMS.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Using the DUT messaging application, create a new SMS and enter the MSISDN of Client-1 as the recipient.  Enter 160 characters (1 segment) in the SMS text. | The SMS is created. |
| 2 | Send the SMS to Client-1 | At DUT, check in SIP protocol messages:  - MO MESSAGE.  SMS is successfully received on Client 1.  The message content is identical to the message prepared on DUT. |

#### 92.3.1.2 SMS over VxWi-Fi (Supported by Network) – MO SMS over VxWi-Fi – Roaming

Description

Verify the DUT can successfully send an MO SMS via IMS when registered for VxWi-Fi under roaming conditions.

Related core specifications

3GPP TS 24.341

GSMA IR.92 2.5; IR.51 2.5

Reason for test

To verify the DUT is able to send an MO SMS over IMS when registered for VxWi-Fi under roaming conditions.

Initial configuration

The DUT is roaming outside of its HPLMN.

DUT and Client-1 are successfully registered for IMS services (VxWi-Fi).

The DUT supports MO SMS over IMS.

The IMS server supports MO SMS over IMS.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Using the DUT messaging application, create a new SMS and enter the MSISDN of Client-1 as the recipient.  Enter 160 characters (1 segment) in the SMS text. | The SMS is created. |
| 2 | Send the SMS to Client-1 | At DUT, check in SIP protocol messages:  - MO MESSAGE.  SMS is successfully received on Client 1.  The message content is identical to the message prepared on DUT. |

#### 92.3.1.3 SMS over VxWi-Fi (Supported by Network) – MT SMS over VxWi-Fi – Flight Mode

Description

Verify the DUT can successfully receive an MT SMS via IMS when registered for VxWi-Fi with Flight Mode enabled.

Related core specifications

3GPP TS 24.341

GSMA IR.92 2.5; IR.51 2.5

Reason for test

To verify the DUT is able to receive an MT SMS over IMS when registered for VxWi-Fi with Flight Mode enabled.

Initial configuration

The DUT has Flight Mode enabled. Once Flight Mode is enabled, enable Wi-Fi and connect to a hotspot.

DUT and Client-1 are successfully registered for IMS services (VxWi-Fi).

The DUT supports MT SMS over IMS.

The IMS server supports MT SMS over IMS.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At Client-1, create a new SMS and enter the MSISDN of DUT as the recipient.  Enter 160 characters (1 segment) in the SMS text. | The SMS is created. |
| 2 | Send the SMS to DUT | At DUT, check in SIP protocol messages:  - MT MESSAGE.  SMS is successfully received on DUT.  The message content is identical to the message prepared on Client-1. |

#### 92.3.1.4 SMS over VxWi-Fi (Supported by Network) – MT SMS over VxWi-Fi – Roaming

Description

Verify the DUT can successfully receive an MT SMS via IMS when registered for VxWi-Fi under roaming conditions.

Related core specifications

3GPP TS 24.341

GSMA IR.92 2.5; IR.51 2.5

Reason for test

To verify the DUT is able to receive an MT SMS over IMS when registered for VxWi-Fi under roaming conditions.

Initial configuration

The DUT is roaming outside of its HPLMN.

DUT and Client-1 are successfully registered for IMS services (VxWi-Fi).

The DUT supports MT SMS over IMS.

The IMS server supports MT SMS over IMS.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At Client-1, create a new SMS and enter the MSISDN of DUT as the recipient.  Enter 160 characters (1 segment) in the SMS text. | The SMS is created. |
| 2 | Send the SMS to DUT | At DUT, check in SIP protocol messages:  - MT MESSAGE.  SMS is successfully received on DUT.  The message content is identical to the message prepared on Client-1. |

### 92.3.2 SMS over VxWi-Fi (Not supported by Network)

#### 92.3.2.1 SMS over VxWi-Fi (Not supported by Network) – MO SMS over CS/SG – Idle

Description

Verify the DUT can successfully send an MO SMS via CS/SG when the IMS server is not supporting MO SMS over IMS.

Related core specifications

3GPP TS 24.341; TS 23.272; TS 23.221; TS 24.301; TS 24.167

GSMA IR.92 2.5; IR.51 2.5

Reason for test

To verify the DUT is able to send an MO SMS over CS/SG when the IMS server is not supporting MO SMS over IMS.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxWi-Fi).

The DUT supports MO SMS over IMS and MO SMS over CS/SG.

The IMS server does not support MO SMS over IMS.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Using the DUT messaging application, create a new SMS and enter the MSISDN of Client-1 as the recipient.  Enter 160 characters (1 segment) in the SMS text. | The SMS is created. |
| 2 | Send the SMS to Client-1 | At DUT, check in SIP protocol messages:  - There is no MO MESSAGE.  SMS is successfully received on Client 1.  The message content is identical to the message prepared on DUT. |

#### 92.3.2.2 SMS over VxWi-Fi (Not supported by Network) – MO SMS over CS/SG – During Voice Call

Description

Verify the DUT can successfully send an MO SMS via CS/SG when the IMS server is not supporting MO SMS over IMS, even though the DUT is in an active VxWi-Fi call.

Related core specifications

3GPP TS 24.341; TS 23.272; TS 23.221; TS 24.301; TS 24.167

GSMA IR.92 2.5; IR.51 2.5

Reason for test

To verify the DUT is able to send an MO SMS over CS/SG when the IMS server is not supporting MO SMS over IMS, even though the DUT is in an active VxWi-Fi call.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxWi-Fi).

The DUT supports MO SMS over IMS and MO SMS over CS/SG.

The IMS server does not support MO SMS over IMS.

The DUT is in an active voice call with Client-1 over VxWi-Fi.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Using the DUT messaging application, create a new SMS and enter the MSISDN of Client-1 as the recipient.  Enter 160 characters (1 segment) in the SMS text. | The SMS is created. |
| 2 | Send the SMS to Client-1 | At DUT, check in SIP protocol messages:  - There is no MO MESSAGE.  SMS is successfully received on Client 1.  The message content is identical to the message prepared on DUT. |

#### 92.3.2.3 SMS over VxWi-Fi (Not supported by Network) – MO SMS over CS/SG – Roaming

Description

To verify the DUT is able to send an MO SMS over CS/SG when the IMS server is not supporting MO SMS over IMS under roaming conditions.

Related core specifications

3GPP TS 24.341; TS 23.272; TS 23.221; TS 24.301; TS 24.167

GSMA IR.92 2.5; IR.51 2.5

Reason for test

To verify the DUT is able to send an MO SMS over CS/SG when registered for VxWi-Fi under roaming conditions.

Initial configuration

The DUT is roaming outside of its HPLMN.

DUT and Client-1 are successfully registered for IMS services (VxWi-Fi).

The DUT supports MO SMS over IMS and MO SMS over CS/SG.

The IMS server does not support MO SMS over IMS.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Using the DUT messaging application, create a new SMS and enter the MSISDN of Client-1 as the recipient.  Enter 160 characters (1 segment) in the SMS text. | The SMS is created. |
| 2 | Send the SMS to Client-1 | At DUT, check in SIP protocol messages:  - There is no MO MESSAGE.  SMS is successfully received on Client 1.  The message content is identical to the message prepared on DUT. |

#### 92.3.2.4 SMS over VxWi-Fi (Not supported by Network) – MT SMS over CS/SG – Idle

Description

Verify the DUT can successfully receive an MT SMS via CS/SG when the IMS server is not supporting MT SMS over IMS.

Related core specifications

3GPP TS 24.341; TS 23.272; TS 23.221; TS 24.301; TS 24.167

GSMA IR.92 2.5; IR.51 2.5

Reason for test

To verify the DUT is able to receive an MT SMS over CS/SG when the IMS server is not supporting MT SMS over IMS.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxWi-Fi).

The DUT supports MT SMS over IMS and MT SMS over CS/SG.

The IMS server does not support MT SMS over IMS.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At Client-1, create a new SMS and enter the MSISDN of DUT as the recipient.  Enter 160 characters (1 segment) in the SMS text. | The SMS is created. |
| 2 | Send the SMS to DUT | At DUT, check in SIP protocol messages:  - There is no MT MESSAGE.  SMS is successfully received on DUT.  The message content is identical to the message prepared on Client-1. |

#### 92.3.2.5 SMS over VxWi-Fi (Not supported by Network) – MT SMS over CS/SG – During Voice Call

Description

Verify the DUT can successfully receive an MT SMS via CS/SG when the IMS server is not supporting MT SMS over IMS.

Related core specifications

3GPP TS 24.341; TS 23.272; TS 23.221; TS 24.301; TS 24.167

GSMA IR.92 2.5; IR.51 2.5

Reason for test

To verify the DUT is able to receive an MT SMS over CS/SG when the IMS server is not supporting MT SMS over IMS.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxWi-Fi).

The DUT supports MT SMS over IMS and MT SMS over CS/SG.

The IMS server does not support MT SMS over IMS.

The DUT is in an active voice call with Client-1 over VxWi-Fi.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At Client-1, create a new SMS and enter the MSISDN of DUT as the recipient.  Enter 160 characters (1 segment) in the SMS text. | The SMS is created. |
| 2 | Send the SMS to DUT | At DUT, check in SIP protocol messages:  - There is no MT MESSAGE.  SMS is successfully received on DUT.  The message content is identical to the message prepared on Client-1. |

#### 92.3.2.6 SMS over VxWi-Fi (Not supported by Network) – MT SMS over CS/SG – Roaming

Description

To verify the DUT is able to receive an MT SMS over CS/SG when the IMS server is not supporting MT SMS over IMS under roaming conditions.

Related core specifications

3GPP TS 24.341; TS 23.272; TS 23.221; TS 24.301; TS 24.167

GSMA IR.92 2.5; IR.51 2.5

Reason for test

To verify the DUT is able to receive an MT SMS over CS/SG when registered for VxWi-Fi under roaming conditions.

Initial configuration

The DUT is roaming outside of its HPLMN.

DUT and Client-1 are successfully registered for IMS services (VxWi-Fi).

The DUT supports MT SMS over IMS and MT SMS over CS/SG.

The IMS server does not support MT SMS over IMS.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At Client-1, create a new SMS and enter the MSISDN of DUT as the recipient.  Enter 160 characters (1 segment) in the SMS text. | The SMS is created. |
| 2 | Send the SMS to DUT | At DUT, check in SIP protocol messages:  - There are is MT MESSAGE.  SMS is successfully received on DUT.  The message content is identical to the message prepared on Client-1. |

## 92.4 VxWi-Fi – Supplementary Services

### 92.4.1 Supplementary Services via VxWi-Fi (Supported by network)

#### 92.4.1.1 Communication Forwarding Unconditional (CFU) – Configuration – Flight Mode

Description

The DUT must be able to register/activate and erase/deactivate the Communication Diversion successfully over Ut/XCAP when in Flight Mode but registered for VxWi-Fi. When activated, the voice call shall be forwarded as expected for the Communication Diversion configured in the DUT.

Related core specifications

GSMA IR.92, sub clause 2.3.8

Reason for test

To confirm the DUT is able to successfully register/activate and erase/deactivate Communication Forwarding Unconditional over Ut/XCAP when in Flight Mode but registered for VxWi-Fi.

Initial Configuration

Network under test supports Communication Diversion over Ut/XCAP.

The DUT has Flight Mode enabled. Once Flight Mode is enabled, enable Wi-Fi and connect to a hotspot.

DUT is successfully registered for IMS services (VxWi-Fi).

All Communication Forwarding are erased at DUT.

Client-1 and Client-2 required.

|  |  |  |
| --- | --- | --- |
| - | Test procedure | Expected behaviour |
| 1 | At DUT register CFU to MSISDN of Client-1. | Confirm DUT indicates CFU is activated.  Confirm DUT used Ut/XCAP protocol. |
| 2 | At DUT interrogate the status of CFU. | Confirm DUT indicates CFU is activated to MSISDN of Client-1.  Confirm DUT used Ut/XCAP protocol. |
| 3 | At Client-2 make MO voice call to DUT. | Confirm the voice call from Client-2 is forwarded to Client-1.  Confirm DUT shows no indication of the voice call from Client-2. |
| 4 | At Client-2 end the call. | Call is ended. |
| 5 | At DUT deactivate CFU. | Confirm DUT indicates CFU is deactivated.  Confirm DUT used Ut/XCAP protocol. |
| 6 | At DUT interrogate the status of CFU. | Confirm DUT indicates CFU is deactivated.  Confirm DUT used Ut/XCAP protocol.  Confirm MSISDN of Client-1 is still set as the destination number, even though the service is deactivated. |
| 7 | At DUT activate CFU. | Confirm DUT indicates CFU is activated.  Confirm DUT used Ut/XCAP protocol. |
| 8 | At DUT interrogate the status of CFU. | Confirm DUT indicates CFU is activated to MSISDN of Client-1.  Confirm DUT used Ut/XCAP protocol.  Confirm MSISDN of Client-1 is displayed as the destination number. |
| 9 | At DUT erase CFU to MSISDN of Client-1. | Confirm DUT indicates CFU is erased.  Confirm DUT used Ut/XCAP protocol. |
| 10 | At DUT interrogate the status of CFU. | Confirm DUT indicates CFU is deactivated.  Confirm DUT used Ut/XCAP protocol.  Confirm no destination number is pre-set anymore. |
| 11 | At Client-2 make MO voice call to DUT. | Confirm the voice call from Client-2 is received successfully on DUT. |
| 12 | End the voice call between DUT and Client-2. | Call is ended. |

#### 92.4.1.2 Barring of all Outgoing Calls (BAOC) – Configuration – Flight Mode

Description

The DUT must be able to activate and deactivate the Communication Baring successfully over XCAP when in Flight Mode but registered for VxWi-Fi. When activated, the voice call shall be barred as expected for the Communication barring configured in the DUT.

Related core specifications

3GPP TS 24.229, TS.24.611

Reason for test

To confirm the DUT is able to successfully activate and deactivate Communication Barring of all outgoing calls over XCAP when in Flight Mode but registered for VxWi-Fi.

Initial Configuration

Network under test supports Communication Barring over Ut/XCAP.

The DUT has Flight Mode enabled. Once Flight Mode is enabled, enable Wi-Fi and connect to a hotspot.

DUT is successfully registered for IMS services (VxWi-Fi).

Client-1 required.

|  |  |  |
| --- | --- | --- |
| - | Test procedure | Expected behaviour |
| 1 | At DUT, activate BAOC. | Confirm DUT indicates BAOC is activated.  Confirm DUT used Ut/XCAP protocol. |
| 2 | At DUT interrogate the status of BAOC. | Confirm DUT indicates BAOC is activated.  Confirm DUT used Ut/XCAP protocol. |
| 3 | At DUT, make MO voice call to Client-1. | Confirm the voice call to Client-1 is not established. |
| 4 | At DUT, deactivate BAOC | Confirm DUT indicates BAOC is deactivated.  Confirm DUT used Ut/XCAP protocol. |
| 5 | At DUT interrogate the status of BAIC. | Confirm DUT indicates BAOC is deactivated.  Confirm DUT used Ut/XCAP protocol. |
| 6 | At DUT, make MO voice call to Client-1. | Confirm the voice call to Client-1 is setup successfully on DUT. |
| 7 | End the voice call between DUT and Client-1. | Call is ended. |

#### 92.4.1.3 Communication Forwarding Unconditional (CFU) – Configuration – Roaming

Description

The DUT must be able to register/activate and erase/deactivate the Communication Diversion successfully over Ut/XCAP when in roaming and registered for VxWi-Fi. When activated, the voice call shall be forwarded as expected for the Communication Diversion configured in the DUT.

Related core specifications

3GPP TS 24.229, TS 24.604

Reason for test

To confirm the DUT is able to successfully register/activate and erase/deactivate Communication Forwarding Unconditional over Ut/XCAP when in roaming and registered for VxWi-Fi.

Initial Configuration

DUT is roaming outside its HPLMN.

Network under test supports Communication Diversion over Ut/XCAP.

DUT is successfully registered for IMS services (VxWi-Fi) in the roaming network.

All Communication Forwarding are erased at DUT.

Client-1 and Client-2 required.

|  |  |  |
| --- | --- | --- |
| - | Test procedure | Expected behaviour |
| 1 | At DUT register CFU to MSISDN of Client-1. | Confirm DUT indicates CFU is activated.  Confirm DUT used Ut/XCAP protocol. |
| 2 | At DUT interrogate the status of CFU. | Confirm DUT indicates CFU is activated to MSISDN of Client-1.  Confirm DUT used Ut/XCAP protocol. |
| 3 | At Client-2 make MO voice call to DUT. | Confirm the voice call from Client-2 is forwarded to Client-1.  Confirm DUT shows no indication of the voice call from Client-2. |
| 4 | At Client-2 end the call. | Call is ended. |
| 5 | At DUT deactivate CFU. | Confirm DUT indicates CFU is deactivated.  Confirm DUT used Ut/XCAP protocol. |
| 6 | At DUT interrogate the status of CFU. | Confirm DUT indicates CFU is deactivated.  Confirm DUT used Ut/XCAP protocol.  Confirm MSISDN of Client-1 is still set as the destination number, even though the service is deactivated. |
| 7 | At DUT activate CFU. | Confirm DUT indicates CFU is activated.  Confirm DUT used Ut/XCAP protocol. |
| 8 | At DUT interrogate the status of CFU. | Confirm DUT indicates CFU is activated to MSISDN of Client-1.  Confirm DUT used Ut/XCAP protocol.  Confirm MSISDN of Client-1 is displayed as the destination number. |
| 9 | At DUT erase CFU to MSISDN of Client-1. | Confirm DUT indicates CFU is erased.  Confirm DUT used Ut/XCAP protocol. |
| 10 | At DUT interrogate the status of CFU. | Confirm DUT indicates CFU is deactivated.  Confirm DUT used Ut/XCAP protocol.  Confirm no destination number is pre-set anymore. |
| 11 | At Client-2 make MO voice call to DUT. | Confirm the voice call from Client-2 is received successfully on DUT. |
| 12 | End the voice call between DUT and Client-2. | Call is ended. |

#### 92.4.1.4 Barring of all Outgoing Calls (BAOC) – Configuration – Roaming

Description

The DUT must be able to activate and deactivate the Communication Baring successfully over XCAP when in roaming and registered for VxWi-Fi. When activated, the voice call shall be barred as expected for the Communication barring configured in the DUT.

Related core specifications

3GPP TS 24.229, TS.24.611

Reason for test

To confirm the DUT is able to successfully activate and deactivate Communication Barring of all outgoing calls over XCAP when in roaming and registered for VxWi-Fi.

Initial Configuration

DUT is roaming outside its HPLMN.

Network under test supports Communication Barring over Ut/XCAP.

DUT is successfully registered for IMS services (VxWi-Fi) in the roaming network:

Client-1 required.

|  |  |  |
| --- | --- | --- |
| - | Test procedure | Expected behaviour |
| 1 | At DUT, activate BAOC. | Confirm DUT indicates BAOC is activated.  Confirm DUT used Ut/XCAP protocol. |
| 2 | At DUT interrogate the status of BAOC. | Confirm DUT indicates BAOC is activated.  Confirm DUT used Ut/XCAP protocol. |
| 3 | At DUT, make MO voice call to Client-1. | Confirm the voice call to Client-1 is not established. |
| 4 | At DUT, deactivate BAOC | Confirm DUT indicates BAOC is deactivated.  Confirm DUT used Ut/XCAP protocol. |
| 5 | At DUT interrogate the status of BAIC. | Confirm DUT indicates BAOC is deactivated.  Confirm DUT used Ut/XCAP protocol. |
| 6 | At DUT, make MO voice call to Client-1. | Confirm the voice call to Client-1 is setup successfully on DUT. |
| 7 | End the voice call between DUT and Client-1. | Call is ended. |

### 92.4.2 Supplementary Services via VxWi-Fi (Not Supported by network)

## 92.5 VxWi-Fi – Service Interworking

### 92.5.1 Interworking with MMS

#### 92.5.1.1 Interworking with MMS – MO MMS over IMS – Flight Mode

Description

Verify the DUT can successfully send an MO MMS via IMS when registered for VxWi-Fi with Flight Mode enabled.

Related core specifications

3GPP 23.140, 3GPP 24.229

Reason for test

To verify the DUT is able to send an MO MMS over IMS when registered for VxWi-Fi with Flight Mode enabled.

Initial configuration

The DUT has Flight Mode enabled. Once Flight Mode is enabled, enable Wi-Fi and connect to a hotspot.

DUT is successfully registered for IMS services (VxWi-Fi).

Client-1 required.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Start a PCAP trace (or similar) of the Wi-Fi interface. | Trace is ongoing. |
| 2 | Using the DUT messaging application, create a new MMS and enter the MSISDN of Client-1 as the recipient.  Enter a subject and some text. | The MMS is created. |
| 3 | Send the MMS to Client-1  Check the PCAP trace (or similar log) to ensure the MMS was sent over VxWi-Fi | At DUT, check in trace:  - IKE\_INIT  - IKE\_AUTH containing the MMS APN name  - - INFORMATIONAL request message including a “DELETE” payloadAfter the MMS has been sent  MMS notification is successfully received at Client-1. |

#### 92.5.1.2 Interworking with MMS – MO MMS over IMS – Roaming

Description

Verify the DUT can successfully send an MO MMS via IMS when registered for VxWi-Fi in roaming.

Related core specifications

3GPP 23.140, 3GPP 24.229

Reason for test

To verify the DUT is able to send an MO MMS over IMS when registered for VxWi-Fi in roaming.

Initial configuration

DUT is roaming outside its HPLMN.

DUT is successfully registered for IMS services (VxWi-Fi) in the roaming network.

Client-1 required.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Start a PCAP trace (or similar) of the Wi-Fi interface. | Trace is ongoing. |
| 2 | Using the DUT messaging application, create a new MMS and enter the MSISDN of Client-1 as the recipient.  Enter a subject and some text. | The MMS is created. |
| 3 | Send the MMS to Client-1  Check the PCAP trace (or similar log) to ensure the MMS was sent over VxWi-Fi | At DUT, check in trace:  - IKE\_INIT  - IKE\_AUTH containing the MMS APN name  - - INFORMATIONAL request message including a “DELETE” payloadAfter the MMS has been sent  MMS notification is successfully received at Client-1 |

#### 92.5.1.3 Interworking with MMS – MO MMS over IMS – During Voice Call

Description

Verify the DUT can successfully send an MO MMS via IMS when registered for VxWi-Fi during an ongoing voice call.

Related core specifications

3GPP 23.140, 3GPP 24.229

Reason for test

To verify the DUT is able to send an MO MMS over IMS when registered for VxWi-Fi during an ongoing voice call.

Initial configuration

DUT is successfully registered for IMS services.

Client-1 required.

The DUT is in an active voice call with Client-1 over VxWi-Fi.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Start a PCAP trace (or similar) of the Wi-Fi interface. | Trace is ongoing. |
| 2 | Using the DUT messaging application, create a new MMS and enter the MSISDN of Client-1 as the recipient.  Enter a subject and some text. | The MMS is created. |
| 3 | Send the MMS to Client-1  Check the PCAP trace (or similar log) to ensure the MMS was sent over VxWi-Fi | At DUT, check in trace:  - IKE\_INIT  - IKE\_AUTH containing the MMS APN name  - - INFORMATIONAL request message including a “DELETE” payloadAfter the MMS has been sent  MMS notification is successfully received at Client-1 |

#### 92.5.1.4 Interworking with MMS – MT MMS over IMS – Flight Mode

Description

Verify the DUT can successfully receive an MT MMS via IMS when registered for VxWi-Fi with Flight Mode enabled.

Related core specifications

3GPP 23.140, 3GPP 24.229

Reason for test

To verify the DUT is able to receive an MT MMS over IMS when registered for VxWi-Fi with Flight Mode enabled.

Initial configuration

The DUT has Flight Mode enabled. Once Flight Mode is enabled, enable Wi-Fi and connect to a hotspot.

DUT is successfully registered for IMS services (VxWi-Fi).

Client-1 required.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Start a PCAP trace (or similar) of the Wi-Fi interface. | Trace is ongoing. |
| 2 | At Client-1, create a new MMS and enter the MSISDN of DUT as the recipient.  Enter a subject and some text. | The MMS is created. |
| 3 | Send the MMS to DUT.  Check the PCAP trace (or similar log) to ensure the MMS was received over VxWi-Fi | At DUT, check in trace:  - IKE\_INIT  - IKE\_AUTH containing the MMS APN name  - - INFORMATIONAL request message including a “DELETE” payloadAfter the MMS has been sent  MMS is successfully received at DUT. |

#### 92.5.1.5 Interworking with MMS – MT MMS over IMS – Roaming

Description

Verify the DUT can successfully receive an MT MMS via IMS when registered for VxWi-Fi in roaming.

Related core specifications

3GPP 23.140, 3GPP 24.229

Reason for test

To verify the DUT is able to receive an MT MMS over IMS when registered for VxWi-Fi in roaming.

Initial configuration

DUT is roaming outside its HPLMN.

DUT is successfully registered for IMS services (VxWi-Fi) in the roaming network.

Client-1 required.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Start a PCAP trace (or similar) of the Wi-Fi interface. | Trace is ongoing. |
| 2 | At Client-1, create a new MMS and enter the MSISDN of DUT as the recipient.  Enter a subject and some text. | The MMS is created. |
| 3 | Send the MMS to DUT.  Check the PCAP trace (or similar log) to ensure the MMS was received over VxWi-Fi | At DUT, check in trace:  - IKE\_INIT  - IKE\_AUTH containing the MMS APN name  - - INFORMATIONAL request message including a “DELETE” payloadAfter the MMS has been sent  MMS is successfully received at DUT. |

#### 92.5.1.6 Interworking with MMS – MT MMS over IMS – During Voice Call

Description

Verify the DUT can successfully receive an MT MMS via IMS when registered for VxWi-Fi during an ongoing voice call.

Related core specifications

3GPP 23.140, 3GPP 24.229

Reason for test

To verify the DUT is able to receive an MT MMS over IMS when registered for VxWi-Fi during an ongoing voice call.

Initial configuration

DUT is successfully registered for IMS services.

Client-1 required.

The DUT is in an active voice call with Client-1 over VxWi-Fi.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Start a PCAP trace (or similar) of the Wi-Fi interface. | Trace is ongoing. |
| 2 | At Client-1, create a new MMS and enter the MSISDN of DUT as the recipient.  Enter a subject and some text. | The MMS is created. |
| 3 | Send the MMS to DUT.  Check the PCAP trace (or similar log) to ensure the MMS was received over VxWi-Fi | At DUT, check in trace:  - IKE\_INIT  - IKE\_AUTH containing the MMS APN name  - - INFORMATIONAL request message including a “DELETE” payloadAfter the MMS has been sent  MMS is successfully received at DUT. |

## 92.6 VxWi-Fi – Mobility

### 92.6.1 Reselection (Wi-Fi)

#### 92.6.1.1 Reselection (Wi-Fi) – Different AP – Same IP

Description

Verify that the DUT can successfully reselect between different Access Points.

Related core specifications

TS 23.402

Reason for test

To ensure the DUT can successfully reselect between different Access Points.

Initial configuration

Wi-Fi hotspot AP1 that provides a connection to the internet is available.

Wi-Fi hotspot AP2 is a repeater that is connected to AP1 with the same SSID.

DUT has previously connected to AP1 and AP2 hotspots,

The DUT has Flight Mode enabled. Once Flight Mode is enabled, enable Wi-Fi and connect to hotspot AP1.

DUT is successfully registered for IMS services (VxWi-Fi) on AP1.

Client-1 required.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, use an internal monitoring tool to check the IP address assigned by AP1. | IP address is noted. |
| 2 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call over AP1 is successfully established with 2-way audio. |
| 3 | At Client-1, end the voice call. | Call is ended. |
| 4 | Move DUT to an area where AP2 is available but AP1 is not available. | DUT Automatically connects to Wi-Fi hotspot AP2 and displays an indication that VxWi-Fi is available. |
| 5 | At DUT, use an internal monitoring tool to check the IP address assigned by AP2.  Confirm the IP address is the same as AP1. | IP address is noted.  IP address of AP2 is the same as AP1.  The DUT is not performing any additional IPSEC tunnel establishment to ePDG upon selection of Wi-Fi AP2 |
| 6 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call over AP2 is successfully established with 2-way audio. |
| 7 | At Client-1, end the voice call. | Call is ended. |

#### 92.6.1.2 Reselection (Wi-Fi) – Different AP – Different IP

Description

Verify that the DUT can successfully reselect between different Access Points.

Related core specifications

TS 23.402

Reason for test

To ensure the DUT can successfully reselect between different Access Points.

Initial configuration

Wi-Fi hotspot AP1 that provides a connection to the internet is available.

Wi-Fi hotspot AP2 that provides a connection to the internet is available.

AP1 and AP2 have different IP addresses.

DUT has previously connected to AP1 and AP2 hotspots,

The DUT has Flight Mode enabled. Once Flight Mode is enabled, enable Wi-Fi and connect to hotspot AP1.

DUT is successfully registered for IMS services (VxWi-Fi) on AP1.

Client-1 required.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, use an internal monitoring tool to check the IP address assigned by AP1. | IP address is noted. |
| 2 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call over AP1 is successfully established with 2-way audio. |
| 3 | At Client-1, end the voice call. | Call is ended. |
| 4 | Move DUT to an area where AP2 is available but AP1 is not available. | DUT Automatically connects to Wi-Fi hotspot AP2 and displays an indication that Wi-Fi is available. |
| 5 | At DUT, use an internal monitoring tool to check the IP address assigned by AP2.  Confirm the IP address is different to AP1. | IP address is noted.  IP address of AP2 is different to AP1.  DUT is performing new IPSEC tunnel establishment to ePDG upon selection of Wi-Fi AP2 |
| 6 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call over AP2 is successfully established with 2-way audio. |
| 7 | At Client-1, end the voice call. | Call is ended. |

#### 92.6.1.3 Reselection (Wi-Fi) – Same AP – To/From Weak Wi-Fi Coverage

Description

Verify the DUT does not de-register from IMS services and maintains the Wi-Fi connection when moving into a “Weak Wi-Fi coverage” area.

Related core specifications

TS 23.402; IR.51

Reason for test

Verify the DUT does not de-register from IMS services and maintains the Wi-Fi connection when moving into a “Weak Wi-Fi coverage” area.

Initial configuration

Wi-Fi hotspot AP1 that provides a connection to the internet is available.

The DUT has Flight Mode enabled. Once Flight Mode is enabled, enable Wi-Fi and connect to a hotspot.

DUT is successfully registered for IMS services (VxWi-Fi) in “Good Wi-Fi coverage”

Client-1 required.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Move the DUT to “Weak Wi-Fi coverage”.  (The DUT should be moved far enough away to weaken the coverage but not lose the coverage). | DUT remains registered for IMS services.  DUT is still connected to Wi-Fi hotspot AP1.  Wi-Fi icon is still available. |
| 2 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call over AP1 is successfully established with 2-way audio. |
| 3 | Move the DUT to “Good Wi-Fi coverage”. | DUT remains registered for IMS services.  DUT is still connected to Wi-Fi hotspot AP1.  Wi-Fi icon is still available. |
| 4 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call over AP1 is successfully established with 2-way audio. |
| 5 | At Client-1, end the voice call. | Call is ended. |

#### 92.6.1.4 Reselection (Wi-Fi) – Same AP – To/From No Coverage

Description

Verify the DUT displays information for VxWi-Fi availability when moving into a “No Wi-Fi coverage” area and re-registers when returning to “Good Wi-Fi coverage”.

Related core specifications

TS 23.402

Reason for test

To verify the DUT displays correct information for VxWi-Fi when moving into a “No Wi-Fi coverage” area and re-registers when returning to “Good Wi-Fi coverage”.

Initial configuration

Wi-Fi hotspot AP1 that provides a connection to the internet is available.

The DUT has Flight Mode enabled. Once Flight Mode is enabled, enable Wi-Fi and connect to a hotspot.

DUT is successfully registered for IMS services (VxWi-Fi) in “Good Wi-Fi coverage”

Client-1 required.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Move the DUT to “No Wi-Fi coverage”. | DUT ’s Wi-Fi calling icon is no longer available.  DUT displays “No Service” icon. |
| 2 | At DUT, receive MT voice call from Client-1. | Call setup fails. |
| 3 | Move the DUT to “Good Wi-Fi coverage”. | DUT registers for VxWi-Fi successfully on AP1 and displays the appropriate icon to indicate to the user that Wi-Fi calling is available.  In case the IPSec tunnel to the ePDG has been kept in place while Wi-fi connectivity was lost (e.g. out of service situation shorter than liveness check timer) there will be no additional registration. |
| 4 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call over AP1 is successfully established with 2-way audio. |
| 5 | At Client-1, end the voice call. | Call is ended. |

### 92.6.2 Reselection (IRAT)

#### 92.6.2.1 VxWi-Fi to VxLTE Reselection – Wi-Fi Preferred

Description

Verify that the DUT can successfully reselect VxWi-Fi to VxLTE when it loses VxWi-Fi.

Related core specifications

GSMA IR.51

Reason for test

To ensure the DUT is able to reselect from VxWi-Fi to VxLTE when it loses VxWi-Fi.

Initial configuration

Network is supporting E-UTRAN and VxLTE.

Network is supporting Wi-Fi preferred.

DUT is camping to the E-UTRAN network for cellular service.

Wi-Fi hotspot (AP1) that provides a connection to the internet is available.

DUT has Wi-Fi enabled.

DUT environment at time of testing: “Good Cellular + Good Wi-Fi coverage”.

DUT is successfully registered for IMS services (VxWi-Fi) on AP1.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call over AP1 is successfully established with 2-way audio. |
| 2 | At Client-1, end the voice call. | Call is ended. |
| 3 | Move the DUT to “Good Cellular + Weak Wi-Fi coverage” | DUT deregisters from VxWi-Fi successfully and Wi-Fi calling icon is no longer available.  DUT still displays the Wi-Fi icon.  DUT registers for VxLTE.  DUT correctly displays an icon to indicate it is registered for VxLTE according to the customization requirement. |
| 4 | At DUT, receive MT voice call from Client-1. | VxLTE Call is successfully established with 2-way audio. |
| 5 | At Client-1, end the voice call. | Call is ended. |
| 6 | Move the DUT to “Good Cellular + No Wi-Fi coverage” | DUT no longer displays the Wi-Fi icon. |
| 7 | At DUT, receive MT voice call from Client-1. | VxLTE Call is successfully established with 2-way audio. |
| 8 | At Client-1, end the voice call. | Call is ended. |

#### 92.6.2.2 VxLTE to VxWi-Fi Reselection – Wi-Fi Preferred

Description

Verify that the DUT can successfully reselect from VxLTE to VxWi-Fi when Wi-Fi becomes available.

Related core specifications

GSMA IR.51

Reason for test

To ensure the DUT is able to reselect from VxLTE to VxWi-Fi when Wi-Fi becomes available.

Initial configuration

Network is supporting E-UTRAN and VxLTE.

Network is supporting Wi-Fi preferred.

DUT is camping to the E-UTRAN network for cellular service.

Wi-Fi hotspot (AP1) that provides a connection to the internet is available. The hotspot is not currently in range of the DUT.

DUT has Wi-Fi enabled.

DUT environment at time of testing: “Good Cellular + No Wi-Fi coverage”.

DUT is successfully registered for IMS services (VxLTE).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | VxLTE Call is successfully established with 2-way audio. |
| 2 | At Client-1, end the voice call. | Call is ended. |
| 3 | Move the DUT to “Good Cellular + Weak Wi-Fi coverage” | DUT displays the Wi-Fi icon but dos not register for VxWi-Fi. |
| 4 | At DUT, receive MT voice call from Client-1. | VxLTE Call is successfully established with 2-way audio. |
| 5 | At Client-1, end the voice call. | Call is ended. |
| 6 | Move the DUT to “Good Cellular + Good Wi-Fi coverage” | DUT deregisters from VxLTE successfully and the VxLTE icon is no longer displayed on the UI.  DUT registers for VxWi-Fi successfully on AP1 and displays the appropriate icon to indicate to the user that Wi-Fi calling is available. |
| 7 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call over AP1 is successfully established with 2-way audio. |
| 8 | At Client-1, end the voice call. | Call is ended. |

#### 92.6.2.3 VxWi-Fi to CS Reselection – Wi-Fi Preferred

Description

Verify that the DUT can successfully reselect from VxWi-Fi to CS when it loses VxWi-Fi.

Related core specifications

GSMA IR.51

Reason for test

To ensure the DUT is able to reselect from VxWi-Fi to CS when it loses VxWi-Fi.

Initial configuration

Network is supporting UTRAN or GERAN.

Network is supporting Wi-Fi preferred.

DUT is camping to the UTRAN/GERAN network for cellular service.

Wi-Fi hotspot (AP1) that provides a connection to the internet is available.

DUT has Wi-Fi enabled.

DUT environment at time of testing: “Good Cellular + Good Wi-Fi coverage”.

DUT is successfully registered for IMS services (VxWi-Fi) on AP1.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call over AP1 is successfully established with 2-way audio. |
| 2 | At Client-1, end the voice call. | Call is ended. |
| 3 | Move the DUT to “Good Cellular + Weak Wi-Fi coverage” | DUT deregisters from VxWi-Fi successfully and Wi-Fi calling icon is no longer available.  DUT still displays the Wi-Fi icon. |
| 4 | At DUT, receive MT voice call from Client-1. | CS Call is successfully established on UTRAN/GERAN with 2-way audio. |
| 5 | At Client-1, end the voice call. | Call is ended. |
| 6 | Move the DUT to “Good Cellular + No Wi-Fi coverage” | DUT no longer displays the Wi-Fi icon. |
| 7 | At DUT, receive MT voice call from Client-1. | CS Call is successfully established on UTRAN/GERAN with 2-way audio. |
| 8 | At Client-1, end the voice call. | Call is ended. |

#### 92.6.2.4 CS to VxWi-Fi Reselection – Wi-Fi Preferred

Description

Verify that the DUT can successfully reselect from CS to VxWi-Fi when Wi-Fi becomes available.

Related core specifications

GSMA IR.51

Reason for test

To ensure the DUT is able to reselect from CS to VxWi-Fi when Wi-Fi becomes available.

Initial configuration

Network is supporting UTRAN or GERAN.

Network is supporting Wi-Fi preferred.

DUT is camping to the UTRAN/GERAN network for cellular service.

Wi-Fi hotspot (AP1) that provides a connection to the internet is available. The hotspot is not currently in range of the DUT.

DUT has Wi-Fi enabled.

DUT environment at time of testing: “Good Cellular + No Wi-Fi coverage”.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | CS Call is successfully established on UTRAN/GERAN with 2-way audio. |
| 2 | At Client-1, end the voice call. | Call is ended. |
| 3 | Move the DUT to “Good Cellular + Weak Wi-Fi coverage” | DUT displays the Wi-Fi icon but dos not register for VxWi-Fi. |
| 4 | At DUT, receive MT voice call from Client-1. | CS Call is successfully established on UTRAN/GERAN with 2-way audio. |
| 5 | At Client-1, end the voice call. | Call is ended. |
| 6 | Move the DUT to “Good Cellular + Good Wi-Fi coverage” | DUT registers for VxWi-Fi successfully on AP1 and displays the appropriate icon to indicate to the user that Wi-Fi calling is available. |
| 7 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call over AP1 is successfully established with 2-way audio. |
| 8 | At Client-1, end the voice call. | Call is ended. |

#### 92.6.2.5 VxWi-Fi to VxLTE Reselection – Cellular Preferred

Description

Verify that the DUT can successfully reselect from VxWi-Fi to VxLTE when the cellular coverage becomes good.

Related core specifications

GSMA IR.51

Reason for test

To ensure the DUT is able to reselect from VxWi-Fi to VxLTE when the cellular coverage becomes good.

Initial configuration

Network is supporting E-UTRAN and VxLTE.

Network is supporting Cellular preferred.

DUT is camping to the E-UTRAN network for cellular service.

Wi-Fi hotspot (AP1) that provides a connection to the internet is available.

DUT has Wi-Fi enabled.

DUT environment at time of testing: “Weak Cellular + Good Wi-Fi coverage”.

DUT is successfully registered for IMS services (VxWi-Fi) on AP1.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call over AP1 is successfully established with 2-way audio. |
| 2 | At Client-1, end the voice call. | Call is ended. |
| 3 | Move the DUT to “Good Cellular + Good Wi-Fi coverage” | DUT deregisters from VxWi-Fi successfully and Wi-Fi calling icon is no longer available.  DUT no longer displays the Wi-Fi icon.  DUT registers for VxLTE.  DUT correctly displays an icon to indicate it is registered for VxLTE according to the customization requirement. |
| 4 | At DUT, receive MT voice call from Client-1. | VxLTE Call is successfully established with 2-way audio. |
| 5 | At Client-1, end the voice call. | Call is ended. |

#### 92.6.2.6 VxLTE to VxWi-Fi Reselection – Cellular Preferred

Description

Verify that the DUT can successfully reselect from VxLTE to VxWi-Fi when the cellular coverage becomes weak.

Related core specifications

GSMA IR.51

Reason for test

To ensure the DUT is able to reselect from VxLTE to VxWi-Fi when the cellular coverage becomes weak.

Initial configuration

Network is supporting E-UTRAN and VxLTE.

Network is supporting Cellular preferred.

DUT is camping to the E-UTRAN network for cellular service.

Wi-Fi hotspot (AP1) that provides a connection to the internet is available.

DUT has Wi-Fi enabled.

DUT environment at time of testing: “Good Cellular + Good Wi-Fi coverage”.

DUT is successfully registered for IMS services (VxLTE)

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | VxLTE Call is successfully established with 2-way audio. |
| 2 | At Client-1, end the voice call. | Call is ended. |
| 3 | Move the DUT to “Weak Cellular + Good Wi-Fi coverage” | DUT deregisters from VxLTE successfully and the VxLTE icon is no longer displayed on the UI.  DUT registers for VxWi-Fi successfully on AP1 and displays the appropriate icon to indicate to the user that Wi-Fi calling is available. |
| 4 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call over AP1 is successfully established with 2-way audio. |
| 5 | At Client-1, end the voice call. | Call is ended. |

#### 92.6.2.7 VxWi-Fi to CS Reselection – Cellular Preferred

Description

Verify that the DUT can successfully reselect from VxWi-Fi to CS when the cellular coverage becomes good.

Related core specifications

GSMA IR.51

Reason for test

To ensure the DUT is able to reselect from VxWi-Fi to CS when the cellular coverage becomes good.

Initial configuration

Network is supporting UTRAN or GERAN.

Network is supporting Cellular preferred.

DUT is camping to the UTRAN/GERAN network for cellular service.

Wi-Fi hotspot (AP1) that provides a connection to the internet is available.

DUT has Wi-Fi enabled.

DUT environment at time of testing: “Weak Cellular + Good Wi-Fi coverage”.

DUT is successfully registered for IMS services (VxWi-Fi) on AP1.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call over AP1 is successfully established with 2-way audio. |
| 2 | At Client-1, end the voice call. | Call is ended. |
| 3 | Move the DUT to “Good Cellular + Good Wi-Fi coverage” | DUT deregisters from VxWi-Fi successfully and Wi-Fi calling icon is no longer available.  DUT no longer displays the Wi-Fi icon. |
| 4 | At DUT, receive MT voice call from Client-1. | CS Call is successfully established on UTRAN/GERAN with 2-way audio. |
| 5 | At Client-1, end the voice call. | Call is ended. |

#### 92.6.2.8 CS to VxWi-Fi Reselection – Cellular Preferred

Description

Verify that the DUT can successfully reselect from CS to VxWi-Fi when the cellular coverage becomes weak.

Related core specifications

GSMA IR.51

Reason for test

To ensure the DUT is able to reselect from CS to VxWi-Fi when the cellular coverage becomes weak.

Initial configuration

Network is supporting UTRAN or GERAN.

Network is supporting Cellular preferred.

DUT is camping to the UTRAN/GERAN network for cellular service.

Wi-Fi hotspot (AP1) that provides a connection to the internet is available.

DUT has Wi-Fi enabled.

DUT environment at time of testing: “Good Cellular + Good Wi-Fi coverage”.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | CS Call is successfully established on UTRAN/GERAN with 2-way audio. |
| 2 | At Client-1, end the voice call. | Call is ended. |
| 3 | Move the DUT to “Weak Cellular + Good Wi-Fi coverage” | DUT registers for VxWi-Fi successfully on AP1 and displays the appropriate icon to indicate to the user that Wi-Fi calling is available. |
| 4 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call over AP1 is successfully established with 2-way audio. |
| 5 | At Client-1, end the voice call. | Call is ended. |

#### 92.6.2.9 VxWi-Fi to VxLTE Reselection in Roaming

Description

Verify that the DUT can successfully reselect in a roaming scenario from VxWi-Fi to VxLTE when it loses VxWi-Fi coverage and shows the correct behaviour depending on the configuration.

Related core specifications

GSMA IR.51, 3GPP TS 24.167

Reason for test

To ensure the DUT is able to reselect from VxWi-Fi to VxLTE when it loses VxWi-Fi in roaming.

Initial configuration

VPLMN has a VxLTE roaming agreement with the HPLMN of the SIM card used in the DUT.

VPLMN is supporting VxLTE for roaming subscribers (VoPS = 1).

DUT is camping to the E-UTRAN network for cellular service.

A Wi-Fi hotspot (AP1) that provides a connection to the Internet is available.

DUT has Wi-Fi enabled.

DUT environment at time of testing:

Wi-Fi Preferred networks: “Good Cellular + Good Wi-Fi coverage”.

Cellular Preferred networks: “Weak Cellular + Good Wi-Fi coverage”.

DUT is successfully registered for IMS services (VxWi-Fi) on AP1.

Note: IR.51 configuration parameter **Allow\_Handover\_PDN\_connection\_WLAN\_and\_EPS**  allows 3 distinctive values.

Definition of values from 24.167, chapter 5.78

0 – Indicates that a UE roaming in a VPLMN and having an ongoing session, is not allowed to transfer the PDN connection providing access to IMS between EPC via WLAN and EPS.

1 – Indicates that a UE roaming in a VPLMN and having an ongoing session, is allowed to transfer the PDN connection providing access to IMS between EPC via WLAN and EPS;

2 – Indicates that a UE roaming in a VPLMN is not allowed to transfer the PDN connection providing access to IMS between EPC via WLAN and EPS using handover procedures, irrespective of if the UE is in a session or not.

**Scenario A) Transfer of PDN connection is allowed**

In this scenario, DUT has the setting for “Allow\_Handover\_PDN\_connection\_WLAN\_and\_EPS” equal to 0 or 1, which allows to move the IMS default bearer while **no voice call is ongoing** (reselection).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call over AP1 is successfully established with 2-way audio. |
| 2 | At Client-1, end the voice call. | Call is ended. |
| 3 | Wi-Fi Preferred networks:  Move the DUT to “Good Cellular + No Wi-Fi coverage” or “Good Cellular + Weak Wi-Fi coverage”  Cellular Preferred networks:  Move the DUT to “Good Cellular + Good Wi-Fi coverage” | DUT still displays the Wi-Fi icon.  DUT starts registration procedure in LTE.  The PDN Connectivity request sent for IMS APN indicates request type **“Handover”**  DUT registers for VxLTE.  DUT correctly displays an icon to indicate it is registered for VxLTE according to the customization requirement. |
| 4 | At DUT, receive MT voice call from Client-1. | VxLTE Call is successfully established with 2-way audio. |
| 5 | At Client-1, end the voice call. | Call is successfully terminated. |

**Scenario B) Transfer of PDN Connection is not allowed**

In this scenario, DUT has the setting for “Allow\_Handover\_PDN\_connection\_WLAN\_and\_EPS” equal to 2.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call over AP1 is successfully established with 2-way audio. |
| 2 | At Client-1, end the voice call. | Call is ended. |
| 3 | Wi-Fi Preferred networks:  Move the DUT to “Good Cellular + No Wi-Fi coverage” or “Good Cellular + Weak Wi-Fi coverage”  Cellular Preferred networks:  Move the DUT to “Good Cellular + Good Wi-Fi coverage” | DUT deregisters from VxWi-Fi successfully and Wi-Fi calling icon is no longer available.  DUT still displays the Wi-Fi icon.  DUT starts registration procedure in LTE.  The PDN Connectivity request sent for IMS APN indicates request type **“Initial request”**  DUT registers for VxLTE.  DUT correctly displays an icon to indicate it is registered for VxLTE according to the customization requirement. |
| 4 | At DUT, receive MT voice call from Client-1. | VxLTE Call is successfully established with 2-way audio. |
| 5 | At Client-1, end the voice call. | Call is terminated. |

#### 92.6.2.10 VxLTE to VxWi-Fi Reselection in Roaming

Description

Verify that the DUT can successfully reselect in a roaming scenario from VxLTE to VxWi-Fi when Wi-Fi becomes available and shows the correct behaviour depending on the configuration.

Related core specifications

GSMA IR.51, 3GPP TS 24.167

Reason for test

To ensure the DUT is able to reselect from VxLTE to VxWi-Fi when Wi-Fi becomes available in roaming.

Initial configuration

VPLMN has a VxLTE roaming agreement with the HPLMN of the SIM card used in the DUT.

VPLMN is supporting VxLTE for roaming subscribers (VoPS = 1).

DUT is camping to the E-UTRAN network for cellular service.

Wi-Fi hotspot (AP1) that provides a connection to the internet is available. The hotspot is not currently in range of the DUT.

DUT has Wi-Fi enabled.

DUT environment at time of testing:

Wi-Fi Preferred networks: “Good Cellular + No Wi-Fi coverage” or “Good Cellular + Weak Wi-Fi coverage”.

Cellular Preferred networks: “Good Cellular + Good Wi-Fi coverage”.

DUT is successfully registered for IMS services (VxLTE).

Note: IR.51 configuration parameter **Allow\_Handover\_PDN\_connection\_WLAN\_and\_EPS**  allows 3 distinctive values.

Definition of values from 24.167, chapter 5.78

0 – Indicates that a UE roaming in a VPLMN and having an ongoing session, is not allowed to transfer the PDN connection providing access to IMS between EPC via WLAN and EPS.

1 – Indicates that a UE roaming in a VPLMN and having an ongoing session, is allowed to transfer the PDN connection providing access to IMS between EPC via WLAN and EPS;

2 – Indicates that a UE roaming in a VPLMN is not allowed to transfer the PDN connection providing access to IMS between EPC via WLAN and EPS using handover procedures, irrespective of if the UE is in a session or not.

**Scenario A) Transfer of PDN connection is allowed**

In this scenario, DUT has the setting for “Allow\_Handover\_PDN\_connection\_WLAN\_and\_EPS” equal to 0 or 1, which allows to move the IMS default bearer while **no voice call is ongoing** (reselection).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | VxLTE Call is successfully established with 2-way audio. |
| 2 | At Client-1, end the voice call. | Call is ended. |
| 6 | Wi-Fi Preferred networks:  Move the DUT to “Good Cellular + Good Wi-Fi coverage”  Cellular Preferred networks:  Move the DUT to “Weak Cellular + Good Wi-Fi coverage” | DUT starts tunnel establishment on VxWiFi.  UE shall include In IKE\_AUTH non-null value for INTERNAL\_IP4\_ADDRESS or INTERNAL\_IP6\_ADDRES (previously allocated IP addres in LTE) for IMS APN.  DUT registers for VxWi-Fi successfully on AP1 and displays the appropriate icon to indicate to the user that Wi-Fi calling is available. |
| 7 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call over AP1 is successfully established with 2-way audio. |
| 8 | At Client-1, end the voice call. | Call is successfully terminated. |

**Scenario B) Transfer of PDN Connection is not allowed**

In this scenario, DUT has the setting for “Allow\_Handover\_PDN\_connection\_WLAN\_and\_EPS” equal to 2.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | VxLTE Call is successfully established with 2-way audio. |
| 2 | At Client-1, end the voice call. | Call is ended. |
| 6 | Wi-Fi Preferred networks:  Move the DUT to “Good Cellular + Good Wi-Fi coverage”  Cellular Preferred networks:  Move the DUT to “Weak Cellular + Good Wi-Fi coverage” | DUT starts tunnel establishment on VxWiFi.  UE shall include In IKE\_AUTH  INTERNAL\_IP4\_ADDRESS or INTERNAL\_IP6\_ADDRES attributes with zero length and no values (initial attach procedure) for IMS APN.  DUT registers for VxWi-Fi successfully on AP1 and displays the appropriate icon to indicate to the user that Wi-Fi calling is available. |
| 7 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call over AP1 is successfully established with 2-way audio. |
| 8 | At Client-1, end the voice call. | Call is terminated. |

#### 92.6.2.11 VxWi-Fi to VxNR Reselection – Wi-Fi Preferred

Description

Verify that the DUT can successfully reselect VxWi-Fi to VxNR when it loses VxWi-Fi.

Related core specifications

GSMA IR.51; NG.114

Reason for test

To ensure the DUT is able to reselect from VxWi-Fi to VxNR when it loses VxWi-Fi.

Initial configuration

Network is supporting 5G SA and VxNR

Network is supporting Wi-Fi preferred.

DUT is camping on the NG network for cellular service.

Wi-Fi hotspot (AP1) that provides a connection to the internet is available.

DUT has Wi-Fi enabled.

DUT environment at time of testing: “Good Cellular + Good Wi-Fi coverage”.

DUT is successfully registered for IMS services (VxWi-Fi) on AP1.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call over AP1 is successfully established with 2-way audio. |
| 2 | At Client-1, end the voice call. | Call is ended. |
| 3 | Move the DUT to “Good Cellular + Weak Wi-Fi coverage” | DUT deregisters from VxWi-Fi successfully and Wi-Fi calling icon is no longer available.  DUT still displays the Wi-Fi icon.  DUT registers for VxNR.  DUT correctly displays an icon to indicate it is registered for VxNR according to the customization requirement. |
| 4 | At DUT, receive MT voice call from Client-1. | VxNR Call is successfully established with 2-way audio. |
| 5 | At Client-1, end the voice call. | Call is ended. |
| 6 | Move the DUT to “Good Cellular + No Wi-Fi coverage” | DUT no longer displays the Wi-Fi icon. |
| 7 | At DUT, receive MT voice call from Client-1. | VxNR Call is successfully established with 2-way audio. |
| 8 | At Client-1, end the voice call. | Call is ended. |

#### 92.6.2.12 VxNR to VxWi-Fi Reselection – Wi-Fi Preferred

Description

Verify that the DUT can successfully reselect from VxNR to VxWi-Fi when Wi-Fi becomes available.

Related core specifications

GSMA IR.51; NG.114

Reason for test

To ensure the DUT is able to reselect from VxNR to VxWi-Fi when Wi-Fi becomes available.

Initial configuration

Network is supporting 5G SA and VxNR.

Network is supporting Wi-Fi preferred.

DUT is camping to the E-UTRAN network for cellular service.

Wi-Fi hotspot (AP1) that provides a connection to the internet is available. The hotspot is not currently in range of the DUT.

DUT has Wi-Fi enabled.

DUT environment at time of testing: “Good Cellular + No Wi-Fi coverage”.

DUT is successfully registered for IMS services (VxNR).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | VxNR Call is successfully established with 2-way audio. |
| 2 | At Client-1, end the voice call. | Call is ended. |
| 3 | Move the DUT to “Good Cellular + Weak Wi-Fi coverage” | DUT displays the Wi-Fi icon but dos does not register for VxWi-Fi. |
| 4 | At DUT, receive MT voice call from Client-1. | VxNR Call is successfully established with 2-way audio. |
| 5 | At Client-1, end the voice call. | Call is ended. |
| 6 | Move the DUT to “Good Cellular + Good Wi-Fi coverage” | DUT deregisters from VxNR successfully and the VxNR icon is no longer displayed on the UI.  DUT registers for VxWi-Fi successfully on AP1 and displays the appropriate icon to indicate to the user that Wi-Fi calling is available. |
| 7 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call over AP1 is successfully established with 2-way audio. |
| 8 | At Client-1, end the voice call. | Call is ended. |

#### 92.6.2.13 VxWi-Fi to VxNR Reselection – Cellular Preferred

Description

Verify that the DUT can successfully reselect from VxWi-Fi to VxNR when the cellular coverage becomes good.

Related core specifications

GSMA IR.51; NG.114

Reason for test

To ensure the DUT is able to reselect from VxWi-Fi to VxNG when the cellular coverage becomes good.

Initial configuration

Network is supporting 5G SA and VxNR.

Network is supporting Cellular preferred.

DUT is camping on the 5G SA network for cellular service.

Wi-Fi hotspot (AP1) that provides a connection to the internet is available.

DUT has Wi-Fi enabled.

DUT environment at time of testing: “Weak Cellular + Good Wi-Fi coverage”.

DUT is successfully registered for IMS services (VxWi-Fi) on AP1.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call over AP1 is successfully established with 2-way audio. |
| 2 | At Client-1, end the voice call. | Call is ended. |
| 3 | Move the DUT to “Good Cellular + Good Wi-Fi coverage” | DUT deregisters from VxWi-Fi successfully and Wi-Fi calling icon is no longer available.  DUT no longer displays the Wi-Fi icon.  DUT registers for VxNR.  DUT correctly displays an icon to indicate it is registered for VxNR according to the customization requirement. |
| 4 | At DUT, receive MT voice call from Client-1. | VxNR Call is successfully established with 2-way audio. |
| 5 | At Client-1, end the voice call. | Call is ended. |

#### 92.6.2.14 VxNR to VxWi-Fi Reselection – Cellular Preferred

Description

Verify that the DUT can successfully reselect from VxNR to VxWi-Fi when the cellular coverage becomes weak.

Related core specifications

GSMA IR.51

Reason for test

To ensure the DUT is able to reselect from VxNR to VxWi-Fi when the cellular coverage becomes weak.

Initial configuration

Network is supporting 5G SA and VxNR.

Network is supporting Cellular preferred.

DUT is camping on the 5G SA network for cellular service.

Wi-Fi hotspot (AP1) that provides a connection to the internet is available.

DUT has Wi-Fi enabled.

DUT environment at time of testing: “Good Cellular + Good Wi-Fi coverage”.

DUT is successfully registered for IMS services (VxNR)

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | VxNR Call is successfully established with 2-way audio. |
| 2 | At Client-1, end the voice call. | Call is ended. |
| 3 | Move the DUT to “Weak Cellular + Good Wi-Fi coverage” | DUT deregisters from VxNR successfully and the VxNR icon is no longer displayed on the UI.  DUT registers for VxWi-Fi successfully on AP1 and displays the appropriate icon to indicate to the user that Wi-Fi calling is available. |
| 4 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call over AP1 is successfully established with 2-way audio. |
| 5 | At Client-1, end the voice call. | Call is ended. |

### 92.6.3 Wi-Fi/Wi-Fi Call continuity (Voice Call)

#### 92.6.3.1 Wi-Fi/Wi-Fi Call continuity – Different Aps – Same IP – Active Voice Call

Description

Verify that the DUT can successfully continue Voice calls between different Access Points.

Related core specifications

TS 23.402

Reason for test

To ensure the DUT can successfully continue Voice calls between different Access Points.

Initial configuration

Network supports “Call continuity during Wi-Fi to Wi-Fi mobility without IP change”.

Wi-Fi hotspot AP1 that provides a connection to the internet is available.

Wi-Fi hotspot AP2 is a repeater that is connected to AP1 with the same SSID.

DUT has previously connected to AP1 and AP2 hotspots,

The DUT has Flight Mode enabled. Once Flight Mode is enabled, enable Wi-Fi and connect to hotspot AP1.

DUT is successfully registered for IMS services (VxWi-Fi) on AP1.

Client-1 required.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, use an internal monitoring tool to check the IP address assigned by AP1. | IP address is noted. |
| 2 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call over AP1 is successfully established with 2-way audio. |
| 3 | Move DUT to an area where AP2 is available but AP1 is not available. | DUT Automatically connects to Wi-Fi hotspot AP2.  VxWi-Fi Call continues over AP2 with 2-way audio. |
| 4 | At DUT, use an internal monitoring tool to check the IP address assigned by AP2.  Confirm the IP address is the same as AP1. | IP address is noted.  IP address of AP2 is the same as AP1. |
| 5 | At Client-1, end the voice call. | Call is ended. |

Note 1: Fast BSS Transition (a.k.a 802-11r) is strongly suggested to be in use in order to reduce total interruption time and packet loss

#### 92.6.3.2 Wi-Fi/Wi-Fi Call continuity – Different Aps – Different IP – Active Voice Call

Description

Verify that the DUT can successfully continue Voice calls between different Access Points.

Related core specifications

TS 23.402

Reason for test

To ensure the DUT can successfully continue Voice calls between different Access Points.

Initial configuration

Network supports “Call continuity during Wi-Fi to Wi-Fi mobility with IP change”.

Wi-Fi hotspot AP1 that provides a connection to the internet is available.

Wi-Fi hotspot AP2 that provides a connection to the internet is available.

AP1 and AP2 have different IP addresses.

DUT has previously connected to AP1 and AP2 hotspots,

The DUT has Flight Mode enabled. Once Flight Mode is enabled, enable Wi-Fi and connect to hotspot AP1.

DUT is successfully registered for IMS services (VxWi-Fi) on AP1.

Client-1 required.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, use an internal monitoring tool to check the IP address assigned by AP1. | IP address is noted. |
| 2 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call over AP1 is successfully established with 2-way audio. |
| 3 | Move DUT to an area where AP2 is available but AP1 is not available. | DUT Automatically connects to Wi-Fi hotspot AP2.  VxWi-Fi Call continues over AP2 with 2-way audio. |
| 4 | At DUT, use an internal monitoring tool to check the IP address assigned by AP2.  Confirm the IP address is different to AP1. | IP address is noted.  IP address of AP2 is different to AP1. |
| 5 | At Client-1, end the voice call. | Call is ended. |

Note 1: Fast BSS Transition (a.k.a 802-11r) is strongly suggested to be in use in order to reduce total interruption time and packet loss

Note 2: new ePDG tunnel establishment at step3 will increase dramatically voice interruption time and packet loss

Note 3: Due to above two factors, the seamless handover at step 3 cannot be guaranteed if total interruption time is greater than voice inactivity timer on network/DUT side

### 92.6.4 Wi-Fi/Wi-Fi Call continuity (Video Call)

#### 92.6.4.1 Wi-Fi/Wi-Fi Call continuity – Different Aps – Same IP – Active Video Call

Description

Verify that the DUT can successfully continue Video calls between different Access Points.

Related core specifications

TS 23.402

Reason for test

To ensure the DUT can successfully continue Video calls between different Access Points.

Initial configuration

Network supports “Call continuity during Wi-Fi to Wi-Fi mobility without IP change”.

Wi-Fi hotspot AP1 that provides a connection to the internet is available.

Wi-Fi hotspot AP2 is a repeater that is connected to AP1 with the same SSID.

DUT has previously connected to AP1 and AP2 hotspots,

The DUT has Flight Mode enabled. Once Flight Mode is enabled, enable Wi-Fi and connect to hotspot AP1.

DUT is successfully registered for IMS services (VxWi-Fi) on AP1.

Client-1 required.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, use an internal monitoring tool to check the IP address assigned by AP1. | IP address is noted. |
| 2 | At DUT, receive MT video call from Client-1. | VxWi-Fi Call over AP1 is successfully established with 2-way audio and video stream. |
| 3 | Move DUT to an area where AP2 is available but AP1 is not available. | DUT Automatically connects to Wi-Fi hotspot AP2.  VxWi-Fi Call continues over AP2 with 2-way audio and video stream. |
| 4 | At DUT, use an internal monitoring tool to check the IP address assigned by AP2.  Confirm the IP address is the same as AP1. | IP address is noted.  IP address of AP2 is the same as AP1. |
| 5 | At Client-1, end the video call. | Call is ended. |

Note 1: Fast BSS Transition (a.k.a 802-11r) is strongly suggested to be in use in order to reduce total interruption time and packet loss

#### 92.6.4.2 Wi-Fi/Wi-Fi Call continuity – Different Aps – Different IP – Active Video Call

Description

Verify that the DUT can successfully continue Video calls between different Access Points.

Related core specifications

TS 23.402

Reason for test

To ensure the DUT can successfully continue Video calls between different Access Points.

Initial configuration

Network supports “Call continuity during Wi-Fi to Wi-Fi mobility with IP change”.

Wi-Fi hotspot AP1 that provides a connection to the internet is available.

Wi-Fi hotspot AP2 that provides a connection to the internet is available.

AP1 and AP2 have different IP addresses.

DUT has previously connected to AP1 and AP2 hotspots,

The DUT has Flight Mode enabled. Once Flight Mode is enabled, enable Wi-Fi and connect to hotspot AP1.

DUT is successfully registered for IMS services (VxWi-Fi) on AP1.

Client-1 required.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, use an internal monitoring tool to check the IP address assigned by AP1. | IP address is noted. |
| 2 | At DUT, receive MT video call from Client-1. | VxWi-Fi Call over AP1 is successfully established with 2-way audio and video stream. |
| 3 | Move DUT to an area where AP2 is available but AP1 is not available. | DUT Automatically connects to Wi-Fi hotspot AP2.  VxWi-Fi Call continues over AP2 with 2-way audio and video stream. |
| 4 | At DUT, use an internal monitoring tool to check the IP address assigned by AP2.  Confirm the IP address is different to AP1. | IP address is noted.  IP address of AP2 is different to AP1. |
| 5 | At Client-1, end the video call. | Call is ended. |

Note 1: Fast BSS Transition (a.k.a 802-11r) is strongly suggested to be in use in order to reduce total interruption time and packet loss

Note 2: new ePDG tunnel establishment at step3 will increase dramatically voice interruption time and packet loss

Note 3: Due to above two factors, the seamless handover at step 3 cannot be guaranteed if total interruption time is greater than voice inactivity timer on network/DUT side

### 92.6.5 Wi-Fi/LTE Call continuity (Voice Call)

#### 92.6.5.1 Wi-Fi/LTE Call continuity (Voice Call) – Active Call – To VxLTE

Description

Verify that the DUT can successfully continue a call over VxLTE when it loses VxWi-Fi.

Related core specifications

GSMA IR.51

Reason for test

To ensure the DUT is able to continue a call over VxLTE when it loses VxWi-Fi.

Initial configuration

Wi-Fi hotspot AP1 that provides a connection to the internet is available.

Network is supporting E-UTRAN and VxLTE.

DUT is camping to the E-UTRAN network for cellular service.

DUT has Wi-Fi enabled.

DUT environment at time of testing:

Wi-Fi Preferred networks: “Good Cellular + Good Wi-Fi coverage”.

Cellular Preferred networks: “Weak Cellular + Good Wi-Fi coverage”.

DUT is successfully registered for IMS services (VxWi-Fi) on AP1.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call with Client-1 is successfully established with 2-way audio. |
| 2 | Wi-Fi Preferred networks:  Move the DUT to “Good Cellular + No Wi-Fi coverage” or “Good Cellular + Weak Wi-Fi coverage”  Cellular Preferred networks:  Move the DUT to “Good Cellular + Good Wi-Fi coverage” | Call continues in VxLTE with 2-way audio.  DUT no longer displays the VxWi-Fi icon.  DUT correctly displays an icon to indicate it is registered for VxLTE according to the customization requirement. |
| 3 | At Client-1, end the voice call. | Call is ended. |

#### 92.6.5.2 Wi-Fi/LTE Call continuity (Voice Call) – Active Call – To VxWi-Fi

Description

Verify that the DUT can successfully continue a call over VxWi-Fi when moving from a VxLTE environment.

Related core specifications

GSMA IR.51

Reason for test

To ensure the DUT is able to continue a call over VxWi-Fi when moving from a VxLTE environment.

Initial configuration

Wi-Fi hotspot AP1 that provides a connection to the internet is available.

Network is supporting E-UTRAN and VxLTE.

DUT is camping to the E-UTRAN network for cellular service.

DUT has Wi-Fi enabled.

DUT environment at time of testing:

Wi-Fi Preferred networks: “Good Cellular + No Wi-Fi coverage” or “Good Cellular + Weak Wi-Fi coverage”.

Cellular Preferred networks: “GoodCellular + Good Wi-Fi coverage”.

DUT is successfully registered for IMS services (VxLTE)

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | VxLTE Call with Client-1 is successfully established with 2-way audio. |
| 2 | Wi-Fi Preferred networks:  Move the DUT to “Good Cellular + Good Wi-Fi coverage”  Cellular Preferred networks:  Move the DUT to “Weak Cellular + Good Wi-Fi coverage” | Call continues in VxWi-Fi with 2-way audio.  DUT no longer displays the VxLTE icon.  DUT correctly displays an icon to indicate it is registered for VxWi-Fi. |
| 3 | At Client-1, end the voice call. | Call is ended. |

#### 92.6.5.3 Wi-Fi/LTE Call continuity (Voice Call) – Held Call – To VxLTE

Description

Verify that the DUT can successfully maintain a held call over VxLTE when it loses VxWi-Fi.

Related core specifications

GSMA IR.51

Reason for test

To ensure the DUT is able to maintain a held call over VxLTE when it loses VxWi-Fi.

Initial configuration

Wi-Fi hotspot AP1 that provides a connection to the internet is available.

Network is supporting E-UTRAN and VxLTE.

DUT is camping to the E-UTRAN network for cellular service.

DUT has Wi-Fi enabled.

DUT environment at time of testing:

Wi-Fi Preferred networks: “Good Cellular + Good Wi-Fi coverage”.

Cellular Preferred networks: “Weak Cellular + Good Wi-Fi coverage”.

DUT is successfully registered for IMS services (VxWi-Fi) on AP1.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call with Client-1 is successfully established with 2-way audio. |
| 2 | At DUT, place Client-1 on hold using the menu option. | Confirm there is a visible indication on the DUT that the call is held.  Confirm there is no audio is either direction. |
| 3 | Wi-Fi Preferred networks:  Move the DUT to “Good Cellular + No Wi-Fi coverage” or “Good Cellular + Weak Wi-Fi coverage”  Cellular Preferred networks:  Move the DUT to “Good Cellular + Good Wi-Fi coverage” | Held call is maintained in VxLTE and the call hold tone is audible (if supported by network).  DUT no longer displays the VxWi-Fi icon.  DUT correctly displays an icon to indicate it is registered for VxLTE according to the customization requirement. |
| 4 | At DUT, retrieve the call using the menu option. | Confirm the call with Client-1 is restored.  Confirm 2-way audio between DUT and Client-1. |
| 5 | At Client-1, end the voice call. | Call is ended. |

#### 92.6.5.4 Wi-Fi/LTE Call continuity (Voice Call) – Held Call – To VxWi-Fi

Description

Verify that the DUT can successfully maintain a held call over VxWi-Fi when moving from a VxLTE environment.

Related core specifications

GSMA IR.51

Reason for test

To ensure the DUT is able to maintain a held call over VxWi-Fi when moving from a VxLTE environment.

Initial configuration

Wi-Fi hotspot AP1 that provides a connection to the internet is available.

Network is supporting E-UTRAN and VxLTE.

DUT is camping to the E-UTRAN network for cellular service.

DUT has Wi-Fi enabled.

DUT environment at time of testing:

Wi-Fi Preferred networks: “Good Cellular + No Wi-Fi coverage” or “Good Cellular + Weak Wi-Fi coverage”.

Cellular Preferred networks: “GoodCellular + Good Wi-Fi coverage”.

DUT is successfully registered for IMS services (VxLTE)

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | VxLTE Call with Client-1 is successfully established with 2-way audio. |
| 2 | At DUT, place Client-1 on hold using the menu option. | Confirm there is a visible indication on the DUT that the call is held.  Confirm there is no audio is either direction. |
| 3 | Wi-Fi Preferred networks:  Move the DUT to “Good Cellular + Good Wi-Fi coverage”  Cellular Preferred networks:  Move the DUT to “Weak Cellular + Good Wi-Fi coverage” | Held call is maintained in VxWi-Fi and the call hold tone is audible (if supported by network).  DUT no longer displays the VxLTE icon.  DUT correctly displays an icon to indicate it is registered for VxWi-Fi. |
| 4 | At DUT, retrieve the call using the menu option. | Confirm the call with Client-1 is restored.  Confirm 2-way audio between DUT and Client-1. |
| 5 | At Client-1, end the voice call. | Call is ended. |

#### 92.6.5.5 Wi-Fi/LTE Call continuity (Voice Call) – Alerting – To VxLTE

Description

Verify that the DUT can successfully continue alerting over VxLTE when it loses VxWi-Fi.

Related core specifications

GSMA IR.51

Reason for test

To ensure the DUT is able to continue alerting over VxLTE when it loses VxWi-Fi.

Initial configuration

Wi-Fi hotspot AP1 that provides a connection to the internet is available.

Network is supporting E-UTRAN and VxLTE.

DUT is camping to the E-UTRAN network for cellular service.

DUT has Wi-Fi enabled.

DUT environment at time of testing:

Wi-Fi Preferred networks: “Good Cellular + Good Wi-Fi coverage”.

Cellular Preferred networks: “Weak Cellular + Good Wi-Fi coverage”.

DUT is successfully registered for IMS services (VxWi-Fi) on AP1.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | DUT is alerting. |
| 2 | Wi-Fi Preferred networks:  Move the DUT to “Good Cellular + No Wi-Fi coverage” or “Good Cellular + Weak Wi-Fi coverage”  Cellular Preferred networks:  Move the DUT to “Good Cellular + Good Wi-Fi coverage” | DUT continues alerting on VxLTE.  DUT no longer displays the VxWi-Fi icon.  DUT correctly displays an icon to indicate it is registered for VxLTE according to the customization requirement. |
| 3 | At DUT, accept the call from Client-1. | VxLTE Call with Client-1 is successfully established with 2-way audio. |
| 4 | At Client-1, end the voice call. | Call is ended. |

#### 92.6.5.6 Wi-Fi/LTE Call continuity (Voice Call) – Alerting – To VxWi-Fi

Description

Verify that the DUT can successfully continue alerting over VxWi-Fi when moving from a VxLTE environment.

Related core specifications

GSMA IR.51

Reason for test

To ensure the DUT is able to continue alerting over VxWi-Fi when moving from a VxLTE environment.

Initial configuration

Wi-Fi hotspot AP1 that provides a connection to the internet is available.

Network is supporting E-UTRAN and VxLTE.

DUT is camping to the E-UTRAN network for cellular service.

DUT has Wi-Fi enabled.

DUT environment at time of testing:

Wi-Fi Preferred networks: “Good Cellular + No Wi-Fi coverage” or “Good Cellular + Weak Wi-Fi coverage”.

Cellular Preferred networks: “Good Cellular + Good Wi-Fi coverage”.

DUT is successfully registered for IMS services (VxLTE)

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | DUT is alerting. |
| 2 | Wi-Fi Preferred networks:  Move the DUT to “Good Cellular + Good Wi-Fi coverage”  Cellular Preferred networks:  Move the DUT to “Weak Cellular + Good Wi-Fi coverage” | DUT continues alerting on VxWi-Fi.  DUT no longer displays the VxLTE icon.  DUT correctly displays an icon to indicate it is registered for VxWi-Fi. |
| 3 | At DUT, accept the call from Client-1. | VxWi-Fi Call with Client-1 is successfully established with 2-way audio. |
| 4 | At Client-1, end the voice call. | Call is ended. |

#### 92.6.5.7 Wi-Fi/LTE Call continuity (Voice Call) – 1 Active Call, 1 Alerting – To VxLTE

Description

Verify that the DUT can successfully continue an active call and alerting call over VxLTE when it loses VxWi-Fi.

Related core specifications

GSMA IR.51

Reason for test

To ensure the DUT can successfully continue an active call and alerting call over VxLTE when it loses VxWi-Fi.

Initial configuration

Wi-Fi hotspot AP1 that provides a connection to the internet is available.

Network is supporting E-UTRAN and VxLTE.

DUT is camping to the E-UTRAN network for cellular service.

DUT has Wi-Fi enabled.

DUT environment at time of testing:

Wi-Fi Preferred networks: “Good Cellular + Good Wi-Fi coverage”.

Cellular Preferred networks: “Weak Cellular + Good Wi-Fi coverage”.

DUT is successfully registered for IMS services (VxWi-Fi) on AP1.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call with Client-1 is successfully established with 2-way audio. |
| 2 | At DUT, receive MT voice call from Client-2. | DUT is alerting from Client-2.  Call with Client-1 continues with 2-way audio. |
| 3 | Wi-Fi Preferred networks:  Move the DUT to “Good Cellular + No Wi-Fi coverage” or “Good Cellular + Weak Wi-Fi coverage”  Cellular Preferred networks:  Move the DUT to “Good Cellular + Good Wi-Fi coverage” | Call with Client-1 continues in VxLTE with 2-way audio.  Call from Client-2 continues alerting on VxLTE.  DUT no longer displays the VxWi-Fi icon.  DUT correctly displays an icon to indicate it is registered for VxLTE according to the customization requirement. |
| 4 | At DUT, accept the Voice call from Client-2 and put the Voice call with Client-1 on hold. | Confirm DUT puts Client-1 on hold.  VxLTE Call with Client-2 is successfully established with 2-way audio. |
| 5 | At Client-1, end the voice call. | Held Call is ended. |
| 6 | At Client-2, end the voice call. | Call is ended. |

#### 92.6.5.8 Wi-Fi/LTE Call continuity (Voice Call) – 1 Active Call, 1 Alerting – To VxWi-Fi

Description

Verify that the DUT can successfully continue an active call and alerting call over VxWi-Fi when moving from a VxLTE environment.

Related core specifications

GSMA IR.51

Reason for test

To ensure the DUT is able to continue an active call and alerting call over VxWi-Fi when moving from a VxLTE environment.

Initial configuration

Wi-Fi hotspot AP1 that provides a connection to the internet is available.

Network is supporting E-UTRAN and VxLTE.

DUT is camping to the E-UTRAN network for cellular service.

DUT has Wi-Fi enabled.

DUT environment at time of testing:

Wi-Fi Preferred networks: “Good Cellular + No Wi-Fi coverage” or “Good Cellular + Weak Wi-Fi coverage”.

Cellular Preferred networks: “Good Cellular + Good Wi-Fi coverage”.

DUT is successfully registered for IMS services (VxLTE)

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | VxLTE Call with Client-1 is successfully established with 2-way audio. |
| 2 | At DUT, receive MT voice call from Client-2. | DUT is alerting from Client-2.  Call with Client-1 continues with 2-way audio. |
| 3 | Wi-Fi Preferred networks:  Move the DUT to “Good Cellular + Good Wi-Fi coverage”  Cellular Preferred networks:  Move the DUT to “Weak Cellular + Good Wi-Fi coverage” | Call with Client-1 continues in VxWi-Fi with 2-way audio.  Call from Client-2 continues alerting on VxWi-Fi.  DUT no longer displays the VxLTE icon.  DUT correctly displays an icon to indicate it is registered for VxWi-Fi. |
| 4 | At DUT, accept the Voice call from Client-2 and put the Voice call with Client-1 on hold. | Confirm DUT puts Client-1 on hold.  VxWi-Fi Call with Client-2 is successfully established with 2-way audio. |
| 5 | At Client-1, end the voice call. | Held Call is ended. |
| 6 | At Client-2, end the voice call. | Call is ended. |

#### 92.6.5.9 Wi-Fi/LTE Call continuity (Voice Call) – 1 Active Call, 1 Held Call – To VxLTE

Description

Verify that the DUT can successfully continue an active call and held call over VxLTE when it loses VxWi-Fi.

Related core specifications

GSMA IR.51

Reason for test

To ensure the DUT can successfully continue an active call and held call over VxLTE when it loses VxWi-Fi.

Initial configuration

Wi-Fi hotspot AP1 that provides a connection to the internet is available.

Network is supporting E-UTRAN and VxLTE.

DUT is camping to the E-UTRAN network for cellular service.

DUT has Wi-Fi enabled.

DUT environment at time of testing:

Wi-Fi Preferred networks: “Good Cellular + Good Wi-Fi coverage”.

Cellular Preferred networks: “Weak Cellular + Good Wi-Fi coverage”.

DUT is successfully registered for IMS services (VxWi-Fi) on AP1.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call with Client-1 is successfully established with 2-way audio. |
| 2 | At DUT, receive MT voice call from Client-2.  At DUT, accept the Voice call from Client-2 and put the Voice call with Client-1 on hold. | Confirm DUT puts Client-1 on hold.  VxWi-Fi Call with Client-2 is successfully established with 2-way audio. |
| 3 | Wi-Fi Preferred networks:  Move the DUT to “Good Cellular + No Wi-Fi coverage” or “Good Cellular + Weak Wi-Fi coverage”  Cellular Preferred networks:  Move the DUT to “Good Cellular + Good Wi-Fi coverage” | Call with Client-2 continues in VxLTE with 2-way audio.  Call with Client-1 is on hold.  DUT no longer displays the VxWi-Fi icon.  DUT correctly displays an icon to indicate it is registered for VxLTE according to the customization requirement. |
| 4 | At Client-1, end the voice call. | Held Call is ended. |
| 5 | At Client-2, end the voice call. | Call is ended. |

#### 92.6.5.10 Wi-Fi/LTE Call continuity (Voice Call) – 1 Active Call, 1 Held Call – To VxWi-Fi

Description

Verify that the DUT can successfully continue an active call and held call over VxWi-Fi when moving from a VxLTE environment.

Related core specifications

GSMA IR.51

Reason for test

To ensure the DUT is able to continue an active call and held call over VxWi-Fi when moving from a VxLTE environment.

Initial configuration

Wi-Fi hotspot AP1 that provides a connection to the internet is available.

Network is supporting E-UTRAN and VxLTE.

DUT is camping to the E-UTRAN network for cellular service.

DUT has Wi-Fi enabled.

DUT environment at time of testing:

Wi-Fi Preferred networks: “Good Cellular + No Wi-Fi coverage” or “Good Cellular + Weak Wi-Fi coverage”.

Cellular Preferred networks: “Good Cellular + Good Wi-Fi coverage”.

DUT is successfully registered for IMS services (VxLTE)

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | VxLTE Call with Client-1 is successfully established with 2-way audio. |
| 2 | At DUT, receive MT voice call from Client-2.  At DUT, accept the Voice call from Client-2 and put the Voice call with Client-1 on hold. | Confirm DUT puts Client-1 on hold.  VxLTE Call with Client-2 is successfully established with 2-way audio. |
| 3 | Wi-Fi Preferred networks:  Move the DUT to “Good Cellular + Good Wi-Fi coverage”  Cellular Preferred networks:  Move the DUT to “Weak Cellular + Good Wi-Fi coverage” | Call with Client-2 continues in VxWi-Fi with 2-way audio.  Call with Client-1 is on hold.  DUT no longer displays the VxLTE icon.  DUT correctly displays an icon to indicate it is registered for VxWi-Fi. |
| 5 | At Client-1, end the voice call. | Held Call is ended. |
| 6 | At Client-2, end the voice call. | Call is ended. |

#### 92.6.5.11 Wi-Fi/LTE Call continuity (Voice Call) – Conference Call – To VxLTE

Description

Verify that the DUT can successfully continue a conference call over VxLTE when it loses VxWi-Fi.

Related core specifications

GSMA IR.51

Reason for test

To ensure the DUT can successfully continue a conference call over VxLTE when it loses VxWi-Fi.

Initial configuration

Wi-Fi hotspot AP1 that provides a connection to the internet is available.

Network is supporting E-UTRAN and VxLTE.

DUT is camping to the E-UTRAN network for cellular service.

DUT has Wi-Fi enabled.

DUT environment at time of testing:

Wi-Fi Preferred networks: “Good Cellular + Good Wi-Fi coverage”.

Cellular Preferred networks: “Weak Cellular + Good Wi-Fi coverage”.

DUT is successfully registered for IMS services (VxWi-Fi) on AP1.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1.  Answer the call at Client-1. | VxWi-Fi Call with Client-1 is successfully established with 2-way audio. |
| 2 | At DUT, use the menu option to make a “new call” to Client-2.  Answer the call at Client-2. | Call with Client-1 is on hold.  VxWi-Fi Call with Client-2 is successfully established with 2-way audio. |
| 3 | At DUT, use the menu option to “merge” the calls. | Conference call is successfully established between DUT, Client-1 and Client-2 with 3-way audio. |
| 4 | Wi-Fi Preferred networks:  Move the DUT to “Good Cellular + No Wi-Fi coverage” or “Good Cellular + Weak Wi-Fi coverage”  Cellular Preferred networks:  Move the DUT to “Good Cellular + Good Wi-Fi coverage” | Conference call with Client-1 and Client-2 remains active with 3-way audio in VxLTE.  DUT no longer displays the VxWi-Fi icon.  DUT correctly displays an icon to indicate it is registered for VxLTE according to the customization requirement. |
| 5 | At DUT, end the voice call. | All Calls are ended. |

#### 92.6.5.12 Wi-Fi/LTE Call continuity (Voice Call) – Conference Call – To VxWi-Fi

Description

Verify that the DUT can successfully continue a conference call over VxWi-Fi when moving from a VxLTE environment.

Related core specifications

GSMA IR.51

Reason for test

To ensure the DUT is able to continue a conference call over VxWi-Fi when moving from a VxLTE environment.

Initial configuration

Wi-Fi hotspot AP1 that provides a connection to the internet is available.

Network is supporting E-UTRAN and VxLTE.

DUT is camping to the E-UTRAN network for cellular service.

DUT has Wi-Fi enabled.

DUT environment at time of testing:

Wi-Fi Preferred networks: “Good Cellular + No Wi-Fi coverage” or “Good Cellular + Weak Wi-Fi coverage”.

Cellular Preferred networks: “Good Cellular + Good Wi-Fi coverage”.

DUT is successfully registered for IMS services (VxLTE)

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1.  Answer the call at Client-1. | VxLTE Call with Client-1 is successfully established with 2-way audio. |
| 2 | At DUT, use the menu option to make a “new call” to Client-2.  Answer the call at Client-2. | Call with Client-1 is on hold.  VxLTE Call with Client-2 is successfully established with 2-way audio. |
| 3 | At DUT, use the menu option to “merge” the calls. | Conference call is successfully established between DUT, Client-1 and Client-2 with 3-way audio. |
| 4 | Wi-Fi Preferred networks:  Move the DUT to “Good Cellular + Good Wi-Fi coverage”  Cellular Preferred networks:  Move the DUT to “Weak Cellular + Good Wi-Fi coverage” | Conference call with Client-1 and Client-2 remains active with 3-way audio in VxWi-Fi.  DUT no longer displays the VxLTE icon.  DUT correctly displays an icon to indicate it is registered for VxWi-Fi. |
| 5 | At DUT, end the voice call. | All Calls are ended. |

#### 92.6.5.13 Wi-Fi/LTE Call continuity in Roaming (Voice Call) – Active Call To VxLTE

Description

Verify that the DUT can successfully continue a call over VxLTE when it loses VxWi-Fi in roaming scenario and has correct behaviour depending on the configuration.

Related core specifications

GSMA IR.51, 3GPP TS 24.167

Reason for test

To ensure the DUT is able to continue a call over VxLTE when it loses VxWi-Fi.

Initial configuration

Wi-Fi hotspot AP1 that provides a connection to the internet is available.

VPLMN has an VxLTE roaming agreement with the HPLMN of the SIM card used in the DUT.

VPLMN is supporting VxLTE for roaming subscribers (VoPS = 1).

DUT is camping to the E-UTRAN network for cellular service.

DUT has Wi-Fi enabled.

DUT environment at time of testing:

Wi-Fi Preferred networks: “Good Cellular + Good Wi-Fi coverage”.

Cellular Preferred networks: “Weak Cellular + Good Wi-Fi coverage”.

DUT is successfully registered for IMS services (VxWi-Fi) on AP1.

Note: IR.51 configuration parameter **Allow\_Handover\_PDN\_connection\_WLAN\_and\_EPS**  allows 3 distinctive values.

Definition of values from 24.167, chapter 5.78

0 – Indicates that a UE roaming in a VPLMN and having an ongoing session, is not allowed to transfer the PDN connection providing access to IMS between EPC via WLAN and EPS.

1 – Indicates that a UE roaming in a VPLMN and having an ongoing session, is allowed to transfer the PDN connection providing access to IMS between EPC via WLAN and EPS;

2 – Indicates that a UE roaming in a VPLMN is not allowed to transfer the PDN connection providing access to IMS between EPC via WLAN and EPS using handover procedures, irrespective of if the UE is in a session or not.

**Scenario A) Transfer of PDN connection is not allowed during ongoing session**

In this scenario, DUT has the setting for “Allow\_Handover\_PDN\_connection\_WLAN\_and\_EPS” equal to 0.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call over AP1 is successfully established with 2-way audio. |
| 2 | Wi-Fi Preferred networks:  Move the DUT to “Good Cellular + Weak Wi-Fi coverage” or “Good Cellular + No Wi-Fi coverage”  Cellular Preferred networks:  Move the DUT to “Good Cellular + Good Wi-Fi coverage” or “Good Cellular + No Wi-Fi coverage” | DUT does not deregister from VxWiFi and the call is ongoing.  In case of “No Wi-Fi coverage”, the call will be dropped. |
| 3 | At Client-1, end the voice call. | Call is ended.  DUT starts registration procedure in LTE.  The PDN Connectivity request sent for IMS APN indicates request type **“Handover”**  DUT registers for VxLTE.  DUT correctly displays an icon to indicate it is registered for VxLTE according to the customization requirement. |

**Scenario B) Transfer of PDN Connection is allowed during ongoing session**

In this scenario, DUT has the setting for “Allow\_Handover\_PDN\_connection\_WLAN\_and\_EPS” equal to 1.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call over AP1 is successfully established with 2-way audio. |
| 2 | Wi-Fi Preferred networks:  Move the DUT to “Good Cellular + Weak Wi-Fi coverage”  Cellular Preferred networks:  Move the DUT to “Good Cellular + Good Wi-Fi coverage” | DUT still displays the Wi-Fi icon.  DUT starts registration procedure in LTE.  The PDN Connectivity request sent for IMS APN indicates request type **“Handover”**  DUT registers for VxLTE.  DUT correctly displays an icon to indicate it is registered for VxLTE according to the customization requirement.  The voice call is ongoing |
| 3 | At Client-1, end the voice call. | Call is successfully terminated. |

**Scenario C) Transfer of PDN Connection is not allowed**

In this scenario, DUT has the setting for “Allow\_Handover\_PDN\_connection\_WLAN\_and\_EPS” equal to 2.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call over AP1 is successfully established with 2-way audio. |
| 2 | Wi-Fi Preferred networks:  Move the DUT to “Good Cellular + Weak Wi-Fi coverage” or “Good Cellular + No Wi-Fi coverage”  Cellular Preferred networks:  Move the DUT to “Good Cellular + Good Wi-Fi coverage” or “Good Cellular + No Wi-Fi coverage” | DUT does not deregister from VxWiFi and the call is ongoing.  In case of “No Wi-Fi coverage”, the call will be dropped. |
| 3 | At Client-1, end the voice call. | Call is terminated.  DUT starts registration procedure in LTE.  The PDN Connectivity request sent for IMS APN indicates request type **“Initial request”**  DUT registers for VxLTE.  DUT correctly displays an icon to indicate it is registered for VxLTE according to the customization requirement. |

#### 92.6.5.14 Wi-Fi/LTE Call continuity in Roaming (Voice Call) – Active Call To VxWi-Fi

Description

Verify that the DUT can successfully continue a call over VxWi-Fi when moving from a VxLTE environment in roaming scenario and has correct behaviour depending on the configuration.

Related core specifications

GSMA IR.51, 3GPP TS 24.167

Reason for test

To ensure the DUT is able to continue a call over VxWi-Fi when moving from a VxLTE environment.

Initial configuration

Wi-Fi hotspot AP1 that provides a connection to the internet is available.

VPLMN has an VxLTE roaming agreement with the HPLMN of the SIM card used in the DUT.

VPLMN is supporting VxLTE for roaming subscribers (VoPS = 1).

DUT is camping to the E-UTRAN network for cellular service.

DUT has Wi-Fi enabled.

DUT environment at time of testing:

Wi-Fi Preferred networks: “Good Cellular + No Wi-Fi coverage” or “Good Cellular + Weak Wi-Fi coverage”.

Cellular Preferred networks: “GoodCellular + Good Wi-Fi coverage”.

DUT is successfully registered for IMS services (VxLTE).

Note: IR.51 configuration parameter **Allow\_Handover\_PDN\_connection\_WLAN\_and\_EPS** allows 3 distinctive values.

Definition of values from 24.167, chapter 5.78

0 – Indicates that a UE roaming in a VPLMN and having an ongoing session, is not allowed to transfer the PDN connection providing access to IMS between EPC via WLAN and EPS.

1 – Indicates that a UE roaming in a VPLMN and having an ongoing session, is allowed to transfer the PDN connection providing access to IMS between EPC via WLAN and EPS;

2 – Indicates that a UE roaming in a VPLMN is not allowed to transfer the PDN connection providing access to IMS between EPC via WLAN and EPS using handover procedures, irrespective of if the UE is in a session or not.

**Scenario A) Transfer of PDN connection is not allowed during ongoing session**

In this scenario, DUT has the setting for “Allow\_Handover\_PDN\_connection\_WLAN\_and\_EPS” equal to 0.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | VxLTE Call with Client-1 is successfully established with 2-way audio. |
| 2 | Wi-Fi Preferred networks:  Move the DUT to “Good Cellular + Good Wi-Fi coverage” or “No Cellular + Good Wi-Fi coverage”  Cellular Preferred networks:  Move the DUT to “Weak Cellular + Good Wi-Fi coverage” or “No Cellular + Good Wi-Fi coverage” | Call continues in VxLTE with 2-way audio.  The UE does NOT attempt to move the IMS bearer to Wi-Fi while the call is ongoing.  In case of “No Cellular coverage”, the call will be dropped. |
| 3 | At Client-1, end the voice call. | Call is ended.  DUT starts tunnel establishment on VxWiFi.  UE shall include In IKE\_AUTH non-null value for INTERNAL\_IP4\_ADDRESS or INTERNAL\_IP6\_ADDRES (previously allocated IP addres in LTE) for IMS APN.  DUT registers for VxWi-Fi successfully on AP1 and displays the appropriate icon to indicate to the user that Wi-Fi calling is available |

**Scenario B) Transfer of PDN Connection is allowed during ongoing session**

In this scenario, DUT has the setting for “Allow\_Handover\_PDN\_connection\_WLAN\_and\_EPS” equal to 1.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | VxLTE Call with Client-1 is successfully established with 2-way audio. |
| 2 | Wi-Fi Preferred networks:  Move the DUT to “Good Cellular + Good Wi-Fi coverage”  Cellular Preferred networks:  Move the DUT to “Weak Cellular + Good Wi-Fi coverage” | Call continues in VxWi-Fi with 2-way audio.  DUT no longer displays the VxLTE icon.  DUT correctly displays an icon to indicate it is registered for VxWi-Fi. |
| 3 | At Client-1, end the voice call. | Call is successfully terminated. |

**Scenario C) Transfer of PDN Connection is not allowed**

In this scenario, DUT has the setting for “Allow\_Handover\_PDN\_connection\_WLAN\_and\_EPS” equal to 2.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | VxLTE Call with Client-1 is successfully established with 2-way audio. |
| 2 | Wi-Fi Preferred networks:  Move the DUT to “Good Cellular + Good Wi-Fi coverage” or “No Cellular + Good Wi-Fi coverage”  Cellular Preferred networks:  Move the DUT to “Weak Cellular + Good Wi-Fi coverage” or “No Cellular + Good Wi-Fi coverage” | Call continues in VxLTE with 2-way audio.  The UE does NOT attempt to move the IMS bearer to Wi-Fi while the call is ongoing.  In case of “No Cellular coverage”, the call will be dropped. |
| 3 | At Client-1, end the voice call. | Call is ended.  DUT starts tunnel establishment on VxWiFi.  UE shall include In IKE\_AUTH  INTERNAL\_IP4\_ADDRESS or INTERNAL\_IP6\_ADDRES attributes with zero length and no values (initial attach procedure) for IMS APN.  DUT registers for VxWi-Fi successfully on AP1 and displays the appropriate icon to indicate to the user that Wi-Fi calling is available. |

### 92.6.6 Wi-Fi/LTE Call continuity (Video Call)

#### 92.6.6.1 Wi-Fi/LTE Call continuity (Video Call) – Active Video Call – To VxLTE

Description

Verify that the DUT can successfully continue a call over VxLTE when it loses VxWi-Fi.

Related core specifications

GSMA IR.51

Reason for test

To ensure the DUT is able to continue a call over VxLTE when it loses VxWi-Fi.

Initial configuration

Wi-Fi hotspot AP1 that provides a connection to the internet is available.

Network is supporting E-UTRAN and VxLTE.

DUT is camping to the E-UTRAN network for cellular service.

DUT has Wi-Fi enabled.

DUT environment at time of testing:

Wi-Fi Preferred networks: “Good Cellular + Good Wi-Fi coverage”.

Cellular Preferred networks: “Weak Cellular + Good Wi-Fi coverage”.

DUT is successfully registered for IMS services (VxWi-Fi) on AP1.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT video call from Client-1. | VxWi-Fi Call with Client-1 is successfully established.  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1. |
| 2 | Wi-Fi Preferred networks:  Move the DUT to “Good Cellular + No Wi-Fi coverage” or “Good Cellular + Weak Wi-Fi coverage”  Cellular Preferred networks:  Move the DUT to “Good Cellular + Good Wi-Fi coverage” | Video Call continues in VxLTE.  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1.  DUT no longer displays the VxWi-Fi icon.  DUT correctly displays an icon to indicate it is registered for VxLTE according to the customization requirement. |
| 3 | At Client-1, end the video call. | Call is ended. |

#### 92.6.6.2 Wi-Fi/LTE Call continuity (Video Call) – Active Video Call – To VxWi-Fi

Description

Verify that the DUT can successfully continue a call over VxWi-Fi when moving from a VxLTE environment.

Related core specifications

GSMA IR.51

Reason for test

To ensure the DUT is able to continue a call over VxWi-Fi when moving from a VxLTE environment.

Initial configuration

Wi-Fi hotspot AP1 that provides a connection to the internet is available.

Network is supporting E-UTRAN and VxLTE.

DUT is camping to the E-UTRAN network for cellular service.

DUT has Wi-Fi enabled.

DUT environment at time of testing:

Wi-Fi Preferred networks: “Good Cellular + No Wi-Fi coverage” or “Good Cellular + Weak Wi-Fi coverage”.

Cellular Preferred networks: “Good Cellular + Good Wi-Fi coverage”.

DUT is successfully registered for IMS services (VxLTE)

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT video call from Client-1. | VxLTE Call with Client-1 is successfully established.  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1. |
| 2 | Wi-Fi Preferred networks:  Move the DUT to “Good Cellular + Good Wi-Fi coverage”  Cellular Preferred networks:  Move the DUT to “Weak Cellular + Good Wi-Fi coverage” | Call continues in VxWi-Fi.  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1.  DUT no longer displays the VxLTE icon.  DUT correctly displays an icon to indicate it is registered for VxWi-Fi. |
| 3 | At Client-1, end the video call. | Call is ended. |

### 92.6.7 Wi-Fi/CS Call continuity (Voice Call)

#### 92.6.7.1 Wi-Fi/CS Call continuity (Voice Call) – Active Call – To CS

Description

Verify that the DUT can successfully continue a Voice call over CS when it loses VxWi-Fi.

Related core specifications

GSMA IR.51

Reason for test

To ensure the DUT is able to continue a Voice call over CS when it loses VxWi-Fi.

Initial configuration

Wi-Fi hotspot AP1 that provides a connection to the internet is available.

Network is supporting UTRAN or GERAN.

DUT is camping to the UTRAN or GERAN network for cellular service.

DUT has Wi-Fi enabled.

DUT environment at time of testing:

Wi-Fi Preferred networks: “Good Cellular + Good Wi-Fi coverage”.

Cellular Preferred networks: “Weak Cellular + Good Wi-Fi coverage”.

DUT is successfully registered for IMS services (VxWi-Fi) on AP1.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call with Client-1 is successfully established with 2-way audio. |
| 2 | Wi-Fi Preferred networks:  Move the DUT to “Good Cellular + No Wi-Fi coverage” or “Good Cellular + Weak Wi-Fi coverage”  Cellular Preferred networks:  Move the DUT to “Good Cellular + Good Wi-Fi coverage” | Call continues in CS domain.  Confirm 2-way audio between DUT and Client-1.  DUT no longer displays the VxWi-Fi icon. |
| 3 | At Client-1, end the voice call. | Call is ended. |

#### 92.6.7.2 Wi-Fi/CS Call continuity (Voice Call) – Active Call – To VxWi-Fi

Description

Verify that the DUT can successfully continue a Voice call over VxWi-Fi when moving from a CS environment.

Related core specifications

GSMA IR.51

Reason for test

To ensure the DUT is able to continue a Voice call over VxWi-Fi when moving from a CS environment.

Initial configuration

Wi-Fi hotspot AP1 that provides a connection to the internet is available.

Network is supporting UTRAN or GERAN.

DUT is camping to the UTRAN or GERAN network for cellular service.

DUT has Wi-Fi enabled.

DUT environment at time of testing:

Wi-Fi Preferred networks: “Good Cellular + No Wi-Fi coverage” or “Good Cellular + Weak Wi-Fi coverage”.

Cellular Preferred networks: “Good Cellular + Good Wi-Fi coverage”.

DUT is successfully registered for IMS services (VxLTE)

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | CS Call with Client-1 is successfully established with 2-way audio. |
| 2 | Wi-Fi Preferred networks:  Move the DUT to “Good Cellular + Good Wi-Fi coverage”  Cellular Preferred networks:  Move the DUT to “Weak Cellular + Good Wi-Fi coverage” | DUT registers for VxWi-Fi on AP1.  Call continues in VxWi-Fi with 2-way audio.  DUT correctly displays an icon to indicate it is registered for VxWi-Fi. |
| 3 | At Client-1, end the voice call. | Call is ended. |

### 92.6.8 Wi-Fi/CS Call continuity (Video Call)

#### 92.6.8.1 Wi-Fi/CS Call continuity (Video Call) – Active Call – To CS

Description

Verify that the DUT can successfully continue a Video call over CS when it loses VxWi-Fi.

Related core specifications

GSMA IR.51

Reason for test

To ensure the DUT is able to continue a Video call over CS when it loses VxWi-Fi.

Initial configuration

Wi-Fi hotspot AP1 that provides a connection to the internet is available.

Network is supporting UTRAN or GERAN.

DUT is camping to the UTRAN or GERAN network for cellular service.

DUT has Wi-Fi enabled.

DUT environment at time of testing:

Wi-Fi Preferred networks: “Good Cellular + Good Wi-Fi coverage”.

Cellular Preferred networks: “Weak Cellular + Good Wi-Fi coverage”.

DUT is successfully registered for IMS services (VxWi-Fi) on AP1.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT video call from Client-1. | VxWi-Fi Call with Client-1 is successfully established with 2-way audio and video stream. |
| 2 | Wi-Fi Preferred networks:  Move the DUT to “Good Cellular + No Wi-Fi coverage” or “Good Cellular + Weak Wi-Fi coverage”  Cellular Preferred networks:  Move the DUT to “Good Cellular + Good Wi-Fi coverage” | Video Call continues in CS domain.  Confirm 2-way audio between DUT and Client-1.  DUT no longer displays the VxWi-Fi icon. |
| 3 | At Client-1, end the video call. | Call is ended. |

#### 92.6.8.2 Wi-Fi/CS Call continuity (Video Call) – Active Call – To VxWi-Fi

Description

Verify that the DUT can successfully continue a Video call over VxWi-Fi when moving from a CS environment.

Related core specifications

GSMA IR.51

Reason for test

To ensure the DUT is able to continue a Video call over VxWi-Fi when moving from a CS environment.

Initial configuration

Wi-Fi hotspot AP1 that provides a connection to the internet is available.

Network is supporting UTRAN or GERAN.

DUT is camping to the UTRAN or GERAN network for cellular service.

DUT has Wi-Fi enabled.

DUT environment at time of testing:

Wi-Fi Preferred networks: “Good Cellular + No Wi-Fi coverage” or “Good Cellular + Weak Wi-Fi coverage”.

Cellular Preferred networks: “Good Cellular + Good Wi-Fi coverage”.

DUT is successfully registered for IMS services (VxLTE)

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT video call from Client-1. | CS Call with Client-1 is successfully established with 2-way audio and video stream. |
| 2 | Wi-Fi Preferred networks:  Move the DUT to “Good Cellular + Good Wi-Fi coverage”  Cellular Preferred networks:  Move the DUT to “Weak Cellular + Good Wi-Fi coverage” | DUT registers for VxWi-Fi on AP1.  Call continues in VxWi-Fi with 2-way audio and video stream.  DUT correctly displays an icon to indicate it is registered for VxWi-Fi. |
| 3 | At Client-1, end the video call. | Call is ended. |

### 92.6.9 Interworking with CS Domain

#### 92.6.9.1 Transition from Wi-Fi to CS – Active Voice Call – Wi-Fi Preferred

Description

Verify that the DUT drops the VxWi-Fi call after losing Wi-Fi connectivity and provides the user a means to make and receive calls over the CS network.

Related core specifications

TS 23.402

Reason for test

To ensure the DUT is able to drop the VxWi-Fi call after moving to CS-only coverage.

Initial configuration

Network is supporting UTRAN or GERAN.

Network is supporting Wi-Fi preferred.

DUT is camping to the UTRAN/GERAN network for cellular service.

Wi-Fi hotspot (AP1) that provides a connection to the internet is available.

DUT has Wi-Fi enabled.

DUT environment at time of testing: “Good Cellular + Good Wi-Fi coverage”.

DUT is successfully registered for IMS services (VxWi-Fi) on AP1.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call over AP1 is successfully established with 2-way audio. |
| 2 | Move the DUT to “Good Cellular + No Wi-Fi coverage” | VxWi-Fi call is dropped.  DUT deregisters from VxWi-Fi successfully and Wi-Fi calling icon is no longer available.  DUT no longer displays the Wi-Fi icon. |
| 3 | At DUT, receive MT voice call from Client-1. | CS Call is successfully established on UTRAN/GERAN with 2-way audio. |
| 4 | At Client-1, end the voice call. | Call is ended. |

#### 92.6.9.2 Transition from Wi-Fi to CS – Active Voice Call – Cellular Preferred

Description

Verify that the DUT drops the VxWi-Fi call after losing Wi-Fi connectivity and provides the user a means to make and receive calls over the CS network.

Related core specifications

TS 23.402

Reason for test

To ensure the DUT is able to drop the VxWi-Fi call after moving to CS-only coverage.

Initial configuration

Network is supporting UTRAN or GERAN.

Network is supporting Cellular preferred.

DUT is camping to the UTRAN/GERAN network for cellular service.

Wi-Fi hotspot (AP1) that provides a connection to the internet is available.

DUT has Wi-Fi enabled.

DUT environment at time of testing: “Weak Cellular + Good Wi-Fi coverage”.

DUT is successfully registered for IMS services (VxWi-Fi) on AP1.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call over AP1 is successfully established with 2-way audio. |
| 2 | Move the DUT to “Good Cellular + No Wi-Fi coverage” | VxWi-Fi call is dropped.  DUT deregisters from VxWi-Fi successfully and Wi-Fi calling icon is no longer available.  DUT no longer displays the Wi-Fi icon. |
| 3 | At DUT, receive MT voice call from Client-1. | CS Call is successfully established on UTRAN/GERAN with 2-way audio. |
| 4 | At Client-1, end the voice call. | Call is ended. |

#### 92.6.9.3 Transition from Wi-Fi to No Service – Active Voice Call

Description

Verify that the DUT drops the VxWi-Fi call after losing Wi-Fi connectivity and displays the no service icon when no other cellular network is available.

Related core specifications

TS 23.402

Reason for test

To ensure the DUT is able to drop the VxWi-Fi call after losing Wi-Fi connectivity and display the no service icon when no other cellular network is available.

Initial configuration

Network is supporting UTRAN or GERAN.

DUT is camping to the UTRAN/GERAN network for cellular service.

Wi-Fi hotspot (AP1) that provides a connection to the internet is available.

DUT has Wi-Fi enabled.

DUT environment at time of testing:

Wi-Fi Preferred networks: “Good Cellular + Good Wi-Fi coverage”.

Cellular Preferred networks: “Weak Cellular + Good Wi-Fi coverage”.

DUT is successfully registered for IMS services (VxWi-Fi) on AP1.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call over AP1 is successfully established with 2-way audio. |
| 2 | Move the DUT to “No Cellular + No Wi-Fi coverage” | VxWi-Fi call is dropped.  DUT deregisters from VxWi-Fi successfully and Wi-Fi calling icon is no longer available.  DUT no longer displays the Wi-Fi icon.  DUT displays “No Service” icon. |
| 3 | At DUT, receive MT voice call from Client-1. | Call fails. |

#### 92.6.9.4 Transition from CS to Wi-Fi – Active Voice Call – Wi-Fi Preferred

Description

Verify that the DUT can successfully connect to Wi-Fi during a CS call but it should not establish a VxWi-Fi registration.

Related core specifications

TS 23.402

Reason for test

To ensure the DUT is able to connect to Wi-Fi during a CS call but it should not establish a VxWi-Fi registration.

Initial configuration

Network is supporting UTRAN or GERAN.

Network is supporting Wi-Fi preferred.

DUT is camping to the UTRAN/GERAN network for cellular service.

Wi-Fi hotspot (AP1) that provides a connection to the internet is available. The hotspot is not currently in range of the DUT.

DUT has Wi-Fi enabled.

DUT environment at time of testing: “Good Cellular + No Wi-Fi coverage”.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | CS Call is successfully established on UTRAN/GERAN with 2-way audio. |
| 2 | Move the DUT to “Good Cellular + Good Wi-Fi coverage” | DUT connects to Wi-Fi hotspot AP1.  Wi-Fi icon is displayed.  VxWi-Fi icon is not displayed.  CS call continues with 2-way audio. |
| 3 | At Client-1, end the voice call. | Call is ended.  DUT registers for VxWi-Fi successfully on AP1 and displays the appropriate icon to indicate to the user that Wi-Fi calling is available. |
| 4 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call over AP1 is successfully established with 2-way audio. |
| 5 | At Client-1, end the voice call. | Call is ended. |

#### 92.6.9.5 Transition from CS to Wi-Fi – Active Voice Call – Cellular Preferred

Description

Verify that the DUT can successfully connect to Wi-Fi during a CS call but it should not establish a VxWi-Fi registration.

Related core specifications

TS 23.402

Reason for test

To ensure the DUT is able to connect to Wi-Fi during a CS call but it should not establish a VxWi-Fi registration.

Initial configuration

Network is supporting UTRAN or GERAN.

Network is supporting Cellular preferred.

DUT is camping to the UTRAN/GERAN network for cellular service.

Wi-Fi hotspot (AP1) that provides a connection to the internet is available.

DUT has Wi-Fi enabled.

DUT environment at time of testing: “Good Cellular + Good Wi-Fi coverage”.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | CS Call is successfully established on UTRAN/GERAN with 2-way audio. |
| 2 | Move the DUT to “Weak Cellular + Good Wi-Fi coverage” | DUT connects to Wi-Fi hotspot AP1.  Wi-Fi icon is displayed.  VxWi-Fi icon is not displayed.  CS call continues with 2-way audio. |
| 3 | At Client-1, end the voice call. | Call is ended.  DUT registers for VxWi-Fi successfully on AP1 and displays the appropriate icon to indicate to the user that Wi-Fi calling is available. |
| 4 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call over AP1 is successfully established with 2-way audio. |
| 5 | At Client-1, end the voice call. | Call is ended. |

### 92.6.10 Wi-Fi/NR Call continuity (Voice Call)

#### 92.6.10.1 Wi-Fi/NR Call continuity (Voice Call) – Active Call – To VxNR

Description

Verify that the DUT can successfully continue a call over VxNR when it loses VxWi-Fi.

Related core specifications

GSMA IR.51; NG.114

Reason for test

To ensure the DUT is able to continue a call over VxNR when it loses VxWi-Fi.

Initial configuration

Wi-Fi hotspot AP1 that provides a connection to the internet is available.

Network is supporting 5G SA and VxNR.

DUT is camping on 5G SA network for cellular service.

DUT has Wi-Fi enabled.

DUT environment at time of testing:

Wi-Fi Preferred networks: “Good Cellular + Good Wi-Fi coverage”.

Cellular Preferred networks: “Weak Cellular + Good Wi-Fi coverage”.

DUT is successfully registered for IMS services (VxWi-Fi) on AP1.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call with Client-1 is successfully established with 2-way audio. |
| 2 | Wi-Fi Preferred networks:  Move the DUT to “Good Cellular + No Wi-Fi coverage” or “Good Cellular + Weak Wi-Fi coverage”  Cellular Preferred networks:  Move the DUT to “Good Cellular + Good Wi-Fi coverage” | Call continues in VxNR with 2-way audio.  DUT no longer displays the VxWi-Fi icon.  DUT correctly displays an icon to indicate it is registered for VxNR according to the customization requirement. |
| 3 | At Client-1, end the voice call. | Call is ended. |

#### 92.6.10.2 Wi-Fi/NR Call continuity (Voice Call) – Active Call – To VxWi-Fi

Description

Verify that the DUT can successfully continue a call over VxWi-Fi when moving from a VxNR environment.

Related core specifications

GSMA IR.51; NG.114

Reason for test

To ensure the DUT is able to continue a call over VxWi-Fi when moving from a VxNR environment.

Initial configuration

Wi-Fi hotspot AP1 that provides a connection to the internet is available.

Network is supporting 5G SA and VxNR.

DUT is camping on the 5G SA network for cellular service.

DUT has Wi-Fi enabled.

DUT environment at time of testing:

Wi-Fi Preferred networks: “Good Cellular + No Wi-Fi coverage” or “Good Cellular + Weak Wi-Fi coverage”.

Cellular Preferred networks: “GoodCellular + Good Wi-Fi coverage”.

DUT is successfully registered for IMS services (VxNR)

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | VxNR Call with Client-1 is successfully established with 2-way audio. |
| 2 | Wi-Fi Preferred networks:  Move the DUT to “Good Cellular + Good Wi-Fi coverage”  Cellular Preferred networks:  Move the DUT to “Weak Cellular + Good Wi-Fi coverage” | Call continues in VxWi-Fi with 2-way audio.  DUT no longer displays the VxNR icon.  DUT correctly displays an icon to indicate it is registered for VxWi-Fi. |
| 3 | At Client-1, end the voice call. | Call is ended. |

#### 92.6.10.3 Wi-Fi/NR Call continuity (Voice Call) – Held Call – To VxNR

Description

Verify that the DUT can successfully maintain a held call over VxNR when it loses VxWi-Fi.

Related core specifications

GSMA IR.51

Reason for test

To ensure the DUT is able to maintain a held call over VxNR when it loses VxWi-Fi.

Initial configuration

Wi-Fi hotspot AP1 that provides a connection to the internet is available.

Network is supporting 5G SA and VxNR.

DUT is camping on the 5G SA network for cellular service.

DUT has Wi-Fi enabled.

DUT environment at time of testing:

Wi-Fi Preferred networks: “Good Cellular + Good Wi-Fi coverage”.

Cellular Preferred networks: “Weak Cellular + Good Wi-Fi coverage”.

DUT is successfully registered for IMS services (VxWi-Fi) on AP1.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call with Client-1 is successfully established with 2-way audio. |
| 2 | At DUT, place Client-1 on hold using the menu option. | Confirm there is a visible indication on the DUT that the call is held.  Confirm there is no audio is either direction. |
| 3 | Wi-Fi Preferred networks:  Move the DUT to “Good Cellular + No Wi-Fi coverage” or “Good Cellular + Weak Wi-Fi coverage”  Cellular Preferred networks:  Move the DUT to “Good Cellular + Good Wi-Fi coverage” | Held call is maintained in VxNR and the call hold tone is audible (if supported by network).  DUT no longer displays the VxWi-Fi icon.  DUT correctly displays an icon to indicate it is registered for VxNR according to the customization requirement. |
| 4 | At DUT, retrieve the call using the menu option. | Confirm the call with Client-1 is restored.  Confirm 2-way audio between DUT and Client-1. |
| 5 | At Client-1, end the voice call. | Call is ended. |

#### 92.6.10.4 Wi-Fi/NR Call continuity (Voice Call) – Held Call – To VxWi-Fi

Description

Verify that the DUT can successfully maintain a held call over VxWi-Fi when moving from a VxNR environment.

Related core specifications

GSMA IR.51

Reason for test

To ensure the DUT is able to maintain a held call over VxWi-Fi when moving from a VxNR environment.

Initial configuration

Wi-Fi hotspot AP1 that provides a connection to the internet is available.

Network is supporting 5G SA and VxNR.

DUT is camping on the 5G SA network for cellular service.

DUT has Wi-Fi enabled.

DUT environment at time of testing:

Wi-Fi Preferred networks: “Good Cellular + No Wi-Fi coverage” or “Good Cellular + Weak Wi-Fi coverage”.

Cellular Preferred networks: “GoodCellular + Good Wi-Fi coverage”.

DUT is successfully registered for IMS services (VxNR)

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | VxNR Call with Client-1 is successfully established with 2-way audio. |
| 2 | At DUT, place Client-1 on hold using the menu option. | Confirm there is a visible indication on the DUT that the call is held.  Confirm there is no audio is either direction. |
| 3 | Wi-Fi Preferred networks:  Move the DUT to “Good Cellular + Good Wi-Fi coverage”  Cellular Preferred networks:  Move the DUT to “Weak Cellular + Good Wi-Fi coverage” | Held call is maintained in VxWi-Fi and the call hold tone is audible (if supported by network).  DUT no longer displays the VxNR icon.  DUT correctly displays an icon to indicate it is registered for VxWi-Fi. |
| 4 | At DUT, retrieve the call using the menu option. | Confirm the call with Client-1 is restored.  Confirm 2-way audio between DUT and Client-1. |
| 5 | At Client-1, end the voice call. | Call is ended. |

#### 92.6.10.5 Wi-Fi/NR Call continuity (Voice Call) – Alerting – To VxNR

Description

Verify that the DUT can successfully continue alerting over VxNR when it loses VxWi-Fi.

Related core specifications

GSMA IR.51

Reason for test

To ensure the DUT is able to continue alerting over VxNR when it loses VxWi-Fi.

Initial configuration

Wi-Fi hotspot AP1 that provides a connection to the internet is available.

Network is supporting 5G SA and VxNR.

DUT is camping on the 5G SA network for cellular service.

DUT has Wi-Fi enabled.

DUT environment at time of testing:

Wi-Fi Preferred networks: “Good Cellular + Good Wi-Fi coverage”.

Cellular Preferred networks: “Weak Cellular + Good Wi-Fi coverage”.

DUT is successfully registered for IMS services (VxWi-Fi) on AP1.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | DUT is alerting. |
| 2 | Wi-Fi Preferred networks:  Move the DUT to “Good Cellular + No Wi-Fi coverage” or “Good Cellular + Weak Wi-Fi coverage”  Cellular Preferred networks:  Move the DUT to “Good Cellular + Good Wi-Fi coverage” | DUT continues alerting on VxNR.  DUT no longer displays the VxWi-Fi icon.  DUT correctly displays an icon to indicate it is registered for VxNR according to the customization requirement. |
| 3 | At DUT, accept the call from Client-1. | VxNR Call with Client-1 is successfully established with 2-way audio. |
| 4 | At Client-1, end the voice call. | Call is ended. |

#### 92.6.10.6 Wi-Fi/NR Call continuity (Voice Call) – Alerting – To VxWi-Fi

Description

Verify that the DUT can successfully continue alerting over VxWi-Fi when moving from a VxNR environment.

Related core specifications

GSMA IR.51

Reason for test

To ensure the DUT is able to continue alerting over VxWi-Fi when moving from a VxNR environment.

Initial configuration

Wi-Fi hotspot AP1 that provides a connection to the internet is available.

Network is supporting 5G SA and VxNR.

DUT is camping on the 5G SA network for cellular service.

DUT has Wi-Fi enabled.

DUT environment at time of testing:

Wi-Fi Preferred networks: “Good Cellular + No Wi-Fi coverage” or “Good Cellular + Weak Wi-Fi coverage”.

Cellular Preferred networks: “Good Cellular + Good Wi-Fi coverage”.

DUT is successfully registered for IMS services (VxNR)

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | DUT is alerting. |
| 2 | Wi-Fi Preferred networks:  Move the DUT to “Good Cellular + Good Wi-Fi coverage”  Cellular Preferred networks:  Move the DUT to “Weak Cellular + Good Wi-Fi coverage” | DUT continues alerting on VxWi-Fi.  DUT no longer displays the VxNR icon.  DUT correctly displays an icon to indicate it is registered for VxWi-Fi. |
| 3 | At DUT, accept the call from Client-1. | VxWi-Fi Call with Client-1 is successfully established with 2-way audio. |
| 4 | At Client-1, end the voice call. | Call is ended. |

#### 92.6.10.7 Wi-Fi/NR Call continuity (Voice Call) – 1 Active Call, 1 Alerting – To VxNR

Description

Verify that the DUT can successfully continue an active call and alerting call over VxNR when it loses VxWi-Fi.

Related core specifications

GSMA IR.51

Reason for test

To ensure the DUT can successfully continue an active call and alerting call over VxNR when it loses VxWi-Fi.

Initial configuration

Wi-Fi hotspot AP1 that provides a connection to the internet is available.

Network is supporting 5G SA and VxNR.

DUT is camping on the 5G SA network for cellular service.

DUT has Wi-Fi enabled.

DUT environment at time of testing:

Wi-Fi Preferred networks: “Good Cellular + Good Wi-Fi coverage”.

Cellular Preferred networks: “Weak Cellular + Good Wi-Fi coverage”.

DUT is successfully registered for IMS services (VxWi-Fi) on AP1.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call with Client-1 is successfully established with 2-way audio. |
| 2 | At DUT, receive MT voice call from Client-2. | DUT is alerting from Client-2.  Call with Client-1 continues with 2-way audio. |
| 3 | Wi-Fi Preferred networks:  Move the DUT to “Good Cellular + No Wi-Fi coverage” or “Good Cellular + Weak Wi-Fi coverage”  Cellular Preferred networks:  Move the DUT to “Good Cellular + Good Wi-Fi coverage” | Call with Client-1 continues in VxNR with 2-way audio.  Call from Client-2 continues alerting on VxNR.  DUT no longer displays the VxWi-Fi icon.  DUT correctly displays an icon to indicate it is registered for VxNR according to the customization requirement. |
| 4 | At DUT, accept the Voice call from Client-2 and put the Voice call with Client-1 on hold. | Confirm DUT puts Client-1 on hold.  VxNR Call with Client-2 is successfully established with 2-way audio. |
| 5 | At Client-1, end the voice call. | Held Call is ended. |
| 6 | At Client-2, end the voice call. | Call is ended. |

#### 92.6.10.8 Wi-Fi/NR Call continuity (Voice Call) – 1 Active Call, 1 Alerting – To VxWi-Fi

Description

Verify that the DUT can successfully continue an active call and alerting call over VxWi-Fi when moving from a VxNR environment.

Related core specifications

GSMA IR.51

Reason for test

To ensure the DUT is able to continue an active call and alerting call over VxWi-Fi when moving from a VxNR environment.

Initial configuration

Wi-Fi hotspot AP1 that provides a connection to the internet is available.

Network is supporting 5G SA and VxNR.

DUT is camping on the 5G SA network for cellular service.

DUT has Wi-Fi enabled.

DUT environment at time of testing:

Wi-Fi Preferred networks: “Good Cellular + No Wi-Fi coverage” or “Good Cellular + Weak Wi-Fi coverage”.

Cellular Preferred networks: “Good Cellular + Good Wi-Fi coverage”.

DUT is successfully registered for IMS services (VxNR)

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | VxNR Call with Client-1 is successfully established with 2-way audio. |
| 2 | At DUT, receive MT voice call from Client-2. | DUT is alerting from Client-2.  Call with Client-1 continues with 2-way audio. |
| 3 | Wi-Fi Preferred networks:  Move the DUT to “Good Cellular + Good Wi-Fi coverage”  Cellular Preferred networks:  Move the DUT to “Weak Cellular + Good Wi-Fi coverage” | Call with Client-1 continues in VxWi-Fi with 2-way audio.  Call from Client-2 continues alerting on VxWi-Fi.  DUT no longer displays the VxNR icon.  DUT correctly displays an icon to indicate it is registered for VxWi-Fi. |
| 4 | At DUT, accept the Voice call from Client-2 and put the Voice call with Client-1 on hold. | Confirm DUT puts Client-1 on hold.  VxWi-Fi Call with Client-2 is successfully established with 2-way audio. |
| 5 | At Client-1, end the voice call. | Held Call is ended. |
| 6 | At Client-2, end the voice call. | Call is ended. |

#### 92.6.10.9 Wi-Fi/NR Call continuity (Voice Call) – 1 Active Call, 1 Held Call – To VxNR

Description

Verify that the DUT can successfully continue an active call and held call over VxNR when it loses VxWi-Fi.

Related core specifications

GSMA IR.51

Reason for test

To ensure the DUT can successfully continue an active call and held call over VxNR when it loses VxWi-Fi.

Initial configuration

Wi-Fi hotspot AP1 that provides a connection to the internet is available.

Network is supporting 5G SA and VxNR.

DUT is camping on the 5G SA network for cellular service.

DUT has Wi-Fi enabled.

DUT environment at time of testing:

Wi-Fi Preferred networks: “Good Cellular + Good Wi-Fi coverage”.

Cellular Preferred networks: “Weak Cellular + Good Wi-Fi coverage”.

DUT is successfully registered for IMS services (VxWi-Fi) on AP1.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | VxWi-Fi Call with Client-1 is successfully established with 2-way audio. |
| 2 | At DUT, receive MT voice call from Client-2.  At DUT, accept the Voice call from Client-2 and put the Voice call with Client-1 on hold. | Confirm DUT puts Client-1 on hold.  VxWi-Fi Call with Client-2 is successfully established with 2-way audio. |
| 3 | Wi-Fi Preferred networks:  Move the DUT to “Good Cellular + No Wi-Fi coverage” or “Good Cellular + Weak Wi-Fi coverage”  Cellular Preferred networks:  Move the DUT to “Good Cellular + Good Wi-Fi coverage” | Call with Client-2 continues in VxNR with 2-way audio.  Call with Client-1 is on hold.  DUT no longer displays the VxWi-Fi icon.  DUT correctly displays an icon to indicate it is registered for VxNR according to the customization requirement. |
| 4 | At Client-1, end the voice call. | Held Call is ended. |
| 5 | At Client-2, end the voice call. | Call is ended. |

#### 92.6.10.10 Wi-Fi/NR Call continuity (Voice Call) – 1 Active Call, 1 Held Call – To VxWi-Fi

Description

Verify that the DUT can successfully continue an active call and held call over VxWi-Fi when moving from a VxNR environment.

Related core specifications

GSMA IR.51

Reason for test

To ensure the DUT is able to continue an active call and held call over VxWi-Fi when moving from a VxNR environment.

Initial configuration

Wi-Fi hotspot AP1 that provides a connection to the internet is available.

Network is supporting 5G SA and VxNR.

DUT is camping on the 5G SA network for cellular service.

DUT has Wi-Fi enabled.

DUT environment at time of testing:

Wi-Fi Preferred networks: “Good Cellular + No Wi-Fi coverage” or “Good Cellular + Weak Wi-Fi coverage”.

Cellular Preferred networks: “Good Cellular + Good Wi-Fi coverage”.

DUT is successfully registered for IMS services (VxNR)

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | VxNR Call with Client-1 is successfully established with 2-way audio. |
| 2 | At DUT, receive MT voice call from Client-2.  At DUT, accept the Voice call from Client-2 and put the Voice call with Client-1 on hold. | Confirm DUT puts Client-1 on hold.  VxNR Call with Client-2 is successfully established with 2-way audio. |
| 3 | Wi-Fi Preferred networks:  Move the DUT to “Good Cellular + Good Wi-Fi coverage”  Cellular Preferred networks:  Move the DUT to “Weak Cellular + Good Wi-Fi coverage” | Call with Client-2 continues in VxWi-Fi with 2-way audio.  Call with Client-1 is on hold.  DUT no longer displays the VxNR icon.  DUT correctly displays an icon to indicate it is registered for VxWi-Fi. |
| 5 | At Client-1, end the voice call. | Held Call is ended. |
| 6 | At Client-2, end the voice call. | Call is ended. |

#### 92.6.10.11 Wi-Fi/NR Call continuity (Voice Call) – Conference Call – To VxNR

Description

Verify that the DUT can successfully continue a conference call over VxNR when it loses VxWi-Fi.

Related core specifications

GSMA IR.51

Reason for test

To ensure the DUT can successfully continue a conference call over VxNR when it loses VxWi-Fi.

Initial configuration

Wi-Fi hotspot AP1 that provides a connection to the internet is available.

Network is supporting 5G SA and VxNR.

DUT is camping on the 5G SA network for cellular service.

DUT has Wi-Fi enabled.

DUT environment at time of testing:

Wi-Fi Preferred networks: “Good Cellular + Good Wi-Fi coverage”.

Cellular Preferred networks: “Weak Cellular + Good Wi-Fi coverage”.

DUT is successfully registered for IMS services (VxWi-Fi) on AP1.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1.  Answer the call at Client-1. | VxWi-Fi Call with Client-1 is successfully established with 2-way audio. |
| 2 | At DUT, use the menu option to make a “new call” to Client-2.  Answer the call at Client-2. | Call with Client-1 is on hold.  VxWi-Fi Call with Client-2 is successfully established with 2-way audio. |
| 3 | At DUT, use the menu option to “merge” the calls. | Conference call is successfully established between DUT, Client-1 and Client-2 with 3-way audio. |
| 4 | Wi-Fi Preferred networks:  Move the DUT to “Good Cellular + No Wi-Fi coverage” or “Good Cellular + Weak Wi-Fi coverage”  Cellular Preferred networks:  Move the DUT to “Good Cellular + Good Wi-Fi coverage” | Conference call with Client-1 and Client-2 remains active with 3-way audio in VxNR.  DUT no longer displays the VxWi-Fi icon.  DUT correctly displays an icon to indicate it is registered for VxNR according to the customization requirement. |
| 5 | At DUT, end the voice call. | All Calls are ended. |

#### 92.6.10.12 Wi-Fi/NR Call continuity (Voice Call) – Conference Call – To VxWi-Fi

Description

Verify that the DUT can successfully continue a conference call over VxWi-Fi when moving from a VxNR environment.

Related core specifications

GSMA IR.51

Reason for test

To ensure the DUT is able to continue a conference call over VxWi-Fi when moving from a VxNR environment.

Initial configuration

Wi-Fi hotspot AP1 that provides a connection to the internet is available.

Network is supporting 5G SA and VxNR.

DUT is camping on the 5G SA network for cellular service.

DUT has Wi-Fi enabled.

DUT environment at time of testing:

Wi-Fi Preferred networks: “Good Cellular + No Wi-Fi coverage” or “Good Cellular + Weak Wi-Fi coverage”.

Cellular Preferred networks: “Good Cellular + Good Wi-Fi coverage”.

DUT is successfully registered for IMS services (VxNR)

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1.  Answer the call at Client-1. | VxNR Call with Client-1 is successfully established with 2-way audio. |
| 2 | At DUT, use the menu option to make a “new call” to Client-2.  Answer the call at Client-2. | Call with Client-1 is on hold.  VxNR Call with Client-2 is successfully established with 2-way audio. |
| 3 | At DUT, use the menu option to “merge” the calls. | Conference call is successfully established between DUT, Client-1 and Client-2 with 3-way audio. |
| 4 | Wi-Fi Preferred networks:  Move the DUT to “Good Cellular + Good Wi-Fi coverage”  Cellular Preferred networks:  Move the DUT to “Weak Cellular + Good Wi-Fi coverage” | Conference call with Client-1 and Client-2 remains active with 3-way audio in VxWi-Fi.  DUT no longer displays the VxNR icon.  DUT correctly displays an icon to indicate it is registered for VxWi-Fi. |
| 5 | At DUT, end the voice call. | All Calls are ended. |

### 92.6.11 Wi-Fi/NR Call continuity (Video Call)

#### 92.6.11.1 Wi-Fi/NR Call continuity (Video Call) – Active Video Call – To VxNR

Description

Verify that the DUT can successfully continue a call over VxNR when it loses VxWi-Fi.

Related core specifications

GSMA IR.51

Reason for test

To ensure the DUT is able to continue a call over VxNR when it loses VxWi-Fi.

Initial configuration

Wi-Fi hotspot AP1 that provides a connection to the internet is available.

Network is supporting 5G SA and VxNR.

DUT is camping on the 5G SA network for cellular service.

DUT has Wi-Fi enabled.

DUT environment at time of testing:

Wi-Fi Preferred networks: “Good Cellular + Good Wi-Fi coverage”.

Cellular Preferred networks: “Weak Cellular + Good Wi-Fi coverage”.

DUT is successfully registered for IMS services (VxWi-Fi) on AP1.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT video call from Client-1. | VxWi-Fi Call with Client-1 is successfully established.  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1. |
| 2 | Wi-Fi Preferred networks:  Move the DUT to “Good Cellular + No Wi-Fi coverage” or “Good Cellular + Weak Wi-Fi coverage”  Cellular Preferred networks:  Move the DUT to “Good Cellular + Good Wi-Fi coverage” | Video Call continues in VxNR.  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1.  DUT no longer displays the VxWi-Fi icon.  DUT correctly displays an icon to indicate it is registered for VxNR according to the customization requirement. |
| 3 | At Client-1, end the video call. | Call is ended. |

#### 92.6.11.2 Wi-Fi/NR Call continuity (Video Call) – Active Video Call – To VxWi-Fi

Description

Verify that the DUT can successfully continue a call over VxWi-Fi when moving from a VxNR environment.

Related core specifications

GSMA IR.51

Reason for test

To ensure the DUT is able to continue a call over VxWi-Fi when moving from a VxNR environment.

Initial configuration

Wi-Fi hotspot AP1 that provides a connection to the internet is available.

Network is supporting 5G SA and VxNR.

DUT is camping on the 5G SA network for cellular service.

DUT has Wi-Fi enabled.

DUT environment at time of testing:

Wi-Fi Preferred networks: “Good Cellular + No Wi-Fi coverage” or “Good Cellular + Weak Wi-Fi coverage”.

Cellular Preferred networks: “Good Cellular + Good Wi-Fi coverage”.

DUT is successfully registered for IMS services (VxNR)

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT video call from Client-1. | VxNR Call with Client-1 is successfully established.  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1. |
| 2 | Wi-Fi Preferred networks:  Move the DUT to “Good Cellular + Good Wi-Fi coverage”  Cellular Preferred networks:  Move the DUT to “Weak Cellular + Good Wi-Fi coverage” | Call continues in VxWi-Fi.  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1.  DUT no longer displays the VxNR icon.  DUT correctly displays an icon to indicate it is registered for VxWi-Fi. |
| 3 | At Client-1, end the video call. | Call is ended. |

# 93 IP Multimedia Subsystem (IMS)-VxNR

## 93.1 VxNR – System Access & Registration

### 93.1.1 Default PDU Session Establishment/Release

#### 93.1.1.1 Default PDU Session Establishment/Release (VxNR Supported by Network)

Description

The DUT shall successfully establish and release the default PDU session for VxNR services.

Related core specifications

3GPP TS 23.228, TS 24.229, TS 33.203, TS 24.501, TS.23.501

GSMA NG.114, Chapter 4.4; 4.9

Reason for test

To verify the DUT is able to establish and release the default PDU session for IMS services over 5GS.

Initial configuration

DUT and NW support 5G NR Option 2

DUT usage setting is “voice centric “

IMS PDU Session type is configured with Ipv4v6.

DUT is in offline mode (Flight mode enabled / powered off).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Bring DUT online so it initiates initial registration procedures. | At DUT, check NAS protocol messages:  - DUT sends REGISTRATION REQUEST containing usage setting “voice centric”  -DUT sends UE Capability Information containing “voiceOverNR”  - Network sends REGISTRATION ACCEPT containing “IMS voice over PS session supported over 3GPP access” |
| 2 | Observe the IMS Default PDU Session establishment process on DUT. | At DUT, check NAS protocol messages:  - DUT sends PDU SESSION ESTABLISH REQUEST to the network with PDU session type 3 “Ipv4v6” and DNN “IMS”.  - Network sends PDU SESSION ESTABLISHMENT ACCEPT  - DUT must not request another PDU connection to the “IMS” DNN for the other IP version |
| 3 | Check the VxNR service indication (If supported in DUT ustomization). | DUT correctly displays an icon to indicate it is registered for VxNR according to the ustomization requirement. |
| 4 | At DUT, receive MT voice call from Client-1. | VxNR Call is successfully established with 2-way audio. |
| 5 | At Client-1, end the voice call. | Call is ended. |
| 6 | Make DUT offline (Power off / flight mode on) | At DUT, check NAS protocol messages:  - DUT sends PDU SESSION RELEASE REQUEST  - Network sends PDU SESSION RELEASE COMMAND  - DUT sends PDU SESSION RELEASE COMPLETE  - DUT sends DEREGISTRATION REQUEST to the network with Deregistration type “Switch off”. |

#### 93.1.1.2 Default PDU Session establishment – Unsuccessful (VxNR not supported by Network)

Description

The DUT shall not attempt to activate a PDU session for IMS services if the network has not indicated IMS PS Voice support.

Related core specifications

3GPP TS 23.228, TS 24.229, TS 33.203, TS 24.501, TS.23.501

GSMA NG.114, Chapter 4.4; 4.9

Reason for test

To verify the DUT is able to establish and release the default PDU session for IMS services over 5GS.

To verify the DUT does not attempt to establish the PDU session for IMS services over 5GS if the network has not indicated IMS PS Voice support

Initial configuration

DUT and Network support 5G NR Option 2

Network support 5G and 4G RAN

IMS PDU Session type is configured with Ipv4v6.

DUT is in offline mode (Flight mode enabled / powered off).

**Scenario A**) “voice centric” device

DUT usage setting is “voice centric “

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Bring DUT online so it initiates initial registration procedures. | At DUT, check NAS protocol messages:  - DUT sends REGISTRATION REQUEST containing usage setting “data centric”  -DUT sends UE Capability Information containing “voiceOverNR”  - Network sends REGISTRATION ACCEPT with “IMS voice over PS session supported over 3GPP access = 0 ” – not supported |
| 2 | Observe that no PDU session establishment process occurs on DUT. | At DUT, check NAS protocol messages:  - DUT must not request a PDU session ustomization connection to the “IMS” DNN since the network is not supporting VxNR.  - UE shall autonomously reselects to E-UTRA |
| 3 | Check the RAT indicator and VxNR service indicator (if supported in DUT ustomization) | DUT displays 4G RAT icon and does not display that is registered for VxNR according to the ustomization requirement. |
| 4 | At DUT initiate the voice call. | User Interface allows the call establishment.  Voice call is sucessfuly established |
| 5 | Open the embedded browser application and load a webpage | DUT establish PDU session for internet service in 4G  Web page is properly loaded. |

**Scenario B**) is “data centric” device

DUT usage setting is “data centric “

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Bring DUT online so it initiates initial registration procedures. | At DUT, check NAS protocol messages:  - DUT sends REGISTRATION REQUEST containing usage setting “data centric”  -DUT sends UE Capability Information containing “voiceOverNR”  - Network sends REGISTRATION ACCEPT with “IMS voice over PS session supported over 3GPP access = 0 ” – not supported |
| 3 | Check the RAT indicator and VxNR service indicator (if supported in DUT ustomization) | DUT displays 5G RAT icon and does not display that is registered for VxNR according to the ustomization requirement. |
| 4 | At DUT initiate the voice call. | User Interface does not allow the call establishment |
| 5 | Open the embedded browser application and load a webpage | DUT establish PDU session for internet service in 5G  Web page is properly loaded. |

#### 93.1.1.3 Default PDU Session establishment - Unsuccessful (UICC Not Provisioned for IMS)

Description

When a non-provisioned UICC is used in an IMS enabled device on a VxNR network, the device shall handle IMS DNN PDU Session establishment rejections correctly.

Related core specifications

3GPP TS 23.228, TS 24.229, TS 33.203, TS 24.501, TS.23.501

GSMA NG.114

Reason for test

To confirm the DUT behaves correctly when receiving PDU Session establishment reject for IMS DNN.

Initial configuration

DUT and Network support 5G NR Option 2

Network support 5G and 4G RAN

IMS PDU Session type is configured with IPv4v6.

DUT is in offline mode (Flight mode enabled / powered off).

UICC used for this test is not IMS provisioned.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Bring DUT online so it initiates initial registration procedures. | At DUT, check NAS protocol messages:  - DUT sends REGISTRATION REQUEST  -DUT sends UE Capability Information containing “voiceOverNR”  - Network sends REGISTRATION ACCEPT with “IMS voice over PS session supported over 3GPP access = 1” – supported |
| 2 | Observe that PDU session establishment process occurs on DUT. | At DUT, check NAS protocol messages:  - DUT requests a PDU session establisment connection to the “IMS” DNN since the network indicates supporting VxNR.  - Network sends PDU SESSION ESTABLISHMENT REQUEST  Check within the PDU SESSION ESTABLISHMENT REJECT message if Back-off timer is included.  **Back-off Timer included:**  Timer included (not deactivated or zero):  - DUT shall start back-off timer according to the value in T3396 and make a further PDU SESSION ESTABLISHMENT REQUEST message to the same IMS DNN only when the timer has expired. Before back-off timer expiry, confirm DUT is camping to the network but without a VxNR registration.  Timer included (set to deactivated):  - DUT shall not make any further PDU SESSION ESTABLISHMENT REQUESTs until it is restarted or the SIM is removed.  Timer included (set to zero):  - DUT may send a PDU SESSION ESTABLISHMENT REQUEST message to the same IMS DNN (depending on device implementation).  **Back-off timer NOT included:**  Timer not included: Rejected with #8, #27, #32 or #33.  - DUT shall start back-off timer with a default value of 12 minutes and make a further PDU SESSION ESTABLISHMENT REQUEST to the same IMS DNN only when the timer has expired. Before back-off timer expiry, confirm DUT is camping to the network but without a VxNR registration.  Timer not included: Rejected with any other cause:  - DUT may send a “PDN CONNECTIVITY REQUEST” message to the same IMS APN (depending on device implementation).  N.B Some operators request the manufacturer to implement a specific timer value for their network rather than using the default timer value in the reject cause message. Please check with the network under test if no timer is included in the reject cause message. |
| 4 | Check the VxNR service indication (If supported in DUT ustomization). | DUT correctly displays an icon to indicate it is registered for 5G services but not VxNR icon. |
| 9 | At DUT, receive MT SMS | SMS is received over NAS  (If the network is not supporting SMS over NAS, then the SMS procedure will fail). |

#### 93.1.1.4 Default PDU Session Establishment – Unsuccessful (IMS Roaming not allowed by the network)

Description

This test case checks that a VxNR capable device behaves properly in a visited 5G NR network that is not VxNR capable for roaming subscribers and can offer voice services.

Related core specifications

3GPP TS 23.228, TS 24.229, TS 33.203, TS 24.501, TS.23.501

GSMA NG.114,

Reason for test

To verify the DUT does not attempt to Activate a PDU session for IMS services if the network has responded with IMS PS Voice not supported.

Initial configuration

DUT and NW support 5G NR Option 2.

VPLMN network has NR roaming agreement with the HPLMN of the SIM card used in the DUT.

VPLMN network is not supporting VxNR for roaming subscribers.

VPLMN network supports 5G and 4G RAN

DUT usage setting is “voice centric “

IMS PDU Session type is configured with Ipv4v6.

DUT is in offline mode (Flight mode enabled / powered off).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Bring DUT online so it initiates initial registration procedures. | At DUT, check NAS protocol messages:  - DUT sends REGISTRATION REQUEST containing usage setting “voice centric”  -DUT sends UE Capability Information containing “voiceOverNR”  - Network sends REGISTRATION ACCEPT containing “IMS voice over PS session supported over 3GPP access =0” – not supported |
| 2 | Observe that no PDU session establishment process occurs on DUT. | At DUT, check NAS protocol messages:  - DUT must not request a PDU session ustomization connection to the “IMS” DNN since the network is not supporting VxNR.  - UE shall autonomously reselects to E-UTRA |
| 3 | Check the RAT indicator and VxNR service indicator (if supported in DUT ustomization) | DUT displays 4G RAT icon and does not display that is registered for VxNR according to the ustomization requirement. |
| 4 | At DUT, receive MT voice call from Client-1. | VxNR Call is successfully established with 2-way audio. |
| 5 | At Client-1, end the voice call. | Call is ended. |
|  | At DUT, receive MT SMS | SMS is received over IMS |
| 4 | At DUT initiate the voice call. | User Interface allows the call establishment.  Voice call is sucessfuly established |

#### 93.1.1.5 Default PDU Session Establishment – Successful (IMS Roaming Allowed by Network)

Description

This test case checks that a VxNR capable device with VxNR roaming enabled behaves properly in a visited 5G NR network that is VxNR capable for roaming subscribers.

Related core specifications

3GPP TS 23.228, TS 24.229, TS 33.203, TS 24.501, TS.23.501

GSMA NG.114,

Reason for test

It must be ensured that a VxNR capable device with VxNR roaming enabled can properly make and receive packet switched voice calls in VxNR roaming NW.

Initial configuration

DUT and NW support 5G NR Option 2.

VPLMN has an VxNR roaming agreement with the HPLMN of the SIM card used in the DUT.

VPLMN is supporting VxNR for roaming subscribers.

DUT usage setting is “voice centric “

IMS PDU Session type is configured with Ipv4v6.

DUT is in offline mode (Flight mode enabled / powered off).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Bring DUT online so it initiates initial registration procedures. | At DUT, check NAS protocol messages:  - DUT sends REGISTRATION REQUEST containing usage setting “voice centric”  -DUT sends UE Capability Information containing “voiceOverNR”  - Network sends REGISTRATION ACCEPT containing “IMS voice over PS session supported over 3GPP access” |
| 2 | Observe the IMS Default PDU Session establishment process on DUT. | At DUT, check NAS protocol messages:  - DUT sends PDU SESSION ESTABLISH REQUEST to the network with PDU session type 3 “Ipv4v6” and DNN “IMS”.  - Network sends PDU SESSION ESTABLISHMENT ACCEPT  - DUT must not request another PDU connection to the “IMS” DNN for the other IP version |
| 3 | Check the VxNR service indication (If supported in DUT ustomization). | DUT correctly displays an icon to indicate it is registered for VxNR according to the ustomization requirement. |
| 4 | At DUT, receive MT voice call from Client-1. | VxNR Call is successfully established with 2-way audio. |
| 5 | At Client-1, end the voice call. | Call is ended. |
|  | At DUT, receive MT SMS | SMS is received over IMS |
| 6 | At DUT, interrogate CFU via \*#21# or user interface | DUT successfully interrogates CFU status.via PS Domain |

#### 93.1.1.6 Default PDU Session Establishment/Release (VxNR Switch)

Description

The DUT shall successfully establish and release the default PDU session for VxNR services using the menu switch.

Related core specifications

3GPP TS 23.228, TS 24.229, TS 33.203, TS 24.501, TS.23.501

GSMA NG.114

Reason for test

To verify the DUT is able to establish and release the default PDU session for VxNR services using the VxNR menu switch.

This test is only applicable to devices supporting a manual VxNR on/off switch.

Initial configuration

DUT and NW support 5G NR Option 2

IMS APN is configured with Ipv4v6.

DUT menu switch for VxNR is set to “on”.

DUT is registered for VxNR services

**Scenario A) DUT usage setting is “data centric “device**

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | On DUT, set the VxNR menu setting to “off”. | At DUT, check NAS protocol messages:  - DUT sends PDU SESSION RELEASE REQUEST  - Network sends PDU SESSION RELEASE COMMAND  - DUT sends PDU SESSION RELEASE COMPLETE |
| 2 | Check the VxNR service indication (If supported in DUT ustomization). | DUT no longer displays **VxNR** service indication. |
| 3 | Check the 5G service indication (If supported in DUT ustomization). | DUT displays 5G service.  DUT is still registered on 5G NR RAT |
| 4 | At Client-1 initiate a voice call towards DUT. | Call is unsuccessful as DUT is not registered for IMS |

**Scenario B) DUT usage setting is “voice centric “device**

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | On DUT, set the VxNR menu setting to “off”. | At DUT, check NAS protocol messages:  - DUT sends PDU SESSION RELEASE REQUEST  - Network sends PDU SESSION RELEASE COMMAND  - DUT sends PDU SESSION RELEASE COMPLETE |
| 2 | Check the VxNR service indication (If supported in DUT ustomization). | DUT no longer displays **VxNR** service indication. |
| 3 | Check the 5G service indication (If supported in DUT ustomization). | DUT does not display 5G service.  DUT shall start autonomous selection of E-UTRA and register on E-UTRA RAT |
| 4 | At Client-1 initiate a voice call towards DUT. | Call is successful |

### 93.1.2 IMS SIP Registration

#### 93.1.2.1 IMS SIP Registration (Periodic, Out of Service during Server Timer Expiry)

Description

The DUT shall successfully perform the Periodic SIP re-registration procedure with authentication based on AKA and Digest with IMS.

Related core specifications

TS 24.229, 5.1.1.4., GSMA NG.114, Chapter 2.2.1

Reason for test

To verify the DUT can re-register after the Server timer has expired during out of service.

Initial configuration

DUT is successfully registered for IMS services (VxNR).

Server Timer Expiry (X): The server timer expiry for Re-registration is known (This can be found in the MT REGISTER 200 OK message at Registration).

Re-registration Timer (Y):

For server timer expiry values <20, the re-registration timer shall take place when half of the server timer expiry time has elapsed.

For server timer expiry values >20, the re-registration timer shall take place 10 minutes before the server timer expires.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Move DUT to an area where it directly loses all coverage (such as a shielded box). | DUT displays “No Service” indication. |
| 2 | Keep DUT out of service for a time longer than the Server Timer Expiry (X). | DUT displays “No Service” indication. |
| 3 | Move DUT to its initial area where the IMS connection is available. | Confirm DUT performs an Initial Registration.  At DUT, check in SIP protocol messages:  - MO REGISTER message.  - MT REGISTER 401 Unauthorized message.  - MO REGISTER message.  - MT REGISTER 200 OK message. |
| 4 | Check the IMS service indication (if supported in DUT customization). | DUT correctly displays an icon to indicate it is registered for IMS as per the service applicable (VxNR) |
| 5 | At DUT, receive MT voice call from Client-1. | Call is successfully established with 2-way audio. |
| 6 | At Client-1, end the voice call. | Call is ended. |

#### 93.1.2.2 IMS SIP Registration (Periodic, Out of Service during Re-registration Timer expiry but back in service before Server Timer Expiry)

Description

The DUT shall successfully perform the Periodic SIP re-registration procedure with authentication based on AKA and Digest with IMS.

Related core specifications

TS 24.229, 5.1.1.4., GSMA NG.114, Chapter 2.2.1

Reason for test

To verify the DUT is able to re-register after Re-registration timer expiry when DUT has temporarily lost coverage and returned to coverage before the Server timer has expired.

Initial configuration

DUT is successfully registered for IMS services (VxNR).

Server Timer Expiry (X): The server timer expiry for Re-registration is known (This can be found in the MT REGISTER 200 OK message at Registration).

Re-registration Timer (Y):

For server timer expiry timer values <20, the re-registration timer shall take place when half of the server timer expiry time has elapsed.

For server timer expiry timer values >20, the re-registration timer shall take place 10 minutes before the server timer expires.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Move DUT to an area where it directly loses all coverage (such as a shielded box). | DUT displays “No Service” indication. |
| 2 | Keep DUT out of service for a time longer than the Re-registration Time (Y) but shorter than the Server Timer Expiry (X). | DUT displays “No Service” indication. |
| 3 | Move DUT to its initial area where the IMS connection is available. | The DUT may either perform initial registration or a re-registration over the existing set of security associations or TLS session.  At DUT, check in SIP protocol messages:  Initial Registration:  - MO REGISTER message.  - MT REGISTER 401 Unauthorized message.  - MO REGISTER message.  - MT REGISTER 200 OK message.  Or  Re-registration:  - MO REGISTER message.  - MT REGISTER 200 OK message. |
| 4 | Check the IMS service indication (if supported in DUT customization). | DUT correctly displays an icon to indicate it is registered for IMS as per the service applicable (VxNR). |
| 5 | At DUT, receive MT voice call from Client-1. | Call is successfully established with 2-way audio. |
| 6 | At Client-1, end the voice call. | Call is ended. |

#### 93.1.2.3 IMS SIP Registration (Periodic, Out of Service but back in service before Re-registration Timer and Server Timer Expiry)

Description

The DUT shall successfully perform the Periodic SIP re-registration procedure with authentication based on AKA and Digest with IMS.

Related core specifications

TS 24.229, 5.1.1.4., GSMA NG.114, Chapter 2.2.1

Reason for test

To verify the DUT is able to re-register after Re-registration timer expiry when DUT has temporarily lost coverage and returned to coverage before the Re-Registration and Server timer has expired.

Initial configuration

DUT is successfully registered for IMS services (VxNR).

Server Timer Expiry (X): The server timer expiry for Re-registration is known (This can be found in the MT REGISTER 200 OK message at Registration).

Re-registration Timer (Y):

For server timer expiry timer values <20, the re-registration timer shall take place when half of the server timer expiry time has elapsed.

For server timer expiry timer values >20, the re-registration timer shall take place 10 minutes before the server timer expires.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Move DUT to an area where it directly loses all coverage (such as a shielded box). | DUT displays “No Service” indication. |
| 2 | Keep DUT out of service for a time shorter than the Re-registration Time (Y) and Server Timer Expiry (X). | DUT displays “No Service” indication. |
| 3 | Move DUT to its initial area where the IMS connection is available.  Check the IMS service indication (if supported in DUT customization). | At DUT, check there is no MO REGISTER message in the SIP protocol.  DUT correctly displays an icon to indicate it is registered for IMS as per the service applicable (VxNR). |
| 4 | At DUT, receive MT voice call from Client-1. | Call is successfully established with 2-way audio. |
| 5 | Observe DUT during expected re-registration time. | The DUT may either perform initial registration or a re-registration over the existing set of security associations or TLS session.  At DUT, check in SIP protocol messages:  Initial Registration:  - MO REGISTER message.  - MT REGISTER 401 Unauthorized message.  - MO REGISTER message.  - MT REGISTER 200 OK message.  Or  Re-registration:  - MO REGISTER message.  - MT REGISTER 200 OK message. |
| 6 | Check the IMS service indication (if supported in DUT customization). | DUT correctly displays an icon to indicate it is registered for IMS as per the service applicable (VxNR). |
| 7 | At DUT, receive MT voice call from Client-1. | Call is successfully established with 2-way audio. |
| 8 | At Client-1, end the voice call. | Call is ended. |

## 93.2 VxNR – Basic Calls

### 93.2.1 Voice Calls

#### 93.2.1.1 PDU Session modification with associated QOS (MO Voice Call)

Description

The DUT shall successfully perform an MO VxNR call.

Related 3GPP core specifications

3GPP TS 23.228, TS 24.229, TS 33.203, TS 24.501, TS.23.501

GSMA NG.114

Reason for test

To verify the DUT is correctly using the associated GBR QOS Flow for MO VxNR voice calls.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxNR)

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1. | At DUT, check in NAS protocol messages:  - Network sends PDU SESSION MODIFICATION COMMAND with new QOS rules for dedicated bearer  - DUT sends PDU SESSION MODIFICATION COMPLETE  Confirm 2-way audio between DUT and Client-1. |
| 2 | At DUT, end the voice call. | At DUT, check in NAS protocol messages:  - Network sends PDU SESSION MODIFICATION COMMAND deleting QOS rules from step 1  - DUT sends PDU SESSION MODIFICATION COMPLETE  Call is ended. |

#### 93.2.1.2 PDU Session modification with associated QOS (MT Voice Call)

Description

The DUT shall successfully perform an MT VxNR call.

Related 3GPP core specifications

3GPP TS 23.228, TS 24.229, TS 33.203, TS 24.501, TS.23.501

GSMA NG.114

Reason for test

To verify the DUT is correctly using the associated GBR QOS Flow for MT VxNR voice calls.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxNR)

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1. | At DUT, check in NAS protocol messages:  - Network sends PDU SESSION MODIFICATION COMMAND with new QOS rules for dedicated bearer  - DUT sends PDU SESSION MODIFICATION COMPLETE  Confirm 2-way audio between DUT and Client-1. |
| 2 | At Client-1, end the voice call. | At DUT, check in NAS protocol messages:  - Network sends PDU SESSION MODIFICATION COMMAND deleting QOS rules from step 1  - DUT sends PDU SESSION MODIFICATION COMPLETE  Call is ended. |

### 93.2.2 Video Calls

#### 93.2.1.1 PDU Session modification with associated QOS (MO Video Call)

Description

The DUT shall successfully perform an MO VxNR call.

Related 3GPP core specifications

3GPP TS 23.228, TS 24.229, TS 33.203, TS 24.501, TS.23.501

GSMA NG.114

Reason for test

To verify the DUT is correctly using the associated GBR QOS Flow for MO VxNR video calls.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxNR)

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1. | At DUT, check in NAS protocol messages:  - Network sends PDU SESSION MODIFICATION COMMAND with new QOS rules for dedicated bearer  - DUT sends PDU SESSION MODIFICATION COMPLETE  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1. |
| 2 | At DUT, end the voice call. | At DUT, check in NAS protocol messages:  - Network sends PDU SESSION MODIFICATION COMMAND deleting QOS rules from step 1  - DUT sends PDU SESSION MODIFICATION COMPLETE  Call is ended. |

#### 93.2.1.2 PDU Session modification with associated QOS (MT Video Call)

Description

The DUT shall successfully perform an MT VxNR call.

Related 3GPP core specifications

3GPP TS 23.228, TS 24.229, TS 33.203, TS 24.501, TS.23.501

GSMA NG.114

Reason for test

To verify the DUT is correctly using the associated GBR QOS Flow for MT VxNR video calls.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxNR)

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT video call from Client-1. | At DUT, check in NAS protocol messages:  - Network sends PDU SESSION MODIFICATION COMMAND with new QOS rules for dedicated bearer  - DUT sends PDU SESSION MODIFICATION COMPLETE  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1. |
| 2 | At Client-1, end the video call. | At DUT, check in NAS protocol messages:  - Network sends PDU SESSION MODIFICATION COMMAND deleting QOS rules from step 1  - DUT sends PDU SESSION MODIFICATION COMPLETE  Call is ended. |

### 93.2.3 Emergency Calls

#### 93.2.3.1 Emergency Call (EMS Supported by Network)

##### 91.2.3.1.1 Emergency Call over VxNR SoS APN

Description

The DUT shall successfully make Emergency Calls over VxNR.

Related core specifications

3GPP TS 23.167, TS 24.229, TS 24.301, TS 24.237

NG.114, chapter 5.1

Reason for test

To verify the DUT is able to initiate an Emergency call via IMS when registered for VxNR in a network supporting EM calls over IMS.

Initial configuration

DUT and NW support 5G NR Option 2.

Network is supporting Emergency Calls over VxNR (EMC = 1) and IMS services (IMS-VoPS-3GPP= 1)

DUT usage setting is “voice centric “

DUT is successfully registered for IMS services (VxNR).

Note: The following test cases covering Emergency calls over VxNR are written using the “SoS” APN.  However, some operators may use an alternative APN for Emergency calls.  Please clarify with the operator as to what the expected APN name will be in use for the Emergency Calls over VxNR.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO EM call to Emergency Services (112 or 911). | DUT displays Emergency Call setup.  At DUT, check NAS protocol messages:  - DUT sends PDU SESSION ESTABLISH REQUEST to the network with request type 2 “initial emergency request” being included in UL NAS TRANSPORT message  - Network sends PDU SESSION ESTABLISHMENT ACCEPT  - DUT starts IMS Emergency registration procedure  - DUT sends INVITE with “From” identity being equal to public identity received during IMS emergency registration and “To” containing Emergency service URN  Confirm 2-way audio between DUT and Emergency Services operator. |
| 2 | End the EM call. | At DUT, check in NAS protocol messages:  - Network sends PDU SESSION RELEASE COMMAND  - DUT sends PDU SESSION RELEASE COMPLETE  Call is ended. |

##### 93.2.3.2.1 Emergency Call over 5GS (Not Supported by Network EMC=0/EMF=1) - EPS Fallback

Description

The DUT shall successfully make Emergency Calls using Emergency service fallback procedure if supported by the network.

Related core specifications

3GPP TS 23.167, TS 24.229, TS 24.301, TS 24.237

NG.114, chapter 5.1

Reason for test

To verify the DUT is able to initiate an Emergency Service fallback in VxNR network.

Initial configuration

DUT and NW support 5G NR Option 2.

Network does not support Emergency Calls over VxNR (EMC = 0)

Network does support Emergency service fallback (EMF = 1 Emergency services fallback supported in NR connected to 5GCN only)

DUT usage setting is “voice centric “

DUT is successfully registered for IMS services (VxNR).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO EM call to Emergency Services (112 or 911). | DUT displays Emergency Call setup.  At DUT, check NAS protocol messages:  - DUT sends SERVICE REQUEST to the network with request type 2 “emergency services fallback”  - Network initiates handover or redirection to E-UTRAN connected to EPS  - DUT starts IMS Emergency registration procedure in E-UTRAN  - DUT sends INVITE with “From” identity being equal to public identity received during IMS emergency registration and “To” containing Emergency service URN  Confirm 2-way audio between DUT and Emergency Services operator. |
| 2 | End the EM call. | Call is ended. |

##### 93.2.3.2.2 Emergency Call over 5GS (Not Supported by Network EMC=0/EMF=0) - EPS Fallback

Description

The DUT shall successfully make Emergency Calls using Emergency service fallback procedure if supported by the network.

Related core specifications

3GPP TS 23.167, TS 24.229, TS 24.301, TS 24.237

NG.114, chapter 5.1

Reason for test

To verify the DUT is able to initiate an Emergency Service fallback in VxNR network.

Initial configuration

DUT and NW support 5G NR Option 2.

Network does not support Emergency Calls over VxNR (EMC = 0)

Network does not support Emergency service fallback (EMF = 0 Emergency services fallback not supported)

Network does support IMS Emergency services in E-UTRAN

DUT usage setting is “voice centric “

DUT is successfully registered for IMS services (VxNR).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO EM call to Emergency Services (112 or 911). | DUT displays Emergency Call setup.  At DUT, check NAS protocol messages:  - DUT autonomously starts selection of E-UTRAN RAT  - DUT starts IMS Emergency registration procedure in E-UTRAN  - DUT sends INVITE with “From” identity being equal to public identity received during IMS emergency registration and “To” containing Emergency service URN  Confirm 2-way audio between DUT and Emergency Services operator. |
| 2 | End the EM call. | Call is ended. |

### 93.2.4 SIP Preconditions Required (Resource Available)

#### 93.2.4.1 MO Voice Call – SIP Preconditions required

Description

When Resource is available, the DUT should update the QoS status when preconditions are met.

Related core specifications

GSMA NG.114, section 2.2.5

3GPP TS 24.229, RFC 3312, RFC 4032

Reason for test

To confirm when Resource is available, the DUT should update the QoS status when preconditions are met.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxNR).

The DUT and Client-1 are both supporting SIP Precondition.

Network is supporting SIP Precondition.

QoS Resources are available.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO Voice call to Client-1. | At DUT, check in SIP protocol messages:  - MO INVITE message indicates “Precondition” within the “Supported” tag.  - MO INVITE message contains Local QoS setting: desired-status attribute (a=des)  - MO UPDATE message contains Local QoS setting: desired-status attribute (a=des) |
| 2 | Answer the call at Client-1. | Confirm the voice call is established.  Confirm 2-way audio between DUT and Client-1. |
| 3 | End the voice call between DUT and Client-1. | Call is ended. |

#### 93.2.4.2 MT Voice Call – SIP Preconditions required

Description

When Resource is available, the DUT should update the QoS status when preconditions are met.

Related core specifications

GSMA NG.114, section 2.2.5

3GPP TS 24.229, RFC 3312, RFC 4032

Reason for test

To confirm when Resource is available, the DUT should update the QoS status when preconditions are met.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxNR).

The DUT and Client-1 are both supporting SIP Precondition.

Network is supporting SIP Precondition.

QoS Resources are available.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT Voice call from Client-1. | At DUT, check in SIP protocol messages:  - MT INVITE message indicates “Precondition” within the “Supported” tag.  - MT INVITE message contains Local QoS setting: desired-status attribute (a=des)  - MO SESSION PROGRESS message indicates “Precondition” within the “Required” tag.  - |
| 2 | Answer the call at DUT. | Confirm the voice call is established.  Confirm 2-way audio between DUT and Client-1. |
| 3 | End the voice call between DUT and Client-1. | Call is ended. |

#### 93.2.4.3 MO Voice Call – SIP Preconditions required - DUT upgrades call to Video

Description

When Resource is available, the DUT should update the QoS status when preconditions are met.

Related core specifications

GSMA NG.114, section 2.2.5

3GPP TS 24.229, RFC 3312, RFC 4032

Reason for test

To confirm when Resource is available, the DUT should update the QoS status when preconditions are met.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxNR).

The DUT and Client-1 are both supporting SIP Precondition.

Network is supporting SIP Precondition.

QoS Resources are available.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO Voice call to Client-1. | Confirm the voice call is established.  Confirm 2-way audio between DUT and Client-1. |
| 2 | At DUT, select the in-call menu option to upgrade to a video call. | Video Stream is successfully added.  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1.  At DUT, check in SIP protocol messages:  - MO INVITE message indicates “Precondition” within the “Supported” tag.  - MO INVITE message contains Local QoS setting: desired-status attribute (a=des)  - MO UPDATE message contains Local QoS setting: desired-status attribute (a=des) |
| 3 | End the video call between DUT and Client-1. | Call is ended. |

#### 93.2.4.4 MT Voice Call – SIP Preconditions required – Client upgrades call to Video

Description

When Resource is available, the DUT should update the QoS status when preconditions are met.

Related core specifications

GSMA NG.114, section 2.2.5

3GPP TS 24.229, RFC 3312, RFC 4032

Reason for test

To confirm when Resource is available, the DUT should update the QoS status when preconditions are met.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxNR).

The DUT and Client-1 are both supporting SIP Precondition.

Network is supporting SIP Precondition.

QoS Resources are available.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT Voice call from Client-1. | Confirm the voice call is established.  Confirm 2-way audio between DUT and Client-1. |
| 2 | At Client-1, select the in-call menu option to upgrade to a video call. | Video Stream is successfully added.  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1.  At DUT, check in SIP protocol messages:  - MT INVITE message contains Local QoS setting: desired-status attribute (a=des)  - MO SESSION PROGRESS message indicates “Precondition” within the “Required” tag.  - MO OK message indicates “Precondition” within the “Supported” tag. |
| 3 | End the video call between DUT and Client-1. | Call is ended. |

#### 93.2.4.5 MO Video Call – SIP Preconditions required

Description

When Resource is available, the DUT should update the QoS status when preconditions are met.

Related core specifications

GSMA NG.114, section 2.2.5

3GPP TS 24.229, RFC 3312, RFC 4032

Reason for test

To confirm when Resource is available, the DUT should update the QoS status when preconditions are met.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxNR).

The DUT and Client-1 are both supporting SIP Precondition.

Network is supporting SIP Precondition.

QoS Resources are available.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO Video call to Client-1. | At DUT, check in SIP protocol messages:  - MO INVITE message indicates “Precondition” within the “Supported” tag.  - MO INVITE message contains Local QoS setting: desired-status attribute (a=des)  - MO UPDATE message contains Local QoS setting: desired-status attribute (a=des) |
| 2 | Answer the call at Client-1. | Confirm the video call is established.  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1. |
| 3 | End the video call between DUT and Client-1. | Call is ended. |

#### 93.2.4.6 MT Video Call – SIP Preconditions required

Description

When Resource is available, the DUT should update the QoS status when preconditions are met.

Related core specifications

GSMA NG.114, section 2.2.5

3GPP TS 24.229, RFC 3312, RFC 4032

Reason for test

To confirm when Resource is available, the DUT should update the QoS status when preconditions are met.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxNR).

The DUT and Client-1 are both supporting SIP Precondition.

Network is supporting SIP Precondition.

QoS Resources are available.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT Video call from Client-1. | At DUT, check in SIP protocol messages:  - MT INVITE message indicates “Precondition” within the “Supported” tag.  - MT INVITE message contains Local QoS setting: desired-status attribute (a=des)  - MO SESSION PROGRESS message indicates “Precondition” within the “Required” tag. |
| 2 | Answer the call at DUT. | Confirm the video call is established.  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1. |
| 3 | End the video call between DUT and Client-1. | Call is ended. |

### 93.2.5 SIP Preconditions Required (Resource Unavailable)

#### 93.2.5.1 MO Voice Call – SIP Preconditions required – Resource Unavailable

Description

Confirm the DUT sends MO CANCEL message when QoS resource is unavailable for the voice call.

Related core specifications

GSMA NG.114, section 2.2.5

3GPP TS 24.229, RFC 3312, RFC 4032

Reason for test

Ensure that DUT sends MO CANCEL message when QoS resource is unavailable for the voice call.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxNR)

DUT and Client-1 are supporting SIP Precondition.

Network is supporting SIP Precondition.

QoS Resources unavailable for voice call.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO Voice call to Client-1. | At DUT, check in SIP protocol messages:  - MO INVITE message indicates “Precondition” within the “Supported” tag.  - MO INVITE message contains a=des: qos mandatory local “sendrecv”  - MO INVITE message contains a=des: qos optional remote “sendrecv” |
| 2 | Observe the call setup fails to establish. | At DUT, check NAS protocol messages:  Dedicated bearer is not established.  At DUT, check in SIP protocol messages:  - MO CANCEL message.  Call setup is ended. |

#### 93.2.5.2 MT Voice Call – SIP Preconditions required – Resource Unavailable

Description

Confirm the DUT sends 580 PRECONDITION FAILURE message when QoS resource is unavailable for the voice call.

Related core specifications

GSMA NG.114, section 2.2.5

3GPP TS 24.229, RFC 3312, RFC 4032

Reason for test

Ensure that DUT sends 580 PRECONDITION FAILURE message when QoS resource is unavailable for the voice call.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxNR)

DUT and Client-1 are supporting SIP Precondition.

Network is supporting SIP Precondition.

QoS Resources unavailable for voice call.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, Receive MT Voice call from Client-1. | At DUT, check in SIP protocol messages:  - MO SESSION PROGRESS message indicates “Precondition” within the “Required” tag. |
| 2 | Observe the call setup fails to establish. | At DUT, check NAS protocol messages:  Dedicated bearer is not established.  At DUT, check in SIP protocol messages:  - MO 580 PRECONDITION FAILURE message.  No missed call is indicated at DUT. |

#### 93.2.5.3 MO Voice Call – SIP Preconditions required – Resource Insufficient

Description

Confirm the DUT sends MO UPDATE message when QoS resource is insufficient for the voice call.

Related core specifications

GSMA NG.114, section 2.2.5

3GPP TS 24.229, RFC 3312, RFC 4032

Reason for test

Ensure that DUT sends MO UPDATE message when QoS resource is insufficient for the voice call.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxNR)

DUT and Client-1 are supporting SIP Precondition.

Network is supporting SIP Precondition.

QoS Resources insufficient for requested voice call codec.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO Voice call to Client-1. | At DUT, check in SIP protocol messages:  - MO INVITE message indicates “Precondition” within the “Supported” tag.  - MO INVITE message contains a=des: qos mandatory local “sendrecv”  - MO INVITE message contains a=des: qos optional remote “sendrecv”  QoS is insufficient to setup the call.  - MO UPDATE message is sent to downgrade the codec to the bitrate that matches the bandwidth allocated for the dedicated bearer |
| 2 | Answer the call at Client-1. | Confirm the voice call is established.  Confirm 2-way audio between DUT and Client-1. |
| 3 | End the voice call between DUT and Client-1. | Call is ended. |

#### 93.2.5.4 MT Voice Call – SIP Preconditions required – Resource Insufficient

Description

Confirm the DUT sends MO UPDATE message when QoS resource is insufficient for the voice call.

Related core specifications

GSMA NG.114, section 2.2.5

3GPP TS 24.229, RFC 3312, RFC 4032

Reason for test

Ensure that DUT sends MO UPDATE message when QoS resource is insufficient for the voice call.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxNR)

DUT and Client-1 are supporting SIP Precondition.

Network is supporting SIP Precondition.

QoS Resources insufficient for requested voice call codec.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, Receive MT Voice call from Client-1. | At DUT, check in SIP protocol messages:  - MO SESSION PROGRESS message indicates “Precondition” within the “Required” tag.  QoS is insufficient to setup the call.  - MO UPDATE message is sent to downgrade the codec to the bitrate that matches the bandwidth allocated for the dedicated bearer |
| 2 | Answer the call at DUT. | Confirm the voice call is established.  Confirm 2-way audio between DUT and Client-1. |
| 3 | End the voice call between DUT and Client-1. | Call is ended. |

#### 93.2.5.5 MO Video Call – SIP Preconditions required – Resource Unavailable

Description

Confirm the DUT sends MO UPDATE message when QoS resource is unavailable for the video call and establishes a voice call.

Related core specifications

GSMA NG.114, section 2.2.5

3GPP TS 24.229, RFC 3312, RFC 4032

Reason for test

Ensure that DUT sends MO UPDATE message when QoS resource is unavailable for the video call and establishes a voice call.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxNR)

DUT and Client-1 are supporting SIP Precondition.

Network is supporting SIP Precondition.

QoS Resources unavailable for a video call.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO Video call to Client-1. | At DUT, check in SIP protocol messages:  - MO INVITE message indicates “Precondition” within the “Supported” tag.  - MO INVITE message contains a=des: qos mandatory local “sendrecv”  - MO INVITE message contains a=des: qos optional remote “sendrecv”  QoS is unavailable to setup the call.  - MO UPDATE message is sent to downgrade the call to a voice call. |
| 2 | Answer the call at Client-1. | Confirm the voice call is established.  Confirm 2-way audio between DUT and Client-1. |
| 3 | End the voice call between DUT and Client-1. | Call is ended. |

#### 93.2.5.6 MT Video Call – SIP Preconditions required – Resource Unavailable

Description

Confirm the DUT sends MO UPDATE message when QoS resource is unavailable for the video call and establishes a voice call.

Related core specifications

GSMA NG.114, section 2.2.5

3GPP TS 24.229, RFC 3312, RFC 4032

Reason for test

Ensure that DUT sends MO UPDATE message when QoS resource is unavailable for the video call and establishes a voice call.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxNR)

DUT and Client-1 are supporting SIP Precondition.

Network is supporting SIP Precondition.

QoS Resources unavailable for a video call.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, Receive MT Video call from Client-1. | At DUT, check in SIP protocol messages:  - MO SESSION PROGRESS message indicates “Precondition” within the “Required” tag.  QoS is unavailable to setup the call.  - MO UPDATE message is sent to downgrade the call to a voice call. |
| 2 | Answer the call at DUT. | Confirm the voice call is established.  Confirm 2-way audio between DUT and Client-1. |
| 3 | End the voice call between DUT and Client-1. | Call is ended. |

#### 93.2.5.7 MO Video Call – SIP Preconditions required – Resource Insufficient

Description

Confirm the DUT sends MO UPDATE message when QoS resource is insufficient for the video call.

Related core specifications

GSMA NG.114, section 2.2.5

3GPP TS 24.229, RFC 3312, RFC 4032

Reason for test

Ensure that DUT sends MO UPDATE message when QoS resource is insufficient for the video call.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxNR)

DUT and Client-1 are supporting SIP Precondition.

Network is supporting SIP Precondition.

QoS Resources insufficient for requested video call codec.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO Video call to Client-1. | At DUT, check in SIP protocol messages:  - MO INVITE message indicates “Precondition” within the “Supported” tag.  - MO INVITE message contains a=des: qos mandatory local “sendrecv”  - MO INVITE message contains a=des: qos optional remote “sendrecv”  QoS is insufficient to setup the call.  - MO UPDATE message is sent to downgrade the video codec to a bitrate that matches the bandwidth allocated for the dedicated bearer. |
| 2 | Answer the call at Client-1. | Confirm the video call is established.  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1. |
| 3 | End the video call between DUT and Client-1. | Call is ended. |

#### 93.2.5.8 MT Video Call – SIP Preconditions required – Resource Insufficient

Description

Confirm the DUT sends MO UPDATE message when QoS resource is insufficient for the voice call.

Related core specifications

GSMA NG.114, section 2.2.5

3GPP TS 24.229, RFC 3312, RFC 4032

Reason for test

Ensure that DUT sends MO UPDATE message when QoS resource is insufficient for the voice call.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxNR)

DUT and Client-1 are supporting SIP Precondition.

Network is supporting SIP Precondition.

QoS Resources insufficient for requested voice call codec.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, Receive MT Video call from Client-1. | At DUT, check in SIP protocol messages:  - MO SESSION PROGRESS message indicates “Precondition” within the “Required” tag.  QoS is insufficient to setup the call.  - MO UPDATE message is sent to downgrade video codec to a bitrate that matches the bandwidth allocated for the dedicated bearer. |
| 2 | Answer the call at DUT. | Confirm the video call is established.  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1. |
| 3 | End the video call between DUT and Client-1. | Call is ended. |

### 93.2.6 Call Establishment Performance

#### 93.2.6.1 MO Voice Call – Establishment Setup time (Relative measurement)

Description

The DUT shall successfully establish an MO VxNR call within a sufficient setup time.

Related 3GPP core specifications

GSMA NG.114

Reason for test

To verify the DUT establishes an MO VxNR call within a sufficient setup time.

Initial configuration

DUT is successfully registered for IMS services (VxNR)

Reference-1, with similar capabilities to DUT is available and also registered for IMS services (VxNR)

Client-1 is any device that can receive MT voice calls.

DUT, Client-1, Reference-1 are in idle mode upon each call attempt

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1.  At DUT, measure the time from pressing the call button to when the ringing tone can be heard on DUT. | DUT establishes MO call setup and is ringing to indicate the call to Client-1 has been successfully negotiated.  The call setup time is recorded. |
| 2 | At DUT, end the call setup. | Call setup is ended. |
| 3 | At DUT, repeat steps 1 and 2 for 19 more attempts. | 20 call setup times in total are recorded on DUT.  Calculate an average call setup time. |
| 4 | At Reference-1, perform steps 1 and 2 for 20 attempts. | 20 call setup times in total are recorded on Reference-1.  Calculate an average call setup time. |
| 5 | Compare the setup time between DUT and Reference-1. | Call setup time is comparable between DUT and Reference-1 (DUT is no worse than 10% slower in call setup time). |

#### 93.2.6.2 MO Voice Call – Establishment Setup time (Absolute measurement)

Description

The DUT shall successfully establish an MO VxNR call within a sufficient setup time.

Related 3GPP core specifications

GSMA IR.92

Reason for test

To verify the DUT establishes an MO VxNR call within a sufficient setup time.

Initial configuration

Test is done under lab conditions (optimum RF signal, no contention with other devices, and sufficient bandwidth of eNodeB).

DUT is successfully registered for IMS services (VxNR)

Reference-1, with similar capabilities to DUT is available and also registered for IMS services (VxNR)

Client-1 is any device that can receive MT voice calls.

DUT, Client-1, Reference-1 are in idle mode upon each call attempt

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1.  At DUT, measure the time from pressing the call button to when the ringing tone can be heard on DUT. | DUT establishes MO call setup and is ringing to indicate the call to Client-1 has been successfully negotiated.  The call setup time is recorded. |
| 2 | At DUT, end the call setup. | Call setup is ended. |
| 3 | At DUT, repeat steps 1 and 2 for 19 more attempts. | 20 call setup times in total are recorded on DUT.  Calculate an average call setup time. |
| 4 | At Reference-1, perform steps 1 and 2 for 20 attempts. | 20 call setup times in total are recorded on Reference-1.  Calculate an average call setup time. |
| 5 | Compare the setup time between DUT and Reference-1. | Call setup time is comparable between DUT and Reference-1 (DUT is no worse than 10% slower in call setup time). |

#### 93.2.6.3 MO Voice Call – Establishment Success Rate (Relative measurement)

Description

The DUT shall successfully establish an MO VxNR call.

Related 3GPP core specifications

GSMA IR.92

Reason for test

To verify the DUT establishes an MO VxNR call over multiple attempts.

Initial configuration

DUT is successfully registered for IMS services (VxNR)

Reference-1, with similar capabilities to DUT is available and also registered for IMS services (VxNR)

Client-1 is any device that can receive MT voice calls.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1.  Answer call at Client-1. | Confirm the voice call is established.  Confirm 2-way audio between DUT and Client-1. |
| 2 | At DUT, end the call. | Call is ended. |
| 3 | At DUT, repeat steps 1 and 2 for 49 more attempts. | 50 calls in total are recorded on DUT. |
| 4 | At Reference-1, perform steps 1 and 2 for 50 attempts. | 50 calls in total are recorded on Reference-1. |
| 5 | Compare the success rate between DUT and Reference-1. | Call success rate is comparable between DUT and Reference-1 (DUT is no worse than 10% in call success rate). |

#### 93.2.6.4 MO Voice Call – Establishment Success Rate (Absolute measurement)

Description

The DUT shall successfully establish an MO VxNR call.

Related 3GPP core specifications

GSMA IR.92

Reason for test

To verify the DUT establishes an MO VxNR call over multiple attempts.

Initial configuration

Test is done under lab conditions (optimum RF signal, no contention with other devices, and sufficient bandwidth of eNodeB).

DUT is successfully registered for IMS services (VxNR)

Reference-1, with similar capabilities to DUT is available and also registered for IMS services (VxNR)

Client-1 is any device that can receive MT voice calls.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1.  Answer call at Client-1. | Confirm the voice call is established.  Confirm 2-way audio between DUT and Client-1. |
| 2 | At DUT, end the call. | Call is ended. |
| 3 | At DUT, repeat steps 1 and 2 for 49 more attempts. | 50 calls in total are recorded on DUT. |
| 4 | At Reference-1, perform steps 1 and 2 for 50 attempts. | 50 calls in total are recorded on Reference-1. |
| 5 | Compare the success rate between DUT and Reference-1. | Call success rate is comparable between DUT and Reference-1 (DUT is no worse than 10% in call success rate). |

#### 93.2.6.5 MT Voice Call – Establishment Success Rate (Relative measurement)

Description

The DUT shall successfully establish an MT VxNR call.

Related 3GPP core specifications

GSMA IR.92

Reason for test

To verify the DUT establishes an MT VxNR call over multiple attempts.

Initial configuration

DUT is successfully registered for IMS services (VxNR)

Reference-1, with similar capabilities to DUT is available and also registered for IMS services (VxNR)

Client-1 is any device that can make MO voice calls.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1.  Answer call at DUT. | Confirm the voice call is established.  Confirm 2-way audio between DUT and Client-1. |
| 2 | At Client-1, end the call. | Call is ended. |
| 3 | At DUT, repeat steps 1 and 2 for 49 more attempts. | 50 calls in total are recorded on DUT. |
| 4 | At Reference-1, perform steps 1 and 2 for 50 attempts. | 50 calls in total are recorded on Reference-1. |
| 5 | Compare the success rate between DUT and Reference-1. | Call success rate is comparable between DUT and Reference-1 (DUT is no worse than 10% in call success rate). |

#### 93.2.6.6 MT Voice Call – Establishment Success Rate (Absolute measurement)

Description

The DUT shall successfully establish an MT VxNR call.

Related 3GPP core specifications

GSMA IR.92

Reason for test

To verify the DUT establishes an MT VxNR call over multiple attempts.

Initial configuration

Test is done under lab conditions (optimum RF signal, no contention with other devices, and sufficient bandwidth of eNodeB).

DUT is successfully registered for IMS services (VxNR)

Reference-1, with similar capabilities to DUT is available and also registered for IMS services (VxNR)

Client-1 is any device that can make MO voice calls.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT voice call from Client-1.  Answer call at DUT. | Confirm the voice call is established.  Confirm 2-way audio between DUT and Client-1. |
| 2 | At Client-1, end the call. | Call is ended. |
| 3 | At DUT, repeat steps 1 and 2 for 49 more attempts. | 50 calls in total are recorded on DUT. |
| 4 | At Reference-1, perform steps 1 and 2 for 50 attempts. | 50 calls in total are recorded on Reference-1. |
| 5 | Compare the success rate between DUT and Reference-1. | Call success rate is comparable between DUT and Reference-1 (DUT is no worse than 10% in call success rate). |

#### 93.2.6.7 MO Video Call – Establishment Setup Time (Relative measurement)

Description

The DUT shall successfully establish an MO video call within a sufficient setup time.

Related 3GPP core specifications

GSMA IR.94

Reason for test

To verify the DUT establishes an MO video call within a sufficient setup time.

Initial configuration

Reference-1 with similar capabilities to DUT is available

DUT, Client-1and Reference-1 are successfully registered for IMS services (VxNR).

DUT, Client-1, Reference-1 are in idle mode upon each call attempt

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO video call to Client-1.  At DUT, measure the time from pressing the call button to when the ringing tone can be heard on DUT. | Ringing tone is heard on DUT.  The video call setup time is recorded. |
| 2 | At DUT, end the video call setup. | Call setup is ended. |
| 3 | At DUT, repeat steps 1 and 2 for 19 more attempts. | Calculate an average video call setup time of 20 times on DUT. |
| 4 | At Reference-1, perform steps 1 and 2 for 20 attempts. | Video call setup times are recorded on Reference-1.  Calculate an average video call setup time of 20 times. |
| 5 | Compare the setup time between DUT and Reference-1. | Video call setup time is comparable between DUT and Reference-1 (DUT is no worse than 10% slower in video call setup time). |

#### 93.2.6.8 Void

#### 93.2.6.9 MO Video Call – Establishment Success Rate (Relative measurement)

Description

The DUT shall successfully establish an MO video call.

Related 3GPP core specifications

GSMA IR.94

Reason for test

To verify the DUT establishes an MO video call over multiple attempts.

Initial configuration

Reference-1 with similar capabilities to DUT is available

DUT, Client-1and Reference-1 are successfully registered for IMS services (VxNR).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO video call to Client-1.  Answer the call at Client-1. | Confirm 2-way video stream between DUT and Client-1 |
| 2 | At DUT, end the video call. | Video call is ended. |
| 3 | At DUT, repeat steps 1 and 2 for 49 more attempts. | Calculate video call success rate on DUT. |
| 4 | At Reference-1, perform steps 1 and 2 for 50 attempts. | Calculate video call success rate on Reference-1. |
| 5 | Compare the call success rate between DUT and Reference-1. | Video call success rate is comparable between DUT and Reference-1 (DUT is no worse than 10% in video call success rate). |

#### 93.2.6.10 MT Video Call – Establishment Success Rate (Relative measurement)

Description

The DUT shall successfully establish an MT video call.

Related 3GPP core specifications

GSMA IR.94

Reason for test

To verify the DUT establishes an MT video call over multiple attempts.

Initial configuration

Reference-1 with similar capabilities to DUT is available

DUT, Client-1 and Reference-1 are successfully registered for IMS services (VxNR).

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, receive MT video call from Client-1.  Answer the call at DUT. | Confirm 2-way video stream between DUT and Client-1 |
| 2 | At Client-1, end the video call. | Video call is ended. |
| 3 | At DUT, repeat steps 1 and 2 for 49 more attempts. | Calculate video call success rate on DUT. |
| 4 | At Reference-1, perform steps 1 and 2 for 50 attempts. | Calculate video call success rate on Reference-1. |
| 5 | Compare the call success rate between DUT and Reference-1. | Video call success rate is comparable between DUT and Reference-1 (DUT is no worse than 10% in video call success rate). |

#### 93.2.6.11 MO Video Call – Establishment Setup Time (Absolute measurement)

Description

The DUT shall successfully establish an MO video call within a sufficient setup time.

Related 3GPP core specifications

GSMA IR.94

Reason for test

To verify the DUT establishes an MO video call within a sufficient setup time.

Initial configuration

Test is done under lab conditions (optimum RF signal and sufficient bandwidth of eNodeB).

DUT and Client-1 are successfully registered for IMS services (VxNR).

DUT; Client-1 are in idle mode.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO video call to Client-1.  At DUT, measure the time from pressing the call button to when the ringing tone can be heard on DUT. | Ringing tone is heard on DUT.  The video call setup time is recorded. |
| 2 | At DUT, end the video call setup. | Call setup is ended. |
| 3 | At DUT, repeat steps 1 and 2 for 9 more attempts. | Record the video call setup time for each attempt on DUT.  Calculate and record an average video call setup time of 20 times on DUT. |

#### 93.2.6.12 Void

## 93.3 VxNR - SMS

### 93.3.1 SMS over VxNR (Supported by Network)

#### 93.3.1.1 SMS over VxNR - MO SMS

Description

Verify the DUT can successfully send an MO SMS via VxNR.

Related core specifications

3GPP TS 24.341; 24.229

GSMA NG.114

Reason for test

To verify the DUT is able to send an MO SMS over IMS.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxNR).

The DUT supports MO SMS over IMS.

The IMS server supports MO SMS over IMS.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Using the DUT messaging application, create a new SMS and enter the MSISDN of Client-1 as the recipient.  Enter 160 characters (1 segment) in the SMS text. | The SMS is created. |
| 2 | Send the SMS to Client-1 | At DUT, check in SIP protocol messages:  - MO MESSAGE message.  SMS is successfully received on Client 1.  The message content is identical to the message prepared on DUT. |

#### 93.3.1.2 SMS over VxNR - MT SMS

Description

Verify the DUT can successfully receive an MT SMS via VxNR.

Related core specifications

3GPP TS 24.341; 24.229

GSMA NG.114

Reason for test

To verify the DUT can receive an MT SMS over VxNR.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxNR).

The DUT supports MT SMS over IMS.

The IMS server supports MT SMS over IMS.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At Client-1, create a new SMS and enter the MSISDN of DUT as the recipient.  Enter 160 characters (1 segment) in the SMS text. | The SMS is created. |
| 2 | Send the SMS to DUT | At DUT, check in SIP protocol messages:  - MT MESSAGE message.  SMS is successfully received on DUT.  The message content is identical to the message prepared on Client-1. |

### 93.3.2 SMS over VxNR (Not supported by Network)

#### 93.3.2.1 SMS over VxNR (Not supported by Network) - MO SMS over NAS

Description

Verify the DUT can successfully send an MO SMS via NAS when the IMS server is not supporting MO SMS over IMS.

Related core specifications

3GPP TS 24.341; TS 23.272; TS 23.221; TS 25.301; TS 24.167

GSMA NG.114

Reason for test

To verify the DUT is able to send an MO SMS over NAS when the IMS server is not supporting MO SMS over IMS.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxNR).

The DUT supports MO SMS over IMS and MO SMS over NAS.

The IMS server does not support MO SMS over IMS.

The 5GCN supports SMS over NAS

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Using the DUT messaging application, create a new SMS and enter the MSISDN of Client-1 as the recipient.  Enter 160 characters (1 segment) in the SMS text. | The SMS is created. |
| 2 | Send the SMS to Client-1 | At DUT, check in SIP protocol messages:  - There is no MO MESSAGE.  DUT sends SMS message using UL NAS TRANSPORT procedure  SMS is successfully received on Client 1.  The message content is identical to the message prepared on DUT. |

#### 93.3.2.2 SMS over VxNR (Not supported by Network) - MT SMS over NAS

Description

Verify the DUT can successfully receive an MT SMS via NAS when the IMS server is not supporting MT SMS over IMS.

Related core specifications

3GPP TS 24.341; TS 23.272; TS 23.221; TS 25.301; TS 24.167

GSMA NG.114

Reason for test

To verify the DUT is able to receive an MT SMS over NAS when the IMS server is not supporting MT SMS over IMS.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxNR).

The DUT supports MT SMS over IMS and MT SMS over NAS.

The IMS server does not support MT SMS over IMS.

The 5GCN supports SMS over NAS

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At Client-1, create a new SMS and enter the MSISDN of DUT as the recipient.  Enter 160 characters (1 segment) in the SMS text. | The SMS is created. |
| 2 | Send the SMS to DUT | At DUT, check in SIP protocol messages:  - There is no MT MESSAGE.  SMS is successfully received on DUT upon reception of DL NAS TRANSPORT message.  The message content is identical to the message prepared on Client-1. |

## 93.4 VxNR - Supplementary Services

### 93.4.1 Supplementary Services via VxNR (Supported by network)

#### 93.4.1.1 Communication Forwarding Unconditional (CFU)

Description

The DUT must be able to register/activate and erase/deactivate the Communication Diversion successfully over Ut/XCAP while registered for IMS services. When activated, the voice call shall be forwarded as expected for the Communication Diversion configured in the DUT.

Related core specifications

3GPP TS 24.229, TS 24.604

GSMA NG.114

Reason for test

To confirm the DUT is able to successfully register/activate and erase/deactivate Communication Forwarding Unconditional over Ut/XCAP when registered for IMS services.

Initial Configuration

Network under test supports Communication Diversion over Ut/XCAP.

DUT is successfully registered for IMS services (VxNR)

All Communication Forwarding are erased at DUT.

Client-1 and Client-2 required.

|  |  |  |
| --- | --- | --- |
| - | Test procedure | Expected behaviour |
| 1 | At DUT register CFU to MSISDN of Client-1. | Confirm DUT indicates CFU is activated.  Confirm DUT used Ut/XCAP protocol. |
| 2 | At DUT interrogate the status of CFU. | Confirm DUT indicates CFU is activated to MSISDN of Client-1.  Confirm DUT used Ut/XCAP protocol. |
| 3 | At Client-2 make MO voice call to DUT. | Confirm the voice call from Client-2 is forwarded to Client-1.  Confirm DUT shows no indication of the voice call from Client-2. |
| 4 | At Client-2 end the call. | Call is ended. |
| 5 | At DUT deactivate CFU. | Confirm DUT indicates CFU is deactivated.  Confirm DUT used Ut/XCAP protocol. |
| 6 | At DUT interrogate the status of CFU. | Confirm DUT indicates CFU is deactivated.  Confirm DUT used Ut/XCAP protocol.  Confirm MSISDN of Client-1 is still set as the destination number, even though the service is deactivated. |
| 7 | At DUT activate CFU. | Confirm DUT indicates CFU is activated.  Confirm DUT used Ut/XCAP protocol. |
| 8 | At DUT interrogate the status of CFU. | Confirm DUT indicates CFU is activated to MSISDN of Client-1.  Confirm DUT used Ut/XCAP protocol.  Confirm MSISDN of Client-1 is displayed as the destination number. |
| 9 | At DUT erase CFU to MSISDN of Client-1. | Confirm DUT indicates CFU is erased.  Confirm DUT used Ut/XCAP protocol. |
| 10 | At DUT interrogate the status of CFU. | Confirm DUT indicates CFU is deactivated.  Confirm DUT used Ut/XCAP protocol.  Confirm no destination number is pre-set anymore. |
| 11 | At Client-2 make MO voice call to DUT. | Confirm the voice call from Client-2 is received successfully on DUT. |
| 12 | End the voice call between DUT and Client-2. | Call is ended. |

#### 93.4.1.2 Communication Forwarding on Busy User (CFB)

Description

The DUT must be able to register/activate and erase/deactivate the Communication Diversion successfully over XCAP while registered for IMS service. When activated, the voice call shall be forwarded as expected for the Communication Diversion configured in the DUT.

Related core specifications

3GPP TS 24.229, TS 24.604

GSMA NG.114

Reason for test

To confirm the DUT is able to successfully register/activate and erase/deactivate Communication Forwarding on Busy User over XCAP when registered for IMS services.

Initial Configuration

Network under test supports Communication Diversion over Ut/XCAP.

DUT is successfully registered for IMS services (VxNR)

All Communication Forwarding are erased at DUT.

Communication Waiting is deactivated on DUT.

Client-1, Client-2 and Client-3 required.

|  |  |  |
| --- | --- | --- |
| - | Test procedure | Expected behaviour |
| 1 | At DUT register CFB to MSISDN of Client-1. | Confirm DUT indicates CFB is activated.  Confirm DUT used Ut/XCAP protocol. |
| 2 | At DUT interrogate the status of CFB. | Confirm DUT indicates CFB is activated to MSISDN of Client-1.  Confirm DUT used Ut/XCAP protocol. |
| 3 | At DUT make MO voice call to Client-3. | Confirm the voice call is established. |
| 4 | At Client-2 make MO voice call to DUT. | Confirm the voice call from Client-2 is forwarded to Client-1.  Confirm DUT shows no indication of the voice call from Client-2. |
| 5 | At Client-2 end the call. | Call is ended. |
| 6 | At DUT end the call. | Call is ended. |
| 7 | At DUT deactivate CFB. | Confirm DUT indicates CFB is deactivated.  Confirm DUT used Ut/XCAP protocol. |
| 8 | At DUT interrogate the status of CFB. | Confirm DUT indicates CFB is deactivated.  Confirm DUT used Ut/XCAP protocol.  Confirm MSISDN of Client-1 is still set as the destination number, even though the service is deactivated. |
| 9 | At DUT activate CFB. | Confirm DUT indicates CFB is activated.  Confirm DUT used Ut/XCAP protocol. |
| 10 | At DUT interrogate the status of CFB. | Confirm DUT indicates CFB is activated to MSISDN of Client-1.  Confirm DUT used Ut/XCAP protocol.  Confirm MSISDN of Client-1 is displayed as the destination number. |
| 11 | At DUT erase CFB to MSISDN of Client-1. | Confirm DUT indicates CFB is erased.  Confirm DUT used Ut/XCAP protocol. |
| 12 | At DUT interrogate the status of CFB. | Confirm DUT indicates CFB is deactivated.  Confirm DUT used Ut/XCAP protocol.  Confirm no destination number is pre-set anymore. |
| 13 | At DUT make MO voice call to Client-3. | Confirm the voice call is established. |
| 14 | At Client-2 make MO voice call to DUT. | Confirm Client-2 displays a notification that DUT is busy in another call (audible/visual) and the call is not forwarded. |
| 15 | End the voice call between DUT and Client-3. | Call is ended. |

#### 93.4.1.3 Communication Waiting (CW) – Invocation – Activated in DUT – Accept and Hold

Description

For Terminal based Communication Waiting, the operation is handled at the DUT. When a second incoming call is received, the DUT must handle the call according to the DUT Communication Waiting status.

Related core specifications

GSMA NG.114

3GPP TS 24.615

Reason for test

To verify when Terminal based Communication Waiting is activated and the DUT is in an ongoing voice call, the DUT indicates to the user when a 2nd incoming call is received. If the 2nd incoming call is answered, the initial call can be placed on hold.

Initial configuration

Communication Waiting is activated in the network.

DUT is successfully registered for IMS services (VxNR)

Communication Waiting is activated in the DUT.

Client-1 and Client-2 required.

**Scenario A**: Voice

|  |  |  |
| --- | --- | --- |
| - | Test procedure | Expected behaviour |
| 1 | At DUT, make MO Voice call to Client-1. | Confirm Voice call with Client-1 is established.  Confirm 2-way audio. |
| 2 | At DUT, receive MT Voice call from Client-2. | Confirm DUT has an audible / visual notification that a 2nd incoming call from Client-2 is waiting. |
| 3 | At DUT, accept the Voice call from Client-2 and put the Voice call with Client-1 on hold. | Confirm DUT puts Client-1 on hold.  Confirm Voice call with Client-2 is established. Confirm 2-way audio. |
| 4 | At Client-1, end the call with DUT. | Confirm the held call with Client-1 is released.  Confirm the active call with Client-2 is stable with 2-way audio. |
| 5 | At DUT, end all calls. | Confirm all calls are released. |

**Scenario B:** Video

|  |  |  |
| --- | --- | --- |
| - | Test procedure | Expected behaviour |
| 1 | At DUT, make MO Video call to Client-1. | Confirm Video call with Client-1 is established.  Confirm 2-way audio.  Confirm 2-way video media stream between DUT and Client-1. |
| 2 | At DUT, receive MT Voice call from Client-2. | Confirm DUT has an audible / visual notification that a 2nd incoming call from Client-2 is waiting. |
| 3 | At DUT, accept the Voice call from Client-2 and put the Video call with Client-1 on hold. | Confirm DUT puts Client-1 on hold.  Confirm Voice call with Client-2 is established. Confirm 2-way audio. |
| 4 | At Client-1, end the call with DUT. | Confirm the held call with Client-1 is released.  Confirm the active call with Client-2 is stable with 2-way audio. |
| 5 | At DUT, end all calls. | Confirm all calls are released. |

#### 93.4.1.4 MO & MT Voice Communication Hold

Description

MO and MT Communication Hold operation during an IMS Voice call

Related core specifications

3GPP TS 24.173, 3GPP TS 24.610

GSMA NG.114

Reason for test

To ensure there is no audio in either direction when the call is placed on hold by both parties. There is only 2-way audio when both parties have retrieved the call.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxNR)

DUT is an ongoing Voice call with Client-1.

|  |  |  |
| --- | --- | --- |
| - | Test procedure | Expected behaviour |
| 1 | At DUT, place Client-1 on hold using the menu option. | Confirm there is a visible indication on the DUT that the call is held.  Confirm there is no audio on invoking side (DUT) |
| 2 | Wait 15 seconds. | Confirm call is on hold in 1 direction (Held by DUT). |
| 3 | At Client-1, place DUT on hold. | Confirm there is a visible notification on the DUT that the call has been placed on hold (if supported by server).  Confirm there is no audio in either direction. |
| 4 | Wait 15 seconds. | Confirm call is on hold in both directions (Held by DUT and Client-1). |
| 5 | At DUT, retrieve the call using the menu option. | Confirm the call from DUT to Client-1 is retrieved but there is still no audio in either direction because the call from Client-1 to DUT remains held.  If supported by the network – an announcement will be played at held party instead of no audio in both directions. |
| 6 | Wait 15 seconds. | Confirm call is on hold in 1 direction (Held by Client-1). |
| 7 | At Client-1, retrieve the call. | Confirm the call with DUT is restored.  Confirm there is a visible notification on the DUT that the call has been retrieved (if supported by server).  Confirm 2-way audio between DUT and Client-1. |
| 8 | At DUT, end the voice call. | Confirm the call is successfully ended. |

## 93.5 VxNR – Service Interworking

### 93.5.1 Voice with Data Transfer

#### 93.5.1.1 Voice Call setup during Active Data Transfer

Description

The DUT shall successfully setup a VxNR call during an active data transfer.

Related 3GPP core specifications

3GPP TS 24.229

Reason for test

To verify the DUT can successfully setup a VxNR call during an active data transfer Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxNR).

If the DUT is supporting a Carrier Aggregation combination of the network then this shall be used when performing the active data transfer.

|  |  |  |
| --- | --- | --- |
|  | **Test procedure** | Expected behaviour |
| 1 | At DUT, download a large file from an external server.  Note:  This can be via an internal FTP application or via a tethered laptop connection. | Data transfer is ongoing on DUT.  (If DUT is supporting a Carrier Aggregation of the network then CA is successfully established). |
| 2 | At DUT, make MO voice call to Client-1. | Call is successfully established over VxNR.  Confirm 2-way audio between DUT and Client-1.  Data transfer is ongoing on DUT. |
| 3 | At DUT, end the voice call with Client-1. | Call is ended.  Data transfer is ongoing on DUT. |
| 4 | At DUT, receive MT voice call from Client-1. | Call is successfully established over VxNR.  Confirm 2-way audio between DUT and Client-1.  Data transfer is ongoing on DUT. |
| 5 | At Client-1, end the voice call with DUT. | Call is ended.  Data transfer is ongoing on DUT. |
| 6 | End the data download. | Data transfer is stopped. |

#### 93.5.1.2 Data Transfer setup during Active Voice Call

Description

The DUT shall successfully perform data transfer during an ongoing VxNR call.

Related 3GPP core specifications

3GPP TS 24.229

Reason for test

To verify the DUT can perform data transfer during an ongoing VxNR call

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxNR).

If the DUT is supporting a Carrier Aggregation combination of the network then this shall be used when performing the active data transfer.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1. | Call is successfully established over VxNR.  Confirm 2-way audio between DUT and Client-1. |
| 2 | At DUT, download a large file from an external server.  Note:  This can be via an internal FTP application or via a tethered laptop connection. | Data transfer is ongoing on DUT.  (If DUT is supporting a Carrier Aggregation of the network then CA is successfully established).  Call is ongoing with Client-1. |
| 3 | End the data download. | Data transfer is stopped.  Call is ongoing with Client-1. |
| 4 | At DUT, end the voice call with Client-1. | Call is ended. |

#### 93.5.1.3 Voice Call setup during Active Data Transfer over Wi-Fi

Description

The DUT shall successfully setup a VxNR call during an active data transfer over Wi-Fi.

Related 3GPP core specifications

3GPP TS 24.229

Reason for test

To verify the DUT can successfully setup a VxNR call during an active data transfer over Wi-Fi.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxNR).

DUT preference for internet is access is Wi-Fi preferred, Mobile data secondary.

DUT has VxWi-Fi calling disabled in the menu (or is not supporting VxWi-Fi).

Wi-Fi hotspot that provides a connection to the internet is available.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT open the browser and load the page “www.whatismyip.com”.  This will display the IP address and ISP for the 5G SA network the DUT is registered on.  Make a note of these. | IP address and ISP is displayed. |
| 2 | At DUT, enable Wi-Fi and connect to the Wi-Fi hotspot. | DUT displays the Wi-Fi connection icon to indicate it is connected to the Wi-Fi hotspot.  DUT still displays the VxNR icon to indicate VxNR calls are available according to the ustomization requirement. |
| 3 | At DUT open the browser and load the page “www.whatismyip.com”.  This will display the IP address and ISP for the Wi-Fi network the DUT is registered on.  Make a note of these. | IP address and ISP is displayed.  The IP and ISP in this step should be different to that in step 1. |
| 4 | At DUT, download a large file from an external server. | Data transfer is ongoing over Wi-Fi on DUT. |
| 5 | At DUT, make MO voice call to Client-1. | Call is successfully established over VxNR.  Confirm 2-way audio between DUT and Client-1.  Data transfer over Wi-Fi is ongoing on DUT. |
| 6 | At DUT, end the voice call with Client-1. | Call is ended.  Data transfer over Wi-Fi is ongoing on DUT. |
| 7 | End the data download. | Data transfer is stopped. |
| 8 | At DUT, disable Wi-Fi. | Wi-Fi connection icon disappears.  DUT still displays the VxNR icon to indicate VxNR calls are available according to the ustomization requirement. |

#### 93.5.1.4 Data Transfer over Wi-Fi setup during Active Voice Call

Description

The DUT shall successfully perform data transfer over Wi-Fi during an ongoing VxNR call.

Related 3GPP core specifications

3GPP TS 24.229

Reason for test

To verify the DUT can perform data transfer over Wi-Fi during an ongoing VxNR call.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxNR).

DUT preference for internet is access is Wi-Fi preferred, Mobile data secondary.

DUT has VxWi-Fi calling disabled in the menu (or is not supporting VxWi-Fi).

Wi-Fi hotspot that provides a connection to the internet is available.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT open the browser and load the page “www.whatismyip.com”.  This will display the IP address and ISP for the 5G SA network the DUT is registered on.  Make a note of these. | IP address and ISP is displayed. |
| 2 | At DUT, make MO voice call to Client-1. | Call is successfully established over VxNR.  Confirm 2-way audio between DUT and Client-1. |
| 3 | At DUT, enable Wi-Fi and connect to the Wi-Fi hotspot. | DUT displays the Wi-Fi connection icon to indicate it is connected to the Wi-Fi hotspot.  Call is ongoing with Client-1. |
| 4 | At DUT open the browser and load the page “www.whatismyip.com”.  This will display the IP address and ISP for the Wi-Fi network the DUT is registered on.  Make a note of these. | IP address and ISP is displayed.  The IP and ISP in this step should be different to that in step 1. |
| 5 | At DUT, download a large file from an external server. | Data transfer is ongoing over Wi-Fi on DUT.  Call is ongoing with Client-1. |
| 6 | End the data download. | Data transfer is stopped.  Call is ongoing with Client-1. |
| 7 | At DUT, disable Wi-Fi. | Wi-Fi connection icon disappears.  Call is ongoing with Client-1. |
| 8 | At DUT, end the voice call with Client-1. | Call is ended.  DUT still displays the VxNR icon to indicate VxNR calls are available according to the ustomization requirement. |

### 93.5.2 Video with Data Transfer

#### 93.5.2.1 Video Call setup during Active Data Transfer

Description

The DUT shall successfully setup a VxNR call during an active data transfer.

Related 3GPP core specifications

3GPP TS 24.229

Reason for test

To verify the DUT can successfully setup a VxNR call during an active data transfer.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxNR).

If the DUT is supporting a Carrier Aggregation combination of the network then this shall be used when performing the active data transfer.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, download a large file from an external server.  Note:  This can be via an internal FTP application or via a tethered laptop connection. | Data transfer is ongoing on DUT.  (If DUT is supporting a Carrier Aggregation of the network then CA is successfully established). |
| 2 | At DUT, make MO video call to Client-1. | Call is successfully established over VxNR.  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1.  Data transfer is ongoing on DUT. |
| 3 | At DUT, end the video call with Client-1. | Call is ended.  Data transfer is ongoing on DUT. |
| 4 | At DUT, receive MT video call from Client-1. | Call is successfully established over VxNR.  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1.  Data transfer is ongoing on DUT. |
| 5 | At Client-1, end the video call with DUT. | Call is ended.  Data transfer is ongoing on DUT. |
| 6 | End the data download. | Data transfer is stopped. |

#### 93.5.2.2 Data Transfer setup during Active Video Call

Description

The DUT shall successfully perform data transfer during an ongoing VxNR call.

Related 3GPP core specifications

3GPP TS 24.229

Reason for test

To verify the DUT can perform data transfer during an ongoing VxNR call.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxNR).

If the DUT is supporting a Carrier Aggregation combination of the network then this shall be used when performing the active data transfer.

|  |  |  |
| --- | --- | --- |
|  | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO video call to Client-1. | Call is successfully established over VxNR.  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1. |
| 2 | At DUT, download a large file from an external server.  Note:  This can be via an internal FTP application or via a tethered laptop connection. | Data transfer is ongoing on DUT.  (If DUT is supporting a Carrier Aggregation of the network then CA is successfully established).  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1. |
| 3 | End the data download. | Data transfer is stopped.  Call is ongoing with Client-1. |
| 4 | At DUT, end the video call with Client-1. | Call is ended. |

#### 93.5.2.3 Video Call setup during Active Data Transfer over Wi-Fi

Description

The DUT shall successfully setup a VxNR call during an active data transfer over Wi-Fi.

Related 3GPP core specifications

3GPP TS 24.229

Reason for test

To verify the DUT can successfully setup a VxNR call during an active data transfer over Wi-Fi.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxNR).

DUT preference for internet is access is Wi-Fi preferred, Mobile data secondary.

DUT has VxWi-Fi calling disabled in the menu (or is not supporting VxWi-Fi).

Wi-Fi hotspot that provides a connection to the internet is available.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT open the browser and load the page “www.whatismyip.com”.  This will display the IP address and ISP for the 5G SA network the DUT is registered on.  Make a note of these. | IP address and ISP is displayed. |
| 2 | At DUT, enable Wi-Fi and connect to the Wi-Fi hotspot. | DUT displays the Wi-Fi connection icon to indicate it is connected to the Wi-Fi hotspot.  DUT still displays the VxNR icon to indicate VxNR calls are available according to the ustomization requirement. |
| 3 | At DUT open the browser and load the page “www.whatismyip.com”.  This will display the IP address and ISP for the Wi-Fi network the DUT is registered on.  Make a note of these. | IP address and ISP is displayed.  The IP and ISP in this step should be different to that in step 1. |
| 4 | At DUT, download a large file from an external server. | Data transfer is ongoing over Wi-Fi on DUT. |
| 5 | At DUT, make MO video call to Client-1. | Call is successfully established over VxNR.  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1.  Data transfer over Wi-Fi is ongoing on DUT. |
| 6 | At DUT, end the video call with Client-1. | Call is ended.  Data transfer over Wi-Fi is ongoing on DUT. |
| 7 | End the data download. | Data transfer is stopped. |
| 8 | At DUT, disable Wi-Fi. | Wi-Fi connection icon disappears.  DUT still displays the VxNR icon to indicate VxNR calls are available according to the ustomization requirement. |

#### 93.5.2.4 Data Transfer over Wi-Fi setup during Active Video Call

Description

The DUT shall successfully perform data transfer over Wi-Fi during an ongoing VxNR call.

Related 3GPP core specifications

3GPP TS 24.229

Reason for test

To verify the DUT can perform data transfer over Wi-Fi during an ongoing VxNR call.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxNR).

DUT preference for internet is access is Wi-Fi preferred, Mobile data secondary.

DUT has VxWi-Fi calling disabled in the menu (or is not supporting VxWi-Fi).

Wi-Fi hotspot that provides a connection to the internet is available.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT open the browser and load the page “www.whatismyip.com”.  This will display the IP address and ISP for the 5G SA network the DUT is registered on.  Make a note of these. | IP address and ISP is displayed. |
| 2 | At DUT, make MO video call to Client-1. | Call is successfully established over VxNR.  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1. |
| 3 | At DUT, enable Wi-Fi and connect to the Wi-Fi hotspot. | DUT displays the Wi-Fi connection icon to indicate it is connected to the Wi-Fi hotspot.  Call is ongoing with Client-1. |
| 4 | At DUT open the browser and load the page “www.whatismyip.com”.  This will display the IP address and ISP for the Wi-Fi network the DUT is registered on.  Make a note of these. | IP address and ISP is displayed.  The IP and ISP in this step should be different to that in step 1. |
| 5 | At DUT, download a large file from an external server. | Data transfer is ongoing over Wi-Fi on DUT.  Call is ongoing with Client-1. |
| 6 | End the data download. | Data transfer is stopped.  Call is ongoing with Client-1. |
| 7 | At DUT, disable Wi-Fi. | Wi-Fi connection icon disappears.  Call is ongoing with Client-1. |
| 8 | At DUT, end the video call with Client-1. | Call is ended.  DUT still displays the VxNR icon to indicate VxNR calls are available according to the ustomization requirement. |

## 93.6 VxNR- Mobility

### 93.6.1 Service Reselection

#### 93.6.1.1 Service Reselection – NG to E-UTRA – Idle

Description

This test case checks if the DUT is VxNR registered and moves to an area where NG-RAN network is not available, it can successfully establish MO and MT voice calls using VxLTE in E-UTRAN.

Related core specifications

GSMA IR.92; NG.114

Reason for test

The DUT must be able to perform MO and MT voice calls when changing RAT between NG-RAN and E-UTRAN.

Initial Configuration

Network is supporting NG-RAN and E-UTRAN.

Network supports IMS services on both RAT

DUT is configured to LTE/5G mode (or tested in an area where the only available networks are E-UTRAN and NG-RAN).

DUT is successfully registered for IMS services (VxNR) in NG-RAN

DUT is in IDLE state.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Move DUT to an area where no NG-RAN network is available, so it reselects to a E-UTRAN network. | DUT reselects from NG-RAN to E-UTRAN and performs a Tracking Area update procedure.  DUT does not send a new REGISTER message upon RAT change  DUT displays VxLTE service indication. |
| 2 | At DUT, Receive MT voice call Client-1. | Call is successfully established in IMS domain with 2-way audio. |
| 3 | End the voice call between DUT and Client-1. | Call is ended. |
| 4 | At DUT, make MO voice call to Client-1. | Call is successfully established in IMS domain with 2-way audio. |
| 5 | End the voice call between DUT and Client-1. | Call is ended. |

#### 93.6.1.2 Service Reselection – E-UTRA to NG – Idle

Description

This test case checks if the DUT is VxLTE registered in E-UTRAN and moves to an area where NG-RAN network is available, it can successfully establish MO and MT voice calls using VxNR in NG-RAN

Related core specifications

GSMA IR.92; NG.114

Reason for test

The DUT must be able to perform MO and MT voice calls when changing RAT between E-UTRAN and NG-RAN.

Initial Configuration

Network is supporting E-UTRAN and NG-RAN.

Network supports IMS services on both RAT

DUT is configured to LTE/5G mode (or tested in an area where the only available networks are E-UTRAN and NG-RAN).

DUT is successfully registered for IMS services (VxLTE) in E-UTRAN

DUT is in IDLE state.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Move DUT to an area where no E-UTRAN network is available, so it reselects to a NG-RAN network. | DUT reselects from E-UTRAN to NG-RAN and performs a Registration Update procedure.  DUT does not send a new REGISTER message upon RAT change  DUT displays VxNR service indication. |
| 2 | At DUT, Receive MT voice call Client-1. | Call is successfully established in IMS domain with 2-way audio. |
| 3 | End the voice call between DUT and Client-1. | Call is ended. |
| 4 | At DUT, make MO voice call to Client-1. | Call is successfully established in IMS domain with 2-way audio. |
| 5 | End the voice call between DUT and Client-1. | Call is ended. |

### 93.6.2 Service continuity after Handover/Release redirect

#### 93.6.2.1 VxNR to VxLTE Service – During Data Transfer

Description

This test case checks if the DUT is VxNR registered with an active data transfer ongoing, moves to an area where VxNR network is not available, it can successfully establish MO and MT voice calls over VxLTE.

Related core specifications

GSMA IR.92; NG.114

Reason for test

The DUT must be able to perform MO and MT voice calls when changing RAT between 5G SA and E-UTRAN.

**Initial Configuration**

Network is supporting 5G SA and E-UTRAN.

Network supports VxNR and VxLTE services

DUT is configured to have only 5G/E-UTRAN (or tested in an area where the only available networks are E-UTRAN and 5G SA).

DUT is successfully registered for IMS services (VxNR).

DUT is in CONNECTED state with an ongoing data transfer.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Move DUT to an area where no 5G SA network is available so the network performs a Handover / Release redirect to a E-UTRAN network. | DUT performs Handover / Release redirect from 5G SA to E-UTRAN.  Confirm data transfer continues in the E-UTRAN network. |
| 2 | At DUT, Receive MT voice call Client-1. | Call is successfully established in VxLTE domain with 2-way audio. |
| 3 | End the voice call between DUT and Client-1. | Call is ended. |
| 4 | At DUT, make MO voice call to Client-1. | Call is successfully established in VxLTE domain with 2-way audio. |
| 5 | End the voice call between DUT and Client-1. | Call is ended. |
| 6 | End the data transfer at DUT. | Data transfer is stopped. |

#### 93.6.2.2 VxLTE to VxNR Service – During Data Transfer

Description

This test case checks if the DUT moves from E-UTRAN with VxLTE support to a VxNR supported 5G SA network during an active data transfer, it is able to successfully making and receiving calls over VxNR.

This test case checks if the DUT is VxLTE registered with an active data transfer ongoing, moves to an area where VxNR network is available, it can successfully establish MO and MT voice calls over VxNR

Related core specifications

GSMA IR.92; NG.114

Reason for test

The DUT must be able to perform MO and MT voice calls when changing RAT between 5G SA and E-UTRAN.

Initial Configuration

Network is supporting 5G SA and E-UTRAN.

Network supports VxNR and VxLTE services

DUT is configured to have only 5G/E-UTRAN (or tested in an area where the only available networks are E-UTRAN and 5G SA).

DUT is successfully registered for IMS services (VxNR).

DUT is in CONNECTED state with an ongoing data transfer.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | Move DUT to an area where 5G SA network is available so the network performs a Handover / Release redirect to 5G SA network. | DUT performs Handover / Release redirect from E-UTRAN to 5G SA.  Confirm data transfer continues in the 5G SA network. |
| 2 | At DUT, Receive MT voice call Client-1. | Call is successfully established in VxNR with 2-way audio. |
| 3 | End the voice call between DUT and Client-1. | Call is ended. |
| 4 | At DUT, make MO voice call to Client-1. | Call is successfully established in VxNR with 2-way audio. |
| 5 | End the voice call between DUT and Client-1. | Call is ended. |
| 6 | End the data transfer at DUT. | Data transfer is stopped. |

#### 93.6.2.3 VxNR to VxLTE Service – 1 Active Call, 1 Held Call

Description

The DUT shall successfully perform RAT change from 5G SA to E-UTRAN while a call is held and a 2nd call is active.

Related core specifications

GSMA IR.92; NG.114

Reason for test

The DUT must be able to successfully maintain multiple voice calls when changing RAT between 5G SA and E-UTRAN.

**Initial Configuration**

Network is supporting 5G SA and E-UTRAN.

Network supports VxNR and VxLTE services  
DUT is configured to have only 5G/E-UTRAN (or tested in an area where the only available networks are E-UTRAN and 5G SA).

DUT is successfully registered for IMS services (VxNR).

Client-1 and Client-2 are in a static location where no cell changes will occur

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1. | Call is successfully established with Client-1 over VxNR.  Confirm 2-way audio between DUT and Client-1. |
| 2 | At DUT, receive MT voice call from Client-2. | DUT is alerting with incoming VxNR call from Client-2. |
| 3 | At DUT, accept the Voice call from Client-2 and put the Voice call with Client-1 on hold. | Confirm DUT puts Client-1 on hold.  Confirm Voice call with Client-2 is established. Confirm 2-way audio. |
| 4 | Move DUT to an area where no 5G SA network is available so the network commands a Handover to E-UTRAN. | DUT performs Handover from 5G SA to E-UTRAN  Call with Client-1 remains held..  Call with Client-2 remains active with 2-way audio. |
| 5 | At Client-1, end the call with DUT. | Confirm the held call with Client-1 is released  Confirm the active call with Client-2 is stable with 2-way audio |
| 6 | End the voice call between DUT and Client-2. | Call is ended. |

#### 93.6.2.4 VxLTE to VxNR Service – 1 Active Call, 1 Held Call

Description

The DUT shall successfully perform RAT change from E-UTRAN to 5G SA while a call is held and a 2nd call is active

Related core specifications

GSMA IR.92; NG.114

Reason for test

The DUT must be able to successfully maintain multiple voice calls when changing RAT between 5G SA and E-UTRAN.

Initial Configuration

Network is supporting 5G SA and E-UTRAN.

Network supports VxNR and VxLTE services  
DUT is configured to have only 5G/E-UTRAN (or tested in an area where the only available networks are E-UTRAN and 5G SA).

DUT is successfully registered for IMS services (VxLTE).

Client-1 and Client-2 are in a static location where no cell changes will occur.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1. | Call is successfully established with Client-1 over VxLTE.  Confirm 2-way audio between DUT and Client-1. |
| 2 | At DUT, receive MT voice call from Client-2. | DUT is alerting with incoming VxLTE call from Client-2. |
| 3 | At DUT, accept the Voice call from Client-2 and put the Voice call with Client-1 on hold. | Confirm DUT puts Client-1 on hold.  Confirm Voice call with Client-2 is established. Confirm 2-way audio. |
| 4 | Move DUT to an area where no E-UTRA network is available ( or 5G SA network is stronger than the E-UTRAN) so the network commands a Handover to 5G SA. | DUT performs Handover from E-UTRAN to 5G SA  Call with Client-1 remains held..  Call with Client-2 remains active with 2-way audio. |
| 5 | At Client-1, end the call with DUT. | Confirm the held call with Client-1 is released  Confirm the active call with Client-2 is stable with 2-way audio |
| 6 | End the voice call between DUT and Client-2. | Call is ended. |

### 93.6.3 Service continuity during handovers

#### 93.6.3.1 Active Voice Call

Description

The DUT shall maintain the VxNR call during 5G SA Handovers.

Related 3GPP core specifications

3GPP TS 24.229

Reason for test

To verify the DUT can maintain a VxNR call along a test route which covers multiple Handover procedures.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxNR)

Client-1 is in a static location where no cell changes will occur.

Ideally, the test route should contain as many of the scenarios as possible:

* Cells within the same Tracking Area.
* Cells in different Tracking Areas.
* Cells sharing the same gNodeBs.
* Cells not sharing the same gNodeB.
* Cells using a different AMF.
* Cells using the same frequency.
* Areas of poor signal strength.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1. | Call is successfully established over VxNR.  Confirm 2-way audio between DUT and Client-1. |
| 2 | Move DUT along the test route | VxNR call remains active with 2-way audio throughout the route.  No call drops are observed. |
| 3 | At the end of the route, end the voice call between DUT and Client-1. | Call is ended. |

#### 93.6.3.2 Active Voice Call, Data Transfer

Description

The DUT shall maintain the VxNR call during 5G SA Handovers.

Related 3GPP core specifications

3GPP TS 24.229

Reason for test

To verify the DUT can maintain a VxNR call and FTP download along a test route which covers multiple Handover procedures.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxNR)

Client-1 is in a static location where no cell changes will occur.

Ideally, the test route should contain as many of the scenarios as possible:

* Cells within the same Tracking Area.
* Cells in different Tracking Areas.
* Cells sharing the same gNodeB.
* Cells not sharing the same gNodeB.
* Cells using a different AMF.
* Cells using the same frequency.
* Areas of poor signal strength.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO voice call to Client-1. | Call is successfully established over VxNR.  Confirm 2-way audio between DUT and Client-1. |
| 2 | At DUT, download a large file from an external server.  Note:  This can be via an internal FTP application or via a tethered laptop connection. | Data transfer is ongoing on DUT. |
| 3 | Move DUT along the test route | VxNR call remains active with 2-way audio throughout the route.  No call drops are observed.  Data transfer is stable throughout the route. |
| 4 | At the end of the route, end the voice call between DUT and Client-1. | Call is ended. |
| 5 | At the end of the route, end the data download. | Data transfer is stopped. |

#### 93.6.3.3 Active Video Call

Description

The DUT shall maintain the Video call during 5G SA Handovers.

Related 3GPP core specifications

3GPP TS 24.229

Reason for test

To verify the DUT can maintain a Video call along a test route which covers multiple Handover procedures.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxNR)

Client-1 is in a static location where no cell changes will occur.

Ideally, the test route should contain as many of the scenarios as possible:

* Cells within the same Tracking Area.
* Cells in different Tracking Areas.
* Cells sharing the same gNodeB.
* Cells not sharing the same gNodeB.
* Cells using a different AMF.
* Cells using the same frequency.
* Areas of poor signal strength.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO video call to Client-1. | Call is successfully established over VxNR.  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1. |
| 2 | Move DUT along the test route | Video call remains active with 2-way audio / video media stream throughout the route.  No call drops are observed. |
| 3 | At the end of the route, end the video call between DUT and Client-1. | Call is ended. |

#### 93.6.3.4 Active Video Call, Data Transfer

Description

The DUT shall maintain the Video call during 5G SAHandovers.

Related 3GPP core specifications

3GPP TS 24.229

Reason for test

To verify the DUT can maintain a Video call and FTP download along a test route which covers multiple Handover procedures.

Initial configuration

DUT and Client-1 are successfully registered for IMS services (VxNR)

Client-1 is in a static location where no cell changes will occur.

Ideally, the test route should contain as many of the scenarios as possible:

* Cells within the same Tracking Area.
* Cells in different Tracking Areas.
* Cells sharing the same gNodeB.
* Cells not sharing the same gNodeB.
* Cells using a different AMF.
* Cells using the same frequency.
* Areas of poor signal strength.

|  |  |  |
| --- | --- | --- |
| - | **Test procedure** | Expected behaviour |
| 1 | At DUT, make MO video call to Client-1. | Call is successfully established over VxNR.  Confirm 2-way audio between DUT and Client-1.  Confirm 2-way video media stream between DUT and Client-1. |
| 2 | At DUT, download a large file from an external server.  Note:  This can be via an internal FTP application or via a tethered laptop connection. | Data transfer is ongoing on DUT. |
| 3 | Move DUT along the test route | Video call remains active with 2-way audio / video media stream throughout the route.  No call drops are observed.  Data transfer is stable throughout the route. |
| 4 | At the end of the route, end the video call between DUT and Client-1. | Call is ended. |
| 5 | At the end of the route, end the data download. | Data transfer is stopped. |

# Document Management

## Document History

| Version | Date | Brief Description of Change | Approval Authority | Editor / Company |
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