

ETSI TS 124 161 V18.0.0 (2024-05)



**Universal Mobile Telecommunications System (UMTS);
LTE;
Network-Based IP Flow Mobility (NBIFOM);
Stage 3
(3GPP TS 24.161 version 18.0.0 Release 18)**



Reference

RTS/TSGC-0124161 vi00

Keywords

LTE,UMTS

ETSI

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Sous-Préfecture de Grasse (06) N° w061004871

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This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

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1 Scope

The present document specifies the procedures of network-based IP flow mobility (NBIFOM). NBIFOM is based on network mobility protocols (i.e. GTP or PMIP) which is performed between 3GPP access and WLAN access network as specified in 3GPP TS 23.161 [2].

NOTE: IP flow mobility based on PMIP is not supported in this release of the specification.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

- [1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".
- [2] 3GPP TS 23.161: "Network-Based IP Flow Mobility (NBIFOM); Stage 2".
- [3] 3GPP TS 24.008: "Mobile radio interface Layer 3 specification; Core network protocols; Stage 3".
- [4] 3GPP TS 24.301: "Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3".
- [5] 3GPP TS 24.302: "Access to the 3GPP Evolved Packet Core (EPC) via non-3GPP access networks; Stage 3".
- [6] 3GPP TS 24.244: "Wireless LAN control plane protocol for trusted WLAN access to EPC".
- [7] 3GPP TS 29.274: "Tunnelling Protocol for Control plane (GTPv2-C)".
- [8] IEEE Std 802.11-2012: "IEEE Standard for Information technology - Telecommunications and information exchange between systems - Local and metropolitan area networks - Specific requirements - Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905 [1].

3GPP access is unusable: the UE detects that usage of 3GPP access is prevented based on a UE implementation specific mechanism.

3GPP access is usable: 3GPP access is not unusable.

WLAN access is unusable: the UE detects that usage of the WLAN access is prevented based on a UE implementation specific mechanism.

WLAN access is usable: WLAN access is not unusable.

Multi-access PDN connection: A PDN connection whose IP flows can be routed over either a 3GPP access or a WLAN access or both. At any single time, each IP flow is only routed over one access.

For the purposes of the present document, the following terms and definitions given in 3GPP TS 24.302 [5] apply:

3GPP AAA server
RAN rules
TWAG

For the purposes of the present document, the following terms and definitions given in 3GPP TS 24.301 [4] apply:

A/Gb mode
Iu mode
S1 mode

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

APN	Access Point Name
EAP	Extensible Authentication Protocol
E-UTRAN	Evolved Universal Terrestrial Radio Access Network
ePDG	Evolved Packet Data Gateway
GERAN	GSM EDGE Radio Access Network
GTP	GPRS Tunnelling Protocol
IE	Information Element
MCM	Multi-connection mode
MME	Mobility Management Entity
NBIFOM	Network-based IP flow mobility
PDN	Packet Data Network
PDN GW	Packet Data Network Gateway
PDP	Packet Data Protocol
PMIP	Proxy Mobile IP version 6
SCM	Single-connection mode
SGSN	Serving GPRS Support Node
TWAG	Trusted WLAN Access Gateway
UE	User Equipment
UTRAN	UMTS Terrestrial Radio Access Network
WLAN	Wireless Local Area Network
WLCP	Wireless LAN control plane protocol

4 General

This document specifies the following procedures for Network-Based IP Flow Mobility (NBIFOM) as specified in 3GPP TS 23.161 [2] between the User Equipment (UE) and the network. The present document specifies the following procedures for support of NBIFOM in clause 5:

- a) Initial PDN connection establishment procedure;
- b) Extending NBIFOM traffic flows to additional access network;
- c) IP flow mobility between 3GPP and WLAN;
- d) Removal of an access from a PDN connection;
- e) IP flow mapping procedures;
- f) Handling of change of access usability; and

g) Handling of Access stratum indication.

For a), b), e), f) and g), the procedures are always initiated by the UE. Specifically, for e) and g), the procedures are performed only if the network-initiated NBIFOM mode is selected as specified in subclause 5.4 of 3GPP TS 23.161 [2].

For c), the procedure is initiated by:

- the UE if the UE-initiated NBIFOM mode is selected as specified in subclause 5.4 of 3GPP TS 23.161 [2]; or
- the network if the network-initiated NBIFOM mode is selected as specified in subclause 5.4 of 3GPP TS 23.161 [2].

For d), the procedure may be initiated by the UE or the network.

This document also defines the coding of the PDUs and parameters for NBIFOM in clause 6.

5 NBIFOM control procedures

5.1 Initial PDN connection establishment procedures

5.1.1 UE procedures

5.1.1.1 UE-initiated PDN connection establishment over GERAN or UTRAN

This procedure can only be executed if the UE is operating in A/Gb mode or Iu mode. The UE shall not trigger an inter-system change to A/Gb mode of operation or Iu mode of operation to execute this procedure.

Upon request from upper layers to setup a PDN connection with NBIFOM support over GERAN or UTRAN, the UE shall initiate the PDP context activation procedure according to 3GPP TS 24.008 [3].

In the ACTIVATE PDP CONTEXT REQUEST message of the PDP context activation procedure:

- a) the UE shall set the request type IE to "initial request";
- b) the UE shall include the protocol configuration options IE. In the protocol configuration options IE, the UE shall include the NBIFOM request indicator; and
- c) the UE shall include the NBIFOM container IE. In the NBIFOM container IE, the UE shall include the NBIFOM mode parameter indicating the requested NBIFOM mode.

Upon receiving from the network an ACTIVATE PDP CONTEXT ACCEPT message with the NBIFOM container IE containing the NBIFOM status parameter set to "Accepted":

- a) the UE shall consider that NBIFOM applies to the PDN connection;
- b) the UE shall consider the NBIFOM mode parameter of the NBIFOM container IE of the ACTIVATE PDP CONTEXT ACCEPT message as the selected NBIFOM mode; and
- c) if the network-initiated NBIFOM mode is the selected NBIFOM mode, and the NBIFOM RAN rules handling parameter of the NBIFOM container IE of the ACTIVATE PDP CONTEXT ACCEPT message is included and has the "RAN rules handling parameter is set" value, then the UE shall consider that the RAN rules handling parameter is set.

5.1.1.2 UE-initiated PDN connection establishment over E-UTRAN

This procedure can only be executed if the UE is operating in S1 mode. The UE shall not trigger an inter-system change to S1 mode of operation to execute this procedure.

Upon request from upper layers to setup a PDN connection with NBIFOM support over E-UTRAN, the UE shall initiate the UE requested PDN connectivity procedure according to 3GPP TS 24.301 [4].

In the PDN CONNECTIVITY REQUEST message or, when applicable, in the ESM INFORMATION RESPONSE message, of the UE requested PDN connectivity procedure:

- a) the UE shall set the request type IE to "initial request";
- b) the UE shall include the protocol configuration options IE. In the protocol configuration options IE, the UE shall include the NBIFOM request indicator; and
- c) the UE shall include the NBIFOM container IE. In the NBIFOM container IE, the UE shall include the NBIFOM mode parameter indicating the requested NBIFOM mode.

Upon receiving from the network an ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message with the NBIFOM container IE containing the NBIFOM status parameter set to "Accepted":

- a) the UE shall consider that NBIFOM applies to the PDN connection;
- b) the UE shall consider the NBIFOM mode parameter of the NBIFOM container IE of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message as the selected NBIFOM mode; and
- c) if the network-initiated NBIFOM mode is the selected NBIFOM mode, and the NBIFOM RAN rules handling parameter of the NBIFOM container IE of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message is included and has the "RAN rules handling parameter is set" value, then the UE shall consider that the RAN rules handling parameter is set.

5.1.1.3 UE-initiated PDN connection establishment over trusted WLAN using SCM

Upon request from upper layers to setup a PDN connection with NBIFOM support over trusted WLAN using SCM, the UE shall initiate usage of single-connection mode (SCM) procedure according to 3GPP TS 24.302 [5].

In the AT_TWAN_CONN_MODE attribute with the message type field set to SCM_REQUEST and included in the EAP-Response/AKA'-Challenge message of the usage of single-connection mode procedure:

- a) the UE shall set the CONNECTIVITY_TYPE item set to the PDN connection;
- b) the UE shall set the ATTACHMENT_TYPE item set to the initial attach; and
- c) the UE shall include the PROTOCOL_CONFIGURATION_OPTIONS item. In the PROTOCOL_CONFIGURATION_OPTIONS item, the UE shall include the NBIFOM request indicator and the NBIFOM mode parameter indicating the requested NBIFOM mode.

Upon receiving from the network an EAP-Request/AKA'-Notification message:

- a) including the AT_NOTIFICATION attribute indicating success; and
- b) including the AT_TWAN_CONN_MODE attribute containing the message type field indicating SCM_RESPONSE; and
- c) in the item list field, including the PROTOCOL_CONFIGURATION_OPTIONS item containing the NBIFOM accepted indicator and the NBIFOM mode parameter as defined in 3GPP TS 24.008 [3];

then:

- a) the UE shall consider that NBIFOM applies to the PDN connection; and
- b) the UE shall consider the NBIFOM mode parameter included in the PROTOCOL_CONFIGURATION_OPTIONS item as the selected NBIFOM mode.

5.1.1.4 UE-initiated PDN connection establishment over trusted WLAN using MCM

Upon request from upper layers to setup a PDN connection with NBIFOM support over trusted WLAN using MCM, the UE shall initiate the PDN connectivity establishment procedure according to 3GPP TS 24.244 [6].

In the PDN CONNECTIVITY REQUEST message of the PDN connectivity establishment procedure:

- a) the UE shall set the request type IE to "initial request";

- b) the UE shall include the protocol configuration options IE. In the protocol configuration options IE, the UE shall include the NBIFOM request indicator; and
- c) the UE shall include the NBIFOM container IE. In the NBIFOM container IE, the UE shall include the NBIFOM mode parameter indicating the requested NBIFOM mode.

Upon receiving from the network a PDN CONNECTIVITY ACCEPT message with the NBIFOM container IE containing the NBIFOM status parameter set to "Accepted"

- a) the UE shall consider that NBIFOM applies to the PDN connection; and
- b) the UE shall consider the NBIFOM mode parameter of the NBIFOM container IE included in the PDN CONNECTIVITY ACCEPT message as the selected NBIFOM mode.

5.1.1.5 UE-initiated PDN connection establishment over untrusted WLAN

Upon request from the upper layers to setup a PDN connection with NBIFOM support over untrusted WLAN, the UE shall initiate the tunnel establishment procedure according to 3GPP TS 24.302 [5].

In the IKE_AUTH request message of the tunnel establishment procedure:

- a) the UE shall include the CFG_REQUEST configuration payload. In the CFG_REQUEST configuration payload, the UE shall include the INTERNAL_IP4_ADDRESS attribute, the INTERNAL_IP6_ADDRESS attribute or both, with the length field set to zero; and
- b) the UE shall include the NBIFOM_GENERIC_CONTAINER Notify payload. In the NBIFOM_GENERIC_CONTAINER Notify payload, the UE shall include the NBIFOM mode parameter indicating the requested NBIFOM mode.

NOTE: Inclusion of the NBIFOM_GENERIC_CONTAINER Notify payload is an implicit indication of the NBIFOM request.

Upon receiving from the network an IKE_AUTH response message without a Notify payload indicating an error, and with the NBIFOM_GENERIC_CONTAINER Notify payload containing the NBIFOM status parameter set to "Accepted":

- a) the UE shall consider that NBIFOM applies to the PDN connection; and
- b) the UE shall consider the NBIFOM mode parameter of the NBIFOM_GENERIC_CONTAINER Notify payload included in the IKE_AUTH response message as the selected NBIFOM mode.

5.1.2 Network procedures

5.1.2.1 UE-initiated PDN connection establishment over GERAN or UTRAN

If the SGSN receives a Create Session Response message with an acceptance cause value including NBIFOM container IE from the SGW as specified in 3GPP TS 29.274 [7], the SGSN shall include the received NBIFOM container IE in the ACTIVATE PDP CONTEXT ACCEPT message to the UE as specified in 3GPP TS 24.008 [3].

If the SGSN receives a Create Session Response message with a reject cause value including NBIFOM container IE from the SGW as specified in 3GPP TS 29.274 [7], the SGSN shall include the received NBIFOM container IE in the ACTIVATE PDP CONTEXT REJECT message with an appropriate error cause to the UE as specified in 3GPP TS 24.008 [3].

5.1.2.2 UE-initiated PDN connection establishment over E-UTRAN

If the MME receives a Create Session Response message with an acceptance cause value including the NBIFOM container IE from the SGW as specified in 3GPP TS 29.274 [7], the MME shall include the received NBIFOM container IE in the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message to the UE as specified in 3GPP TS 24.301 [4].

If the MME receives a Create Session Response message with a reject cause value including the NBIFOM container IE from the SGW as specified in 3GPP TS 29.274 [7], the MME shall include the received NBIFOM container IE in the

PDN CONNECTIVITY REJECT message with an appropriate error cause to the UE as specified in 3GPP TS 24.301 [4].

5.1.2.3 UE-initiated PDN connection establishment over trusted WLAN using SCM

The 3GPP AAA Server shall follow the 3GPP AAA server behaviour towards UE for PDN connection establishment requests initiated for single-connection mode usage, as specified in 3GPP TS 24.302 [5].

5.1.2.4 UE-initiated PDN connection establishment over trusted WLAN using MCM

If the TWAG receives a Create Session Response message with an acceptance cause value including the NBIFOM container IE from the PGW as specified in 3GPP TS 29.274 [7], the TWAG shall include the received NBIFOM container IE in the PDN CONNECTIVITY ACCEPT message to the UE as specified in 3GPP TS 24.244 [6].

If the TWAG receives a Create Session Response message with a reject cause value including the NBIFOM container IE from the PGW as specified in 3GPP TS 29.274 [7], the TWAG shall include the received NBIFOM container IE in the PDN CONNECTIVITY REJECT message with an appropriate error cause to the UE as specified in 3GPP TS 24.244 [6].

5.1.2.5 UE-initiated PDN connection establishment over untrusted WLAN

If the ePDG receives a Create Session Response message that includes the NBIFOM container IE from the PDN GW as specified in 3GPP TS 29.274 [7],

- a) the ePDG shall construct the NBIFOM_GENERIC_CONTAINER Notify payload as specified in 3GPP TS 24.302 [5] and copy the contents of the NBIFOM container IE into the NBIFOM container contents field of the NBIFOM_GENERIC_CONTAINER Notify payload;
- b) the ePDG shall include the NBIFOM_GENERIC_CONTAINER Notify payload to the UE, in the IKE_AUTH response message; and
- c) if the Create Session Response message includes a reject cause, the ePDG shall also include a Notify payload to the UE, indicating an error in the IKE_AUTH response message.

5.2 Extending NBIFOM traffic flows to additional access network

5.2.1 UE procedures

5.2.1.1 Adding GERAN or UTRAN access to NBIFOM PDN connections (UE-initiated)

This procedure can only be executed if the UE is operating in A/Gb mode or Iu mode. The UE shall not trigger an inter-system change to A/Gb mode of operation or Iu mode of operation to execute this procedure.

If the NBIFOM applies to a PDN connection, then upon request from upper layers to add GERAN or UTRAN access to the PDN connection, the UE shall initiate the PDP context activation procedure according to 3GPP TS 24.008 [3].

In the ACTIVATE PDP CONTEXT REQUEST message of the PDP context activation procedure:

- a) the UE shall include the APN IE set to the APN indicated when the PDN connection was initially setup in subclause 5.1;
- b) the UE shall set the request type IE to "handover";
- c) the UE shall include the protocol configuration options IE. In the protocol configuration options IE, the UE shall include the NBIFOM request indicator; and
- d) the UE shall include the NBIFOM container IE. In the NBIFOM container IE:

- 1) if the UE-initiated NBIFOM mode is the selected NBIFOM mode:
 - A) the UE may include the NBIFOM routing rules parameter; and
 - B) the UE shall include the NBIFOM default access parameter.

Upon receiving an ACTIVATE PDP CONTEXT ACCEPT message with the NBIFOM container IE containing the NBIFOM status parameter set to "Accepted":

- a) the UE shall consider that the network has accepted that NBIFOM traffic for that PDN connection can be sent through GERAN or UTRAN;
- b) the UE shall consider the NBIFOM default access parameter of the NBIFOM container IE of the ACTIVATE PDP CONTEXT ACCEPT message as the NBIFOM default access; and
- c) if the network-initiated NBIFOM mode is the selected NBIFOM mode, and the NBIFOM RAN rules handling parameter of the NBIFOM container IE of the ACTIVATE PDP CONTEXT ACCEPT message is included and has the "RAN rules handling parameter is set" value, then the UE shall consider that the RAN rules handling parameter is set.

5.2.1.2 Adding E-UTRAN access to NBIFOM PDN connections (UE-initiated)

This procedure can only be executed if the UE is operating in S1 mode. The UE shall not trigger an inter-system change to S1 mode of operation to execute this procedure.

If the NBIFOM applies to a PDN connection, then upon request from upper layers to add E-UTRAN access to the PDN connection, the UE shall initiate the UE requested PDN connectivity procedure according to 3GPP TS 24.301 [4].

In the PDN CONNECTIVITY REQUEST message or, when applicable, in the ESM INFORMATION RESPONSE message, of the UE requested PDN connectivity procedure:

- a) the UE shall include the APN IE set to the APN indicated when the PDN connection was initially setup in subclause 5.1;
- b) the UE shall set the request type IE to "handover";
- c) the UE shall include the protocol configuration options IE. In the protocol configuration options IE, the UE shall include the NBIFOM request indicator; and
- d) the UE shall include the NBIFOM container IE. In the NBIFOM container IE:
 - 1) if the UE-initiated NBIFOM mode is the selected NBIFOM mode:
 - A) the UE may include the NBIFOM routing rules parameter; and
 - B) the UE shall include the NBIFOM default access parameter.

Upon receiving an ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message with the NBIFOM container IE containing the NBIFOM status parameter set to "Accepted":

- a) the UE shall consider that the network has accepted that NBIFOM traffic for that PDN connection can be sent through E-UTRAN;
- b) the UE shall consider the NBIFOM default access parameter of the NBIFOM container IE of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message as the NBIFOM default access; and
- c) if the network-initiated NBIFOM mode is the selected NBIFOM mode, and the NBIFOM RAN rules handling parameter of the NBIFOM container IE of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message is included and has the "RAN rules handling parameter is set" value, then the UE shall consider that the RAN rules handling parameter is set.

5.2.1.3 Adding trusted WLAN access to NBIFOM PDN connections (UE-initiated, using SCM)

If the NBIFOM applies to a PDN connection, then upon request from upper layers to add, using SCM, trusted WLAN access to the PDN connection, the UE shall initiate the usage of single-connection mode procedure according to 3GPP TS 24.302 [5].

In the AT_TWAN_CONN_MODE attribute with the message type field set to SCM_REQUEST and included in the EAP-Response/AKA'-Challenge message of the usage of single-connection mode procedure:

- a) the UE shall set the CONNECTIVITY_TYPE item set to the PDN connection;
- b) the UE shall set the APN item to the APN indicated when the PDN connection was setup in subclause 5.1.1;
- c) the UE shall set the ATTACHMENT_TYPE item set to the handover; and
- d) the UE shall include the PROTOCOL_CONFIGURATION_OPTIONS item. In the PROTOCOL_CONFIGURATION_OPTIONS item, the UE shall include the NBIFOM request indicator.

Upon receiving an EAP-Request/AKA'-Notification message:

- a) including the AT_NOTIFICATION attribute indicating success; and
- b) including the AT_TWAN_CONN_MODE attribute:
 - 1) containing the message type field indicating SCM_RESPONSE;
 - 2) in the item list field, containing the PROTOCOL_CONFIGURATION_OPTIONS item including the NBIFOM accepted indicator as defined in 3GPP TS 24.008 [3]:

the UE shall consider that the network has accepted that NBIFOM traffic for that PDN connection can be sent through trusted WLAN using SCM.

5.2.1.4 Adding trusted WLAN access to NBIFOM PDN connections (UE-initiated, using MCM)

If the NBIFOM applies to a PDN connection, then upon request from upper layers to add, using MCM, trusted WLAN access to the PDN connection, the UE shall initiate the PDN connectivity establishment procedure according to 3GPP TS 24.244 [6].

In the PDN CONNECTIVITY REQUEST message of the PDN connectivity establishment procedure:

- a) the UE shall include the APN IE set to the APN indicated when the PDN connection was setup in subclause 5.1.1;
- b) the UE shall set the request type IE to the "handover";
- c) the UE shall include the protocol configuration options IE. In the protocol configuration options IE, the UE shall include the NBIFOM request indicator; and
- d) the UE shall include the NBIFOM container IE. In the NBIFOM container IE:
 - 1) if the UE-initiated NBIFOM mode is the selected NBIFOM mode:
 - A) the UE may include the NBIFOM routing rules parameter; and
 - B) the UE shall include the NBIFOM default access parameter.

Upon receiving a PDN CONNECTIVITY ACCEPT message with the NBIFOM container IE containing the NBIFOM status parameter set to "Accepted":

- a) the UE shall consider that trusted WLAN using MCM is added to the PDN connection; and
- b) the UE shall consider the NBIFOM default access parameter of the NBIFOM container IE of the PDN CONNECTIVITY ACCEPT message as the NBIFOM default access.

5.2.1.5 Adding untrusted WLAN access to NBIFOM PDN connections (UE-initiated)

If the NBIFOM applies to a PDN connection, then upon request from upper layers to add untrusted WLAN access to the PDN connection, the UE shall initiate the tunnel establishment procedure according to 3GPP TS 24.302 [5].

In the IKE_AUTH request message of the tunnel establishment procedure:

- a) the UE shall set the IDr payload to the APN indicated when the PDN connection was setup in subclause 5.1.1;
- b) the UE shall include the CFG_REQUEST configuration payload. In the CFG_REQUEST configuration payload, the UE shall include the INTERNAL_IP4_ADDRESS attribute, the INTERNAL_IP6_ADDRESS attribute or both, indicating the IP address(es) allocated when the PDN connection was setup in subclause 5.2.1; and
- c) the UE shall include the NBIFOM_GENERIC_CONTAINER Notify payload. In the NBIFOM_GENERIC_CONTAINER Notify payload:
 - A) if the UE-initiated NBIFOM mode is the selected NBIFOM mode:
 - i) the UE may include the NBIFOM routing rules parameter; and
 - ii) the UE shall include the NBIFOM default access parameter.

NOTE: Inclusion of the NBIFOM_GENERIC_CONTAINER Notify payload is an implicit indication of a request to apply NBIFOM for that PDN connection.

Upon receiving an IKE_AUTH response message without a Notify payload indicating an error, and with the NBIFOM_GENERIC_CONTAINER Notify payload containing the NBIFOM status parameter set to "Accepted":

- a) the UE shall consider that the network has accepted that NBIFOM traffic for that PDN connection can be sent through untrusted WLAN access; and
- b) the UE shall consider the NBIFOM default access parameter of the NBIFOM_GENERIC_CONTAINER Notify payload of the IKE_AUTH response message as the NBIFOM default access.

5.2.2 Network procedures

5.2.2.1 UE-initiated addition of NBIFOM traffic flows to go over GERAN or UTRAN

The SGSN shall perform the procedure as specified in subclause 5.1.2.1.

5.2.2.2 UE-initiated addition of NBIFOM traffic flows to go over E-UTRAN

The MME shall perform the procedure as specified in subclause 5.1.2.2.

5.2.2.3 UE-initiated addition of NBIFOM traffic flows to go over trusted WLAN using SCM

The 3GPP AAA Server shall follow the 3GPP AAA server behaviour towards UE initiated PDN connection establishment procedure as specified in subclause 6.4.3.5.2 of 3GPP TS 24.302 [5].

5.2.2.4 UE-initiated addition of NBIFOM traffic flows to go over trusted WLAN using MCM

The TWAG shall perform the procedure as specified in subclause 5.1.2.4.

5.2.2.5 UE-initiated addition of NBIFOM traffic flows to go over untrusted WLAN

The ePDG shall perform the procedure as specified in subclause 5.1.2.5.

5.3 IP flow mobility between 3GPP and WLAN

5.3.1 UE procedures

5.3.1.1 UE-initiated IP flow mobility over GERAN or UTRAN

This procedure can only be executed if the UE is operating in A/Gb mode or Iu mode. The UE shall not trigger an inter-system change to A/Gb mode of operation or Iu mode of operation to execute this procedure.

If NBIFOM applies to a PDN connection, and the PDN connection is a multi-access PDN connection for IP flows over GERAN or UTRAN and WLAN, and the UE-initiated NBIFOM mode is the selected NBIFOM mode, then upon request to initiate UE-initiated IP flow mobility over GERAN or UTRAN, the UE shall initiate the PDP context modification procedure or the secondary PDP context activation procedure according to 3GPP TS 24.008 [3].

In:

- a) the MODIFY PDP CONTEXT REQUEST message of the PDP context modification procedure; or
- b) ACTIVATE SECONDARY PDP CONTEXT REQUEST message of the secondary PDP context Activation Procedure;

the UE shall include the NBIFOM container IE. In the NBIFOM container IE:

- a) the UE shall include the NBIFOM routing rules parameter with the requested routing rules; and
- b) if the multi-access PDN connection is for IP flows over GERAN or UTRAN and over trusted WLAN using SCM, the UE shall include the NBIFOM default access parameter when the first time the UE initiates an IP flow mobility procedure over 3GPP access.

Upon receiving a MODIFY PDP CONTEXT ACCEPT message or ACTIVATE SECONDARY PDP CONTEXT ACCEPT message:

- a) the UE shall apply the requested routing rules; and
- b) if the NBIFOM container IE contains the NBIFOM default access parameter, the UE shall consider the NBIFOM default access parameter as the NBIFOM default access.

Upon receiving a MODIFY PDP CONTEXT REJECT message or an ACTIVATE SECONDARY PDP CONTEXT REJECT message, the UE shall consider the NBIFOM status parameter of the NBIFOM container IE of the MODIFY PDP CONTEXT REJECT message or the ACTIVATE SECONDARY PDP CONTEXT REJECT message as the cause of failure.

5.3.1.2 UE-initiated IP flow mobility over E-UTRAN

This procedure can only be executed if the UE is operating in S1 mode. The UE shall not trigger an inter-system change to S1 mode of operation to execute this procedure.

If NBIFOM applies to a PDN connection, and the PDN connection is a multi-access PDN connection for IP flows over E-UTRAN and WLAN, and the UE-initiated NBIFOM mode is the selected NBIFOM mode, then upon request to initiate UE-initiated IP flow mobility over E-UTRAN, the UE shall initiate the UE requested bearer resource modification procedure or the UE requested bearer resource allocation procedure according to 3GPP TS 24.301 [4].

In:

- a) the BEARER RESOURCE MODIFICATION REQUEST message of the UE requested bearer resource modification procedure; or
- b) the BEARER RESOURCE ALLOCATION REQUEST message of the UE requested bearer resource allocation procedure;

the UE shall include the NBIFOM container IE. In the NBIFOM container IE:

- a) the UE shall include the NBIFOM routing rules parameter with the requested routing rules; and

- b) if the multi-access PDN connection is for IP flows over E-UTRAN and over trusted WLAN using SCM, the UE shall include the NBIFOM default access parameter when the first time the UE initiates an IP flow mobility procedure over 3GPP access.

Upon receiving from the network:

- a) an ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message of the dedicated EPS bearer context activation procedure, such that:
 - 1) the ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message is related to the UE requested bearer resource modification procedure or the UE requested bearer resource allocation procedure; and
 - 2) the IEs of the ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message are acceptable;
- b) a MODIFY EPS BEARER CONTEXT REQUEST message of the EPS bearer context modification procedure such that:
 - 1) the MODIFY EPS BEARER CONTEXT REQUEST message is related to the UE requested bearer resource modification procedure or the UE requested bearer resource allocation procedure; and
 - 2) the IEs of the MODIFY EPS BEARER CONTEXT REQUEST message are acceptable; or
- c) a DEACTIVATE EPS BEARER CONTEXT REQUEST message of the EPS bearer context deactivation procedure such that:
 - 1) the DEACTIVATE EPS BEARER CONTEXT REQUEST message is related to the UE requested bearer resource modification procedure or the UE requested bearer resource allocation procedure; and
 - 2) the EPS bearer identity IE of the DEACTIVATE EPS BEARER CONTEXT REQUEST message indicates identity of a dedicated EPS bearer context;

then:

- a) the UE shall respond with the ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT message, the MODIFY EPS BEARER CONTEXT ACCEPT message or the DEACTIVATE EPS BEARER CONTEXT ACCEPT message; and
- b) the UE shall apply the requested routing rules; and
- c) if the NBIFOM container IE contains the NBIFOM default access parameter, the UE shall consider the NBIFOM default access parameter as the NBIFOM default access.

If however, the UE receives a BEARER RESOURCE MODIFICATION REJECT message or a BEARER RESOURCE ALLOCATION REJECT message, the UE shall consider the NBIFOM status parameter of the NBIFOM container IE of the BEARER RESOURCE MODIFICATION REJECT message or a BEARER RESOURCE ALLOCATION REJECT message as the cause of failure.

5.3.1.3 UE-initiated IP flow mobility over trusted WLAN using SCM

Not applicable.

5.3.1.4 UE-initiated IP flow mobility over trusted WLAN using MCM

If NBIFOM applies to a PDN connection, and the PDN connection is a multi-access PDN connection for IP flows over trusted WLAN using MCM and 3GPP accesses, and the UE-initiated NBIFOM mode is the selected NBIFOM mode, then upon request to initiate UE-initiated IP flow mobility over trusted WLAN using MCM, the UE shall initiate the UE requested PDN connectivity modification procedure according to 3GPP TS 24.244 [6].

In the PDN MODIFICATION INDICATION message of the UE requested PDN connectivity modification procedure, the UE shall include the NBIFOM container IE. In the NBIFOM container IE, the UE shall include the NBIFOM routing rules parameter with the requested routing rules.

Upon receiving a PDN MODIFICATION REQUEST message of the TWAG initiated PDN connectivity modification procedure such that:

- a) the PDN MODIFICATION REQUEST message is initiated by the UE requested PDN connectivity modification procedure; and
- b) the IEs of the PDN MODIFICATION REQUEST message are acceptable;

then:

- a) the UE shall respond with a PDN MODIFICATION ACCEPT message; and
- b) the UE shall apply the requested routing rules.

If however, the UE receives a PDN MODIFICATION REJECT message, the UE shall consider the NBIFOM status parameter of the NBIFOM container IE of the PDN MODIFICATION REJECT message as the cause of failure.

5.3.1.5 UE-initiated IP flow mobility over untrusted WLAN

If NBIFOM applies to a PDN connection, and the PDN connection is a multi-access PDN connection for IP flows over untrusted WLAN access and 3GPP accesses, and the UE-initiated NBIFOM mode is the selected NBIFOM mode, then upon request to initiate UE-initiated IP flow mobility over untrusted WLAN access, the UE shall initiate the UE-initiated modification procedure according to 3GPP TS 24.302 [5].

In the INFORMATIONAL request message of the UE-initiated modification procedure, the UE shall include the NBIFOM_GENERIC_CONTAINER Notify payload. In the NBIFOM_GENERIC_CONTAINER Notify payload, the UE shall include the NBIFOM routing rules parameter with the requested routing rules.

Upon receiving an INFORMATIONAL request message of the ePDG-initiated modification procedure such that:

- a) the received INFORMATIONAL request message does not contain a Notify payload indicating an error;
- b) the received INFORMATIONAL request message contains a PTI Notify payload with the Related Message ID field set to the Message ID field of the sent INFORMATIONAL request message; and
- c) the IEs of the received INFORMATIONAL request message are acceptable;

then:

- a) the UE shall respond with an INFORMATIONAL response message without a Notify payload indicating an error; and
- b) the UE shall apply the requested routing rules.

Upon receiving an INFORMATIONAL request message of the ePDG-initiated modification procedure such that:

- a) the received INFORMATIONAL request message contains a Notify payload indicating an error; and
- b) the received INFORMATIONAL request message contains a PTI Notify payload with the Related Message ID field set to the Message ID field of the sent INFORMATIONAL request message;

then:

- a) the UE shall consider the NBIFOM status parameter of the NBIFOM_GENERIC_CONTAINER Notify payload of the INFORMATIONAL request message as the cause of failure; and
- b) the UE shall respond with an INFORMATIONAL response message.

5.3.1.6 Network-initiated IP flow mobility over GERAN or UTRAN

The network-initiated IP flow mobility over GERAN or UTRAN takes place during the network initiated PDP context modification procedure or the secondary PDP context activation procedure requested by the network according to 3GPP TS 24.008 [3].

If NBIFOM applies to a PDN connection, and the PDN connection is a multi-access PDN connection for IP flows over GERAN or UTRAN and WLAN, and the network-initiated NBIFOM mode is the selected NBIFOM mode, then, the UE upon receiving:

- a) a REQUEST SECONDARY PDP CONTEXT ACTIVATION message from the network in which:

- 1) the REQUEST SECONDARY PDP CONTEXT ACTIVATION message contains the NBIFOM container IE containing the NBIFOM routing rules parameter; and
 - 2) the IEs of the REQUEST SECONDARY PDP CONTEXT ACTIVATION message other than the NBIFOM container IE are acceptable; or
- b) a MODIFY PDP CONTEXT REQUEST message from the network in which:
- 1) the MODIFY PDP CONTEXT REQUEST message contains the NBIFOM container IE containing the NBIFOM routing rules parameter; and
 - 2) the IEs of the MODIFY PDP CONTEXT REQUEST message other than the NBIFOM container IE are acceptable;

then:

- a) if the UE accepts the requested routing rules indicated in the NBIFOM routing rules parameter:
- 1) the UE shall proceed with the secondary PDP context activation procedure according to 3GPP TS 24.008 [3] or the UE shall send the MODIFY PDP CONTEXT ACCEPT message;
 - 2) the UE shall apply the requested routing rules; and
 - 3) if the NBIFOM container IE contains the NBIFOM default access parameter, the UE shall consider the NBIFOM default access parameter as the NBIFOM default access; and
- b) if the UE rejects the requested routing rules indicated in the NBIFOM routing rules parameter, the UE shall respond with:
- 1) the REQUEST SECONDARY PDP CONTEXT ACTIVATION REJECT message; or
 - 2) the MODIFY PDP CONTEXT REJECT message;

together with the NBIFOM container IE. In the NBIFOM container IE, the UE shall include the NBIFOM status parameter with appropriate error value.

5.3.1.7 Network-initiated IP flow mobility over E-UTRAN

The network-initiated IP flow mobility over E-UTRAN takes place during the EPS bearer context modification procedure according to 3GPP TS 24.301 [4].

If NBIFOM applies to a PDN connection, and the PDN connection is a multi-access PDN connection for IP flows over E-UTRAN and WLAN, and the network-initiated NBIFOM mode is the selected NBIFOM mode, then, the UE upon receiving:

- a) an ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message from the network, in which:
- 1) the ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message is unrelated to any UE requested bearer resource allocation procedure and is unrelated to any UE requested bearer resource modification procedure;
 - 2) the ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message contains the NBIFOM container IE containing the NBIFOM routing rules parameter; and
 - 3) the IEs of the ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message other than the NBIFOM container IE are acceptable; or
- b) a MODIFY EPS BEARER CONTEXT REQUEST message from the network, in which:
- 1) the MODIFY EPS BEARER CONTEXT REQUEST message is unrelated to any UE requested bearer resource allocation procedure and is unrelated to any UE requested bearer resource modification procedure;
 - 2) the MODIFY EPS BEARER CONTEXT REQUEST message contains the NBIFOM container IE containing the NBIFOM routing rules parameter; and

- 3) the IEs of the MODIFY EPS BEARER CONTEXT REQUEST message other than the NBIFOM container IE are acceptable;

then:

- a) if the UE accepts the requested routing rules indicated in the NBIFOM routing rules parameter:
 - 1) the UE shall respond with the ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT message or the MODIFY EPS BEARER CONTEXT ACCEPT message;
 - 2) the UE shall apply the requested routing rules; and
 - 3) if the NBIFOM container IE contains the NBIFOM default access parameter, the UE shall consider the NBIFOM default access parameter as the NBIFOM default access; and
- b) if the UE rejects the requested routing rules indicated in the NBIFOM routing rules parameter, the UE shall respond with:
 - 1) the ACTIVATE DEDICATED EPS BEARER CONTEXT REJECT message; or
 - 2) the MODIFY EPS BEARER CONTEXT REJECT message

together with the NBIFOM container IE. In the NBIFOM container IE, the UE shall include the NBIFOM status parameter with appropriate error value.

5.3.1.8 Network-initiated IP flow mobility over trusted WLAN using SCM

Not applicable.

5.3.1.9 Network-initiated IP flow mobility over trusted WLAN using MCM

The network-initiated IP flow mobility over trusted WLAN using MCM is performed by the network, by executing the TWAG initiated PDN connectivity modification procedure of 3GPP TS 24.244 [6].

If the NBIFOM applies to a PDN connection, the PDN connection is connected simultaneously over trusted WLAN using MCM and 3GPP access, and the network-initiated NBIFOM mode is the selected NBIFOM mode, then upon receiving a PDN MODIFICATION REQUEST message of the TWAG initiated PDN connectivity modification procedure such that:

- a) the PDN MODIFICATION REQUEST message is not initiated by any UE requested PDN connectivity modification procedure;
- b) the PDN MODIFICATION REQUEST message contains the NBIFOM container IE containing the NBIFOM routing rules parameter; and
- c) the IEs of the PDN MODIFICATION REQUEST other than the NBIFOM container IE are acceptable;

then:

- a) if the UE accepts the requested routing rules indicated in the NBIFOM routing rules parameter, the UE shall respond with the PDN MODIFICATION ACCEPT message, and the UE shall apply the requested routing rules; and
- b) if the UE rejects the requested routing rules indicated in the NBIFOM routing rules parameter, the UE shall respond with the PDN MODIFICATION REJECT message with the NBIFOM container IE. In the NBIFOM container IE, the UE shall include the NBIFOM status parameter with appropriate error value.

5.3.1.10 Network-initiated IP flow mobility over untrusted WLAN

The network-initiated IP flow mobility over untrusted WLAN is performed by the network, by executing the ePDG initiated modification procedure of 3GPP TS 24.302 [5].

If the NBIFOM applies to a PDN connection, the PDN connection is connected simultaneously over untrusted WLAN and 3GPP access, and the network-initiated NBIFOM mode is the selected NBIFOM mode, then upon receiving an INFORMATIONAL request message of the ePDG initiated modification procedure such that:

- a) the INFORMATIONAL request message does not contain a PTI Notify payload;
- b) the INFORMATIONAL request message contains the NBIFOM_GENERIC_CONTAINER Notify payload containing the NBIFOM routing rules parameter; and
- c) the IEs other than the NBIFOM_GENERIC_CONTAINER Notify payload are acceptable;

then:

- a) if the UE accepts the requested routing rules indicated in the NBIFOM routing rules parameter, the UE shall respond with the INFORMATIONAL response message without a Notify payload indicating an error, and the UE shall apply the requested routing rules; and
- b) if the UE rejects the requested routing rules indicated in the NBIFOM routing rules parameter, the UE shall respond with the INFORMATIONAL response message. In the INFORMATIONAL response message, the UE shall include a Notify payload indicating an error and shall include the NBIFOM_GENERIC_CONTAINER Notify payload. In the NBIFOM_GENERIC_CONTAINER Notify payload, the UE shall include the NBIFOM status parameter with appropriate error value.

5.3.2 Network procedures

5.3.2.1 UE-initiated IP flow mobility over GERAN or UTRAN

If the SGSN receives an NBIFOM container IE in an Update Bearer Request message or a Create Bearer Request message as specified in 3GPP TS 29.274 [7] including NBIFOM container IE from the SGW, the SGSN shall include the received NBIFOM container IE in the MODIFY PDP CONTEXT ACCEPT message or the ACTIVATE SECONDARY PDP CONTEXT ACCEPT message to the UE as specified in 3GPP TS 24.008 [3].

If the SGSN receives a Bearer Resource Failure Indication message including NBIFOM container IE from the SGW as specified in 3GPP TS 29.274 [7], the SGSN shall include the received NBIFOM container IE in the MODIFY PDP CONTEXT REJECT message or the ACTIVATE SECONDARY PDP CONTEXT REJECT message to the UE as specified in 3GPP TS 24.008 [3].

5.3.2.2 UE-initiated IP flow mobility over E-UTRAN

If the MME receives a Create Bearer Request message, or an Update Bearer Request message, or a Delete Bearer Request message including NBIFOM container IE from the SGW as specified in 3GPP TS 29.274 [7], the MME shall include the NBIFOM container IE in the ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message, MODIFY EPS BEARER CONTEXT REQUEST message or DEACTIVATE EPS BEARER CONTEXT REQUEST message to the UE as specified in 3GPP TS 24.301 [4].

If the MME receives a Bearer Resource Failure Indication message including NBIFOM container IE from the SGW as specified in 3GPP TS 29.274 [7], the MME shall include the received NBIFOM container IE in the BEARER RESOURCE MODIFICATION REJECT message or BEARER RESOURCE ALLOCATION REJECT message to the UE as specified in 3GPP TS 24.301 [4].

5.3.2.3 UE-initiated IP flow mobility over trusted WLAN using SCM

The delivery of routing rules over trusted WLAN access using SCM is not supported as specified in 3GPP TS 23.161 [2].

5.3.2.4 UE-initiated IP flow mobility over trusted WLAN using MCM

If the TWAG receives an Update Bearer Request message or a Create Bearer Request message including NBIFOM container IE from the PDN GW as specified in 3GPP TS 29.274 [7], TWAG shall include the NBIFOM container IE in the PDN MODIFICATION REQUEST message to the UE as specified in 3GPP TS 24.244 [6].

If the TWAG receives a Bearer Resource Failure Indication including NBIFOM container IE from the PDN GW as specified in 3GPP TS 29.274 [7], the TWAG shall include the NBIFOM container IE in the PDN MODIFICATION REJECT message to the UE as specified in 3GPP TS 24.244 [6].

5.3.2.5 UE-initiated IP flow mobility over untrusted WLAN

Once the ePDG receives an INFORMATIONAL request message including NBIFOM container IE from the UE, the ePDG shall send the INFORMATIONAL response message to the UE as specified in subclause 6.3.3.3 of 3GPP TS 23.161 [2].

If the ePDG receives an Update Bearer Request message, or a Create Bearer Request message, or a Bearer Resource Failure Indication message including NBIFOM container IE from the PDN GW as specified in 3GPP TS 29.274 [7],

- a) the ePDG shall construct the NBIFOM_GENERIC_CONTAINER Notify payload as specified in 3GPP TS 24.302 [5] and copy the NBIFOM container contents from the NBIFOM container IE into the NBIFOM container contents field of the NBIFOM_GENERIC_CONTAINER Notify payload;
- b) the ePDG shall include the NBIFOM_GENERIC_CONTAINER Notify payload in the INFORMATIONAL request message to the UE;
- c) the ePDG shall include a PTI notify payload as specified in subclause 7.4.2.1 of 3GPP TS 24.302 [5] in the INFORMATIONAL request message to the UE; and
- d) if receiving Bearer Resource Failure Indication message, the ePDG shall also include a Notify payload indicating an error in the INFORMATIONAL request message to the UE.

5.3.2.6 Network-initiated IP flow mobility over GERAN or UTRAN

If the SGSN receives an Update Bearer Request message or a Create Bearer Request message including the NBIFOM container IE from the SGW as specified in 3GPP TS 29.274 [7], the SGSN shall include the received NBIFOM container IE in the MODIFY PDP CONTEXT REQUEST message or the REQUEST SECONDARY PDP CONTEXT ACTIVATION message to the UE as specified in 3GPP TS 24.008 [3].

5.3.2.7 Network-initiated IP flow mobility over E-UTRAN

If the MME receives an Update Bearer Request message or a Create Bearer Request message including the NBIFOM container IE from the SGW as specified in 3GPP TS 29.274 [7], the MME shall include the received NBIFOM container IE in the MODIFY EPS BEARER CONTEXT REQUEST message or the ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message to the UE as specified in 3GPP 24.301 [4].

5.3.2.8 Network-initiated IP flow mobility over trusted WLAN using SCM

Not applicable.

5.3.2.9 Network-initiated IP flow mobility over trusted WLAN using MCM

If the TWAG receives an Update Bearer Request message or a Create Bearer Request message including NBIFOM container IE from the PGW as specified in 3GPP TS 29.274 [7], the TWAG shall include the received NBIFOM container IE in the PDN MODIFICATION REQUEST message to the UE as specified in 3GPP TS 24.244 [6].

5.3.2.10 Network-initiated IP flow mobility over untrusted WLAN

If the ePDG receives an Update Bearer Request message, or a Create Bearer Request message including NBIFOM container IE from the PGW as specified in 3GPP TS 29.274 [7],

- a) the ePDG shall construct the NBIFOM_GENERIC_CONTAINER Notify payload as specified in 3GPP TS 24.302 [5] and copy the NBIFOM container contents from the NBIFOM container IE into the NBIFOM container contents field of the NBIFOM_GENERIC_CONTAINER Notify payload ; and
- b) the ePDG shall include the NBIFOM_GENERIC_CONTAINER Notify payload in the INFORMATIONAL request message to the UE.

5.4 Removal of an access from a multi-access PDN connection

5.4.1 General

The removal of an access network from a multi-access PDN connection can be initiated by the UE or the network.

There can be two possible scenarios for this procedure:

- the multi-access PDN connection via 3GPP access network is removed and the multi-access PDN connection via WLAN access network is maintained; or
- the multi-access PDN connection via WLAN access network is removed and the multi-access PDN connection via 3GPP access network is maintained.

Once the procedure is completed, the UE uses the PDN connection over the maintained access network, except in the case of a network-initiated PDN connection release with cause "reactivation requested" as specified in subclause 5.4.2.7.2 or subclause 5.4.2.9.2 or subclause 5.4.2.10.2.

5.4.2 UE procedures

5.4.2.1 UE-initiated removal of GERAN or UTRAN access from a multi-access PDN connection

This procedure can only be executed if the UE is operating in A/Gb mode or Iu mode. The UE shall not trigger an inter-system change to A/Gb mode of operation or Iu mode of operation to execute this procedure.

In order to remove GERAN or UTRAN as an access for IP flows of a multi-access PDN connection, UE shall perform the PDP context deactivation initiated by the MS procedure as specified in subclause 6.1.3.4.1 of 3GPP TS 24.008 [3].

5.4.2.2 UE-initiated removal of E-UTRAN access from a multi-access PDN connection

This procedure can only be executed if the UE is operating in S1 mode. The UE shall not trigger an inter-system change to S1 mode of operation to execute this procedure.

In order to remove E-UTRAN as an access for IP flows of a multi-access PDN connection, the UE shall perform the UE requested PDN disconnect procedure as specified in subclause 6.5.2 of 3GPP TS 24.301 [4].

5.4.2.3 UE-initiated removal of trusted WLAN using SCM as an access from a multi-access PDN connection

In order to remove trusted WLAN using SCM as an access for IP flows of a multi-access PDN connection, the UE can send a disassociation or deauthentication notification to the TWAN according to IEEE Std 802.11-2012 [8].

5.4.2.4 UE-initiated removal of trusted WLAN using MCM as an access from a multi-access PDN connection

In order to remove trusted WLAN using MCM as an access for IP flows of a multi-access PDN connection, the UE shall perform UE requested PDN disconnection procedure as specified in subclause 5.4 of 3GPP TS 24.244 [6].

5.4.2.5 UE-initiated removal of untrusted WLAN as an access from a multi-access PDN connection

In order to remove untrusted WLAN access network as an access for IP flows of a multi-access PDN connection, the UE shall perform the UE initiated disconnection procedure as specified in subclause 7.2.4.1 of 3GPP TS 24.302 [5].

5.4.2.6 Network-initiated removal of GERAN or UTRAN access from a multi-access PDN connection

In order to perform the network-initiated removal of PDN connection over GERAN or UTRAN, the UE shall follow the PDP context deactivation initiated by the network procedure as specified in subclause 6.1.3.4.2 of 3GPP TS 24.008 [3].

5.4.2.7 Network-initiated removal of E-UTRAN access from a multi-access PDN connection

5.4.2.7.1 General

In order to perform the network-initiated removal of PDN connection over E-UTRAN, the UE shall follow the network initiated detach procedure as specified in subclause 5.5.2.3 of 3GPP TS 24.301 [4] or the EPS bearer context deactivation procedure as specified in subclause 6.4.4 of 3GPP TS 24.301 [4].

5.4.2.7.2 Handling of ESM cause #39 "reactivation requested"

Upon receipt of a DEACTIVATE EPS BEARER CONTEXT REQUEST message with the EPS bearer context of a default EPS bearer context and ESM cause #39 "reactivation requested" over the 3GPP access as described in 3GPP TS 24.301 [4], if the corresponding PDN connection is established over both 3GPP access and WLAN, the UE shall:

- follow the procedures specified in 3GPP TS 24.301 [4] to complete the EPS bearer context deactivation; and
- follow the procedures specified in 3GPP TS 24.244 [6] and in 3GPP TS 24.302 [5] to locally release the corresponding PDN connection over trusted WLAN and untrusted WLAN, respectively.

The UE should then re-establish the PDN connection(s) at least over one access with the choice of the access being implementation specific.

Upon receipt of a DETACH REQUEST message with the detach type "re-attach required" over 3GPP access as described in 3GPP TS 24.301 [4], if the PDN connection(s) is established over both 3GPP access and WLAN, the UE shall:

- follow the procedures specified in 3GPP TS 24.244 [6] and in 3GPP TS 24.302 [5] to locally release the corresponding PDN connection over trusted WLAN and untrusted WLAN, respectively; and
- re-attach through E-UTRAN access using procedures specified in 3GPP TS 24.301 [4].

The UE should then re-establish any previously established PDN connection(s) in the 3GPP access.

NOTE: When the detach type indicates "re-attach required", user interaction is necessary in some cases when the UE cannot re-activate the EPS bearer(s) automatically.

5.4.2.8 Network-initiated removal of trusted WLAN using SCM as an access from a multi-access PDN connection

In order to remove the PDN connection over trusted WLAN using SCM applied with NBIFOM, the UE will perform the TWAN-initiated disconnection procedure which is out of 3GPP scope.

5.4.2.9 Network-initiated removal of trusted WLAN using MCM as an access from a multi-access PDN connection

5.4.2.9.1 General

In order to remove the multi-access PDN connection over trusted WLAN using MCM, the UE shall perform the TWAG initiated PDN disconnection procedure as specified in subclause 5.3 of 3GPP TS 24.244 [6].

5.4.2.9.2 Handling of ESM cause #39 "reactivation requested"

Upon receipt of a PDN DISCONNECT REQUEST message to release a PDN connection with the cause "reactivation requested" over the trusted WLAN as described in 3GPP TS 24.244 [6], if the PDN connection is established on both accesses and the UE is in EMM-IDLE mode over the 3GPP access, the UE shall:

- follow the procedure specified in 3GPP TS 24.301 [4] to locally release the PDN connection over the 3GPP access; and
- re-establish the PDN connection at least over one access, the choice of the access being implementation specific.

NOTE: If the UE is in EMM-CONNECTED mode instead of the EMM-IDLE mode over the 3GPP access, the UE follows the connection release procedure initiated by the network.

5.4.2.10 Network-initiated removal of untrusted WLAN as an access from a multi-access PDN connection

5.4.2.10.1 General

In order to remove the multi-access PDN connection over untrusted WLAN access network, the UE shall perform the UE behaviour towards ePDG initiated disconnection as specified in subclause 5.3 of 3GPP TS 24.244 [6].

5.4.2.10.2 Handling of Notify payload indicating reactivation requested

Upon receipt of an INFORMATIONAL request message including the DELETE payload and a NOTIFY payload with a private status type indicating a reactivation requested cause as described in 3GPP TS 24.302 [5] and if the PDN connection is established on both accesses and the UE is in EMM-IDLE mode over the 3GPP access, the UE shall:

- follow the procedure specified in 3GPP TS 24.301 [4] to locally release the PDN connection over the 3GPP access; and
- re-establish the PDN connection at least over one access, the choice of the access being implementation specific.

NOTE: When the UE is in EMM-CONNECTED mode instead of the EMM-IDLE mode over the 3GPP access, the UE follows the connection release procedure initiated by the network.

5.4.3 Network procedures

5.4.3.1 UE-initiated removal of GERAN or UTRAN access from a multi-access PDN connection

The SGSN shall follow the PDP context deactivation initiated by the MS procedure as specified in 3GPP TS 24.008 [3].

5.4.3.2 UE-initiated removal of E-UTRAN access from a multi-access PDN connection

The MME shall follow the UE requested PDN disconnect procedure as specified in 3GPP TS 24.301 [4].

5.4.3.3 UE-initiated removal of trusted WLAN using SCM as an access from a multi-access PDN connection

The TWAN shall follow the procedure as specified in subclause 6.5.2.1 of 3GPP TS 23.161 [2].

5.4.3.4 UE-initiated removal of trusted WLAN using MCM as an access from a multi-access PDN connection

The TWAG shall follow the UE requested PDN disconnection procedure as specified in 3GPP TS 24.244 [6].

5.4.3.5 UE-initiated removal of untrusted WLAN as an access from a multi-access PDN connection

The ePDG shall follow the ePDG behaviour towards UE initiated disconnection procedure as specified in subclause 7.4.3.2 of 3GPP TS 24.302 [5].

5.4.3.6 Network-initiated removal of GERAN or UTRAN access from a multi-access PDN connection

The SGSN shall follow the PDP context deactivation initiated by the network procedure as specified in 3GPP TS 24.008 [3].

5.4.3.7 Network-initiated removal of E-UTRAN access from a multi-access PDN connection

The MME shall follow the EPS bearer context deactivation initiated by the network procedure as specified in 3GPP TS 24.301 [4].

5.4.3.8 Network-initiated removal of trusted WLAN using SCM as an access from a multi-access PDN connection

The TWAN shall follow the procedure as specified in subclause 6.5.2.2 of 3GPP TS 23.161 [2].

5.4.3.9 Network-initiated removal of trusted WLAN using MCM as an access from a multi-access PDN connection

The TWAG shall follow the TWAG initiated PDN disconnection procedure specified in 3GPP TS 24.244 [6].

5.4.3.10 Network-initiated removal of untrusted WLAN as an access from a multi-access PDN connection

The ePDG shall follow the ePDG initiated disconnection procedure as specified in subclause 7.4.3.1 of 3GPP TS 24.302 [5].

5.5 IP flow mapping

5.5.1 UE procedures

5.5.1.1 UE-initiated IP flow mapping over GERAN or UTRAN

This procedure can only be executed if the UE is operating in A/Gb mode or Iu mode. The UE shall not trigger an inter-system change to A/Gb mode of operation or Iu mode of operation to execute this procedure.

If NBIFOM applies to a PDN connection, and the PDN connection is a multi-access PDN connection for IP flows over GERAN or UTRAN and WLAN, and the network-initiated NBIFOM mode is the selected NBIFOM mode, then upon request to initiate UE-initiated IP flow mapping over GERAN or UTRAN, the UE shall initiate the PDP context modification procedure according to 3GPP TS 24.008 [3].

In the MODIFY PDP CONTEXT REQUEST message of the PDP context modification procedure, the UE shall include the NBIFOM container IE. In the NBIFOM container IE, the UE shall include the NBIFOM IP flow mapping parameter.

NOTE: If a MODIFY PDP CONTEXT ACCEPT message is received, network can provide routing rules updated based on the NBIFOM IP flow mapping parameter using the network-initiated IP flow mobility over GERAN or UTRAN described in subclause 5.3.2.6.

Upon receiving a REQUEST SECONDARY PDP CONTEXT ACTIVATION message or a MODIFY PDP CONTEXT REQUEST message including the NBIFOM container IE containing the NBIFOM routing rules parameter updated

based on the UE requested NBIFOM IP flow mapping parameter, the UE shall provide the network with the routing rules accepted or rejected by the UE, using the network-initiated IP flow mobility over GERAN or UTRAN described in subclause 5.3.1.6.

Upon receiving a MODIFY PDP CONTEXT REJECT message, the UE shall consider the NBIFOM status parameter of the NBIFOM container IE of the MODIFY PDP CONTEXT REJECT message as the cause of failure.

5.5.1.2 UE-initiated IP flow mapping over E-UTRAN

This procedure can only be executed if the UE is operating in S1 mode. The UE shall not trigger an inter-system change to S1 mode of operation to execute this procedure.

If NBIFOM applies to a PDN connection, and the PDN connection is a multi-access PDN connection for IP flows over E-UTRAN and WLAN, and the network-initiated NBIFOM mode is the selected NBIFOM mode, then upon request to initiate UE-initiated IP flow mapping over E-UTRAN, the UE shall initiate the UE requested bearer resource modification procedure or the UE requested bearer resource allocation procedure according to 3GPP TS 24.301 [4].

In:

- a) the BEARER RESOURCE MODIFICATION REQUEST message of the UE requested bearer resource modification procedure; or
- b) the BEARER RESOURCE ALLOCATION REQUEST message of the UE requested bearer resource allocation procedure;

the UE shall include the NBIFOM container IE. In the NBIFOM container IE, the UE shall include the NBIFOM IP flow mapping parameter.

Upon receiving:

- a) an ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message of the dedicated EPS bearer context activation procedure, such that:
 - 1) the ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message is related to the UE requested bearer resource modification procedure or the UE requested bearer resource allocation procedure;
 - 2) the IEs of the ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message are acceptable; and
 - 3) the ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message contains the NBIFOM routing rules parameter in the NBIFOM container IE; or
- b) a MODIFY EPS BEARER CONTEXT REQUEST message of the EPS bearer context modification procedure such that:
 - 1) the MODIFY EPS BEARER CONTEXT REQUEST message is related to the UE requested bearer resource modification procedure or the UE requested bearer resource allocation procedure;
 - 2) the IEs of the MODIFY EPS BEARER CONTEXT REQUEST message are acceptable; and
 - 3) the MODIFY EPS BEARER CONTEXT REQUEST message contains the NBIFOM routing rules parameter in the NBIFOM container IE;

then:

- a) if the UE accepts the requested routing rules indicated in the NBIFOM routing rules parameter:
 - 1) the UE shall respond with the ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT message or the MODIFY EPS BEARER CONTEXT ACCEPT message; and
 - 2) the UE shall apply the requested routing rules; and
- b) if the UE rejects the requested routing rules indicated in the NBIFOM routing rules parameter, the UE shall respond with:
 - 1) the ACTIVATE DEDICATED EPS BEARER CONTEXT REJECT message; or

- 2) the MODIFY EPS BEARER CONTEXT REJECT message,

with the NBIFOM container IE. In the NBIFOM container IE, the UE shall include the NBIFOM status parameter with appropriate error value.

If however, the UE receives a BEARER RESOURCE MODIFICATION REJECT message or a BEARER RESOURCE ALLOCATION REJECT message, the UE shall consider the NBIFOM status parameter of the NBIFOM container IE of the BEARER RESOURCE MODIFICATION REJECT message or a BEARER RESOURCE ALLOCATION REJECT message as the cause of failure.

5.5.1.3 UE-initiated IP flow mapping over trusted WLAN using SCM

Not applicable.

5.5.1.4 UE-initiated IP flow mapping over trusted WLAN using MCM

If NBIFOM applies to a PDN connection, and the PDN connection is a multi-access PDN connection for IP flows over trusted WLAN using MCM and 3GPP accesses, and the network-initiated NBIFOM mode is the selected NBIFOM mode, then upon request to initiate UE-initiated IP flow mapping over trusted WLAN using MCM, the UE shall initiate the UE requested PDN connectivity modification procedure according to 3GPP TS 24.244 [6].

In the PDN MODIFICATION INDICATION message of the UE requested PDN connectivity modification procedure, the UE shall include the NBIFOM container IE. In the NBIFOM container IE, the UE shall include the NBIFOM IP flow mapping parameter.

Upon receiving a PDN MODIFICATION REQUEST message of the TWAG initiated PDN connectivity modification procedure such that:

- a) the PDN MODIFICATION REQUEST message is initiated by the UE requested PDN connectivity modification procedure; and
- b) the IEs of the PDN MODIFICATION REQUEST message are acceptable;

then:

- a) if the PDN MODIFICATION REQUEST message does not contain the NBIFOM routing rules parameter in the NBIFOM container IE or does not contain the NBIFOM container IE, the UE shall send a PDN MODIFICATION ACCEPT message; and
- b) if the PDN MODIFICATION REQUEST contains the NBIFOM routing rules parameter in the NBIFOM container IE:
 - 1) if the UE accepts the requested routing rules indicated in the NBIFOM routing rules parameter:
 - A) the UE shall send a PDN MODIFICATION ACCEPT message; and
 - B) the UE shall apply the requested routing rules; and
 - 2) if the UE rejects the requested routing rules indicated in the NBIFOM routing rules parameter, the UE shall send a PDN MODIFICATION REJECT message with the NBIFOM container IE. In the NBIFOM container IE, the UE shall include the NBIFOM status parameter with appropriate error value.

If however, the UE receives a PDN MODIFICATION REJECT message, the UE shall consider the NBIFOM status parameter of the NBIFOM container IE of the PDN MODIFICATION REJECT message as the cause of failure.

5.5.1.5 UE-initiated IP flow mapping over untrusted WLAN

If NBIFOM applies to a PDN connection, and the PDN connection is a multi-access PDN connection for IP flows over untrusted WLAN access and 3GPP access, and the network-initiated NBIFOM mode is the selected NBIFOM mode, then upon request to initiate IP flow mapping over untrusted WLAN access, the UE shall initiate the UE-initiated modification procedure according to 3GPP TS 24.302 [5].

In the INFORMATIONAL request message of the UE-initiated modification procedure, the UE shall include the NBIFOM_GENERIC_CONTAINER Notify payload. In the NBIFOM_GENERIC_CONTAINER Notify payload, the UE shall include the NBIFOM IP flow mapping parameter.

Upon receiving an INFORMATIONAL request message of the ePDG-initiated modification procedure such that:

- a) the received INFORMATIONAL request message does not contain a Notify payload indicating an error;
- b) the received INFORMATIONAL request message contains a PTI Notify payload with the Related Message ID field set to the Message ID field of the sent INFORMATIONAL request message; and
- c) the IEs of the received INFORMATIONAL request message are acceptable;

then:

- a) if the received INFORMATIONAL request message does not contain the NBIFOM routing rules parameter in the NBIFOM_GENERIC_CONTAINER Notify payload, the UE shall send an INFORMATIONAL response message without a Notify payload indicating an error; and
- b) if the received INFORMATIONAL request message contains the NBIFOM routing rules parameter in the NBIFOM_GENERIC_CONTAINER Notify payload:
 - 1) if the UE accepts the requested routing rules indicated in the NBIFOM routing rules parameter:
 - A) the UE shall send an INFORMATIONAL response message without a Notify payload indicating an error; and
 - B) the UE shall apply the requested routing rules; and
 - 2) if the UE rejects the requested routing rules indicated in the NBIFOM routing rules parameter, the UE shall send an INFORMATIONAL response message. In the INFORMATIONAL response message, the UE shall include a Notify payload indicating an error and shall include the NBIFOM_GENERIC_CONTAINER Notify payload. In the NBIFOM_GENERIC_CONTAINER Notify payload, the UE shall include the NBIFOM status parameter with appropriate error value.

Upon receiving an INFORMATIONAL request message of the ePDG-initiated modification procedure such that:

- a) the received INFORMATIONAL request message contains a Notify payload indicating an error; and
- b) the received INFORMATIONAL request message contains a PTI Notify payload with the Related Message ID field set to the Message ID field of the sent INFORMATIONAL request message;

then:

- a) the UE shall consider the NBIFOM status parameter of the NBIFOM_GENERIC_CONTAINER Notify payload of the INFORMATIONAL request message as the cause of failure; and
- b) the UE shall send an INFORMATIONAL response message.

5.5.2 Network procedures

5.5.2.1 UE-initiated IP flow mapping over GERAN or UTRAN

If the SGSN receives an NBIFOM container IE in an Update Bearer Request message or a Create Bearer Request message and the SGSN stored a Triggering SGSN initiated PDP Context Creation/Modification Indication received in the PDP Context Creation Procedure as specified in 3GPP TS 29.274 [7] from the SGW, the SGSN shall include the received NBIFOM container IE in the MODIFY PDP CONTEXT REQUEST message or the REQUEST SECONDARY PDP CONTEXT ACTIVATION message to the UE as specified in 3GPP TS 24.008 [3]. Before that, the SGSN shall also reply the MODIFY PDP CONTEXT ACCEPT message without the NBIFOM container IE in order to reply the MODIFY PDP CONTEXT REQUEST message sent by the UE.

If the SGSN receives a Bearer Resource Failure Indication message including NBIFOM container IE from the SGW as specified in 3GPP TS 29.274 [7], the SGSN shall include the received NBIFOM container IE in the MODIFY PDP CONTEXT REJECT message to the UE as specified in 3GPP TS 24.008 [3].

5.5.2.2 UE-initiated IP flow mapping over E-UTRAN

The MME shall include the NBIFOM container IE in the ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message, MODIFY EPS BEARER CONTEXT REQUEST message as specified in 3GPP TS 24.301 [4] to the UE according to the response message from the network as specified in 3GPP TS 29.274 [7].

If the MME receives a Bearer Resource Failure Indication message including NBIFOM container IE from the SGW as specified in 3GPP TS 29.274 [7], the MME shall include the received NBIFOM container IE to the UE in the BEARER RESOURCE MODIFICATION REJECT message as specified in 3GPP TS 24.301 [4].

5.5.2.3 UE-initiated IP flow mapping over trusted WLAN using SCM

Not applicable.

5.5.2.4 UE-initiated IP flow mapping over trusted WLAN using MCM

If the TWAG receives an Update Bearer Request message or a Create Bearer Request message including NBIFOM container IE from the PDN GW as specified 3GPP TS 29.274 [7], TWAG shall include the NBIFOM container IE in the PDN MODIFICATION REQUEST message to the UE as specified in 3GPP TS 24.244 [6].

If the TWAG receives a Bearer Resource Failure Indication message including NBIFOM container IE from the PDN GW as specified in 3GPP TS 29.274 [7], the TWAG shall include the NBIFOM container IE in the PDN MODIFICATION REJECT message to the UE as specified in 3GPP TS 24.244 [6].

5.5.2.5 UE-initiated IP flow mapping over untrusted WLAN

Once the ePDG receives an INFORMATIONAL request message including NBIFOM container IE from the UE, the ePDG shall send the INFORMATIONAL response message to the UE as specified in subclause 6.4.3 of 3GPP TS 23.161 [2].

If the ePDG receives an Update Bearer Request message, or a Create Bearer Request message, or a Bearer Resource Failure Indication message including NBIFOM container IE from the PDN GW as specified in 3GPP TS 29.274 [7],

- a) the ePDG shall construct the NBIFOM_GENERIC_CONTAINER Notify payload as specified in 3GPP TS 24.302 [5] and copy the NBIFOM container contents from the NBIFOM container IE into the NBIFOM container contents field of the NBIFOM_GENERIC_CONTAINER Notify payload;
- b) the ePDG shall include the NBIFOM_GENERIC_CONTAINER Notify payload in the INFORMATIONAL request message to the UE;
- c) the ePDG shall include a PTI notify payload as specified in subclause 7.4.2.1 of 3GPP TS 24.302 [5] in the INFORMATIONAL request message to the UE; and
- d) if receiving the Bearer Resource Failure Indication message, the ePDG shall also include a Notify payload indicating an error in the INFORMATIONAL request message to the UE.

5.6 Handling of change of access usability

5.6.1 UE procedures

5.6.1.1 Change in usability of GERAN or UTRAN access

This procedure can only be executed if the UE is operating in A/Gb mode or Iu mode. The UE shall not trigger an inter-system change to A/Gb mode of operation or Iu mode of operation to execute this procedure.

If NBIFOM applies to a PDN connection, and the PDN connection is a multi-access PDN connection for IP flows over GERAN or UTRAN and WLAN, the network-initiated NBIFOM mode is the selected NBIFOM mode, and:

- a) the UE detects that GERAN or UTRAN access that was previously unusable has now become usable;
- b) the UE detects that the trusted WLAN using SCM that was previously usable has now become unusable;

- c) the UE detects that the trusted WLAN using MCM that was previously usable has now become unusable;
- d) the UE detects that the untrusted WLAN that was previously usable has now become unusable; or
- e) the UE detects that the trusted WLAN using SCM that was previously unusable has now become usable;

then the UE shall initiate the PDP context modification procedure according to 3GPP TS 24.008 [3].

In the MODIFY PDP CONTEXT REQUEST message of the PDP context modification procedure, the UE shall include the NBIFOM container IE. In the NBIFOM container IE, the UE shall include the NBIFOM access usability indication.

NOTE: If a MODIFY PDP CONTEXT ACCEPT message is received, network can provide routing rules updated based on the NBIFOM access usability indication parameter using the network-initiated IP flow mobility over GERAN or UTRAN described in subclause 5.3.1.6.

Upon receiving a REQUEST SECONDARY PDP CONTEXT ACTIVATION message or a MODIFY PDP CONTEXT REQUEST message including the NBIFOM container IE containing the NBIFOM routing rules parameter, the UE shall provide the network with the routing rules accepted or rejected by the UE, using the network-initiated IP flow mobility over GERAN or UTRAN described in subclause 5.3.1.6.

If however, the UE receives a MODIFY PDP CONTEXT REJECT message, the UE shall consider the NBIFOM status parameter of the NBIFOM container IE of the MODIFY PDP CONTEXT REJECT message as the cause of failure.

5.6.1.2 Change in usability of E-UTRAN access

This procedure can only be executed if the UE is operating in S1 mode. The UE shall not trigger an inter-system change to S1 mode of operation to execute this procedure.

If NBIFOM applies to a PDN connection, and the PDN connection is a multi-access PDN connection for IP flows over E-UTRAN and WLAN, the network-initiated NBIFOM mode is the selected NBIFOM mode, and:

- a) the UE detects that E-UTRAN access that was previously unusable has now become usable;
- b) the UE detects that the trusted WLAN using SCM that was previously usable has now become unusable;
- c) the UE detects that the trusted WLAN using MCM that was previously usable has now become unusable;
- d) the UE detects that the untrusted WLAN that was previously usable has now become unusable; or
- e) the UE detects that the trusted WLAN using SCM that was previously unusable has now become usable;

then the UE shall initiate the UE requested bearer resource modification procedure or the UE requested bearer resource allocation procedure according to 3GPP TS 24.301 [4].

In:

- a) the BEARER RESOURCE MODIFICATION REQUEST message of the UE requested bearer resource modification procedure; or
- b) the BEARER RESOURCE ALLOCATION REQUEST message of the UE requested bearer resource allocation procedure;

the UE shall include the NBIFOM container IE. In the NBIFOM container IE, the UE shall include the NBIFOM access usability indication.

Upon receiving:

- a) an ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message of the dedicated EPS bearer context activation procedure, such that:
 - 1) the ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message is related to the UE requested bearer resource modification procedure or the UE requested bearer resource allocation procedure;
 - 2) the IEs of the ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message are acceptable; and

- 3) the ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message contains the NBIFOM routing rules parameter in the NBIFOM container IE; or
- b) a MODIFY EPS BEARER CONTEXT REQUEST message of the EPS bearer context modification procedure such that:
 - 1) the MODIFY EPS BEARER CONTEXT REQUEST message is related to the UE requested bearer resource modification procedure or the UE requested bearer resource allocation procedure; and
 - 2) the IEs of the MODIFY EPS BEARER CONTEXT REQUEST message are acceptable; or
 - 3) the MODIFY EPS BEARER CONTEXT REQUEST message contains the NBIFOM routing rules parameter in the NBIFOM container IE;

then:

- a) if the UE accepts the requested routing rules indicated in the NBIFOM routing rules parameter:
 - 1) the UE shall send the ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT message or the MODIFY EPS BEARER CONTEXT ACCEPT message; and
 - 2) the UE shall apply the requested routing rules; and
- b) if the UE rejects the requested routing rules indicated in the NBIFOM routing rules parameter, the UE shall send:
 - 1) the ACTIVATE DEDICATED EPS BEARER CONTEXT REJECT message; or
 - 2) the MODIFY EPS BEARER CONTEXT REJECT message,
with the NBIFOM container IE. In the NBIFOM container IE, the UE shall include the NBIFOM status parameter with appropriate error value.

If however, the UE receives a BEARER RESOURCE MODIFICATION REJECT message or a BEARER RESOURCE ALLOCATION REJECT message, the UE shall consider the NBIFOM status parameter of the NBIFOM container IE of the BEARER RESOURCE MODIFICATION REJECT message or a BEARER RESOURCE ALLOCATION REJECT message as the cause of failure.

5.6.1.3 Change in usability of trusted WLAN using SCM

Not applicable.

5.6.1.4 Change in usability of trusted WLAN using MCM

If NBIFOM applies to a PDN connection, and the PDN connection is a multi-access PDN connection for IP flows over trusted WLAN using MCM and 3GPP accesses, the network-initiated NBIFOM mode is the selected NBIFOM mode, and:

- a) the UE detects that the trusted WLAN using MCM that was previously unusable has now become usable; or
- b) the UE detects that the 3GPP accesses that were previously usable have now become unusable;

then the UE shall initiate the UE requested PDN connectivity modification procedure according to 3GPP TS 24.244 [6].

In the PDN MODIFICATION INDICATION message of the UE requested PDN connectivity modification procedure, the UE shall include the NBIFOM container IE. In the NBIFOM container IE, the UE shall include the NBIFOM access usability indication.

Upon receiving a PDN MODIFICATION REQUEST message of the TWAG initiated PDN connectivity modification procedure such that:

- a) the PDN MODIFICATION REQUEST message is initiated by the UE requested PDN connectivity modification procedure; and
- b) the IEs of the PDN MODIFICATION REQUEST message are acceptable;

then:

- a) if the PDN MODIFICATION REQUEST message does not contain the NBIFOM routing rules parameter in the NBIFOM container IE or does not contain the NBIFOM container IE, the UE shall send a PDN MODIFICATION ACCEPT message; and
- b) if the PDN MODIFICATION REQUEST contains the NBIFOM routing rules parameter in the NBIFOM container IE:
 - 1) if the UE accepts the requested routing rules indicated in the NBIFOM routing rules parameter:
 - A) the UE shall send a PDN MODIFICATION ACCEPT message; and
 - B) the UE shall apply the requested routing rules; and
 - 2) if the UE rejects the requested routing rules indicated in the NBIFOM routing rules parameter, the UE shall send a PDN MODIFICATION REJECT message with the NBIFOM container IE. In the NBIFOM container IE, the UE shall include the NBIFOM status parameter with appropriate error value.

If however, the UE receives a PDN MODIFICATION REJECT message, the UE shall consider the NBIFOM status parameter of the NBIFOM container IE of the PDN MODIFICATION REJECT message as the cause of failure.

5.6.1.5 Change in usability of untrusted WLAN

If NBIFOM applies to a PDN connection, and the PDN connection is a multi-access PDN connection for IP flows over untrusted WLAN access and 3GPP accesses, and the network-initiated NBIFOM mode is the selected NBIFOM mode, and:

- a) the UE detects that the untrusted WLAN that was previously unusable has now become usable; or
- b) the UE detects that the 3GPP accesses that was previously usable has now become unusable;

then the UE shall initiate the UE-initiated modification procedure according to 3GPP TS 24.302 [5].

In the INFORMATIONAL request message of the UE-initiated modification procedure, the UE shall include the NBIFOM_GENERIC_CONTAINER Notify payload. In the NBIFOM_GENERIC_CONTAINER Notify payload, the UE shall include the NBIFOM access usability indication.

Upon receiving an INFORMATIONAL request message of the ePDG-initiated modification procedure such that:

- a) the received INFORMATIONAL request message does not contain a Notify payload indicating an error;
- b) the received INFORMATIONAL request message contains a PTI Notify payload with the Related Message ID field set to the Message ID field of the sent INFORMATIONAL request message; and
- c) the IEs of the received INFORMATIONAL request message are acceptable;

then:

- a) if the received INFORMATIONAL request message does not contain the NBIFOM routing rules parameter in the NBIFOM_GENERIC_CONTAINER Notify payload, the UE shall send an INFORMATIONAL response message without a Notify payload indicating an error; and
- b) if the received INFORMATIONAL request message contains the NBIFOM routing rules parameter in the NBIFOM_GENERIC_CONTAINER Notify payload:
 - 1) if the UE accepts the requested routing rules indicated in the NBIFOM routing rules parameter:
 - A) the UE shall send an INFORMATIONAL response message without a Notify payload indicating an error; and
 - B) the UE shall apply the requested routing rules; and
 - 2) if the UE rejects the requested routing rules indicated in the NBIFOM routing rules parameter, the UE shall send an INFORMATIONAL response message. In the INFORMATIONAL response message, the UE shall include a Notify payload indicating an error and the NBIFOM_GENERIC_CONTAINER Notify payload. In the NBIFOM_GENERIC_CONTAINER Notify payload, the UE shall include the NBIFOM status parameter with appropriate error value.

If however, the UE receives an INFORMATIONAL request message of the ePDG-initiated modification procedure such that:

- a) the received INFORMATIONAL request message contains a Notify payload indicating an error; and
- b) the received INFORMATIONAL request message contains a PTI Notify payload with the Related Message ID field set to the Message ID field of the sent INFORMATIONAL request message;

then:

- a) the UE shall consider the NBIFOM status parameter of the NBIFOM_GENERIC_CONTAINER Notify payload of the INFORMATIONAL request message as the cause of failure; and
- b) the UE shall send an INFORMATIONAL response message.

5.6.2 Network procedures

5.6.2.1 Change in usability of GERAN or UTRAN

If the SGSN receives an NBIFOM container IE in an Update Bearer Request message or a Create Bearer Request message as specified in 3GPP TS 29.274 [7] from the SGW as specified in 3GPP TS 29.274 [7], the SGSN shall include the received NBIFOM container IE in the MODIFY PDP CONTEXT REQUEST message or the REQUEST SECONDARY PDP CONTEXT ACTIVATION message to the UE as specified in 3GPP TS 24.008 [3].

If the SGSN receives a Bearer Resource Failure Indication message including NBIFOM container IE from the SGW as specified in 3GPP TS 29.274 [7], the SGSN shall include the received NBIFOM container IE in the MODIFY PDP CONTEXT REJECT message to the UE as specified in 3GPP TS 24.008 [3].

5.6.2.2 Change in usability change of E-UTRAN

If the MME receives an Update Bearer Request message, or a Create Bearer Request message including NBIFOM container IE from the SGW as specified in 3GPP TS 29.274 [7], the MME shall include the received NBIFOM container IE in the MODIFY EPS BEARER CONTEXT REQUEST message, or the ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message to the UE as specified in 3GPP TS 24.301 [4].

If the MME receives a Bearer Resource Failure Indication message including NBIFOM container IE from the SGW as specified in 3GPP TS 29.274 [7], the MME shall include the received NBIFOM container IE to the UE in the BEARER RESOURCE MODIFICATION REJECT message or BEARER RESOURCE ALLOCATION REJECT message as specified in 3GPP TS 24.301 [4].

5.6.2.3 Change in usability of trusted WLAN using SCM

Not applicable.

5.6.2.4 Change in usability of trusted WLAN using MCM

If the TWAG receives an Update Bearer Request message or a Create Bearer Request message including NBIFOM container IE from the PDN GW as specified 3GPP TS 29.274 [7], TWAG shall include the NBIFOM container IE in the PDN MODIFICATION REQUEST message to the UE as specified in 3GPP TS 24.244 [6].

If the TWAG receives a Bearer Resource Failure Indication message including NBIFOM container IE from the PDN GW as specified in 3GPP TS 29.274 [7], the TWAG shall include the NBIFOM container IE in the PDN MODIFICATION REJECT message to the UE as specified in 3GPP TS 24.244 [6].

5.6.2.5 Change in usability of untrusted WLAN

Once the ePDG receives an INFORMATIONAL request message including NBIFOM container IE from the UE, the ePDG shall send the INFORMATIONAL response message to the UE as specified in subclause 6.4.3 of 3GPP TS 23.161 [2].

If the ePDG receives an Update Bearer Request message, or a Create Bearer Request message, or a Bearer Resource Failure Indication message including NBIFOM container IE from the PDN GW as specified in 3GPP TS 29.274 [7],

- a) the ePDG shall construct the NBIFOM_GENERIC_CONTAINER Notify payload as specified in 3GPP TS 24.302 [5] and copy the NBIFOM container contents from the NBIFOM container IE into the NBIFOM container contents field of the NBIFOM_GENERIC_CONTAINER Notify payload;
- b) the ePDG shall include the NBIFOM_GENERIC_CONTAINER Notify payload in the INFORMATIONAL request message to the UE;
- c) the ePDG shall include a PTI notify payload as specified in subclause 7.4.2.1 of 3GPP TS 24.302 [5] in the INFORMATIONAL request message to the UE; and
- d) if receiving the Bearer Resource Failure Indication message, the ePDG shall also include a Notify payload indicating an error in the INFORMATIONAL request message to the UE.

5.7 Handling of Access stratum indication

5.7.1 UE procedures

5.7.1.1 Access stratum indication via GERAN or UTRAN

This procedure can only be executed if the UE is operating in A/Gb mode or Iu mode. The UE shall not trigger an inter-system change to A/Gb mode of operation or Iu mode of operation to execute this procedure.

If NBIFOM applies to a PDN connection, the network-initiated NBIFOM mode is the selected NBIFOM mode, the RAN rules control the WLAN access selection and traffic routing as described in 3GPP TS 24.302 [5], the RAN rules handling parameter is set and:

- a) the PDN connection is a multi-access PDN connection for IP flows over GERAN or UTRAN and over trusted WLAN using SCM, the move-traffic-to-WLAN indication specified in 3GPP TS 24.302 [5] is received from the access stratum layer of the 3GPP access, and the Local Operating Environment Information in the UE does not contain non-radio-related conditions that prohibit the use of WLAN access; or
- b) the PDN connection is a multi-access PDN connection for IP flows over GERAN or UTRAN and WLAN, and the move-traffic-from-WLAN indication specified in 3GPP TS 24.302 [5] is received from the access stratum layer of the 3GPP access;

then the UE shall initiate the PDP context modification procedure according to 3GPP TS 24.008 [3].

NOTE 1: The WLAN offload indication information element described in 3GPP TS 24.301 [4] and 3GPP TS 24.008 [3] does not influence execution of the Access stratum indication via GERAN or UTRAN.

In the MODIFY PDP CONTEXT REQUEST message of the PDP context modification procedure, the UE shall include the NBIFOM container IE. In the NBIFOM container IE, the UE shall include the NBIFOM Access stratum status parameter with value indicating the indication received from the access stratum layer of the 3GPP access.

NOTE 2: If a MODIFY PDP CONTEXT ACCEPT message is received, network can provide routing rules updated based on the NBIFOM Access stratum status parameter using the network-initiated IP flow mobility over GERAN or UTRAN described in subclause 5.3.2.6.

Upon receiving a REQUEST SECONDARY PDP CONTEXT ACTIVATION message or a MODIFY PDP CONTEXT REQUEST message including the NBIFOM container IE containing the NBIFOM routing rules parameter, the UE shall provide the network with the routing rules accepted or rejected by the UE, using the network-initiated IP flow mobility over GERAN or UTRAN described in subclause 5.3.1.6.

If however, the UE receives a MODIFY PDP CONTEXT REJECT message, the UE shall consider the NBIFOM status parameter of the NBIFOM container IE of the MODIFY PDP CONTEXT REJECT message as the cause of failure.

5.7.1.2 Access stratum indication via E-UTRAN

This procedure can only be executed if the UE is operating in S1 mode. The UE shall not trigger an inter-system change to S1 mode of operation to execute this procedure.

If NBIFOM applies to a PDN connection, the network-initiated NBIFOM mode is the selected NBIFOM mode, the RAN rules control the WLAN access selection and traffic routing as described in 3GPP TS 24.302 [5], the RAN rules handling parameter is set and:

- a) the PDN connection is a multi-access PDN connection for IP flows over E-UTRAN and over trusted WLAN using SCM, the move-traffic-to-WLAN indication specified in 3GPP TS 24.302 [5] is received from the access stratum layer of the 3GPP access, and the Local Operating Environment Information in the UE does not contain non-radio-related conditions that prohibit the use of WLAN access; or
- b) the PDN connection is a multi-access PDN connection for IP flows over E-UTRAN and WLAN, and the move-traffic-from-WLAN indication specified in 3GPP TS 24.302 [5] is received from the access stratum layer of the 3GPP access;

then the UE shall initiate the UE requested bearer resource modification procedure or the UE requested bearer resource allocation procedure according to 3GPP TS 24.301 [4].

NOTE: The WLAN offload indication information element described in 3GPP TS 24.301 [4] and 3GPP TS 24.008 [3] does not influence execution of the Access stratum indication via E-UTRAN.

In:

- a) the BEARER RESOURCE MODIFICATION REQUEST message of the UE requested bearer resource modification procedure; or
- b) the BEARER RESOURCE ALLOCATION REQUEST message of the UE requested bearer resource allocation procedure;

the UE shall include the NBIFOM container IE. In the NBIFOM container IE, the UE shall include the NBIFOM Access stratum status parameter with value indicating the indication received from the access stratum layer of the 3GPP access.

Upon receiving:

- a) an ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message of the dedicated EPS bearer context activation procedure, such that:
 - 1) the ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message is related to the UE requested bearer resource modification procedure or the UE requested bearer resource allocation procedure;
 - 2) the IEs of the ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message are acceptable; and
 - 3) the ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message contains the NBIFOM routing rules parameter in the NBIFOM container IE; or
- b) a MODIFY EPS BEARER CONTEXT REQUEST message of the EPS bearer context modification procedure such that:
 - 1) the MODIFY EPS BEARER CONTEXT REQUEST message is related to the UE requested bearer resource modification procedure or the UE requested bearer resource allocation procedure;
 - 2) the IEs of the MODIFY EPS BEARER CONTEXT REQUEST message are acceptable; and
 - 3) the ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message contains the NBIFOM routing rules parameter in the NBIFOM container IE;

then:

- a) if the UE accepts the requested routing rules indicated in the NBIFOM routing rules parameter:

- 1) the UE shall send the ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT message or the MODIFY EPS BEARER CONTEXT ACCEPT message; and
 - 2) the UE shall apply the requested routing rules; and
- b) if the UE rejects the requested routing rules indicated in the NBIFOM routing rules parameter, the UE shall send:
- 1) the ACTIVATE DEDICATED EPS BEARER CONTEXT REJECT message; or
 - 2) the MODIFY EPS BEARER CONTEXT REJECT message,
with the NBIFOM container IE. In the NBIFOM container IE, the UE shall include the NBIFOM status parameter with appropriate error value.

If however, the UE receives a BEARER RESOURCE MODIFICATION REJECT message or a BEARER RESOURCE ALLOCATION REJECT message, the UE shall consider the NBIFOM status parameter of the NBIFOM container IE of the BEARER RESOURCE MODIFICATION REJECT message or a BEARER RESOURCE ALLOCATION REJECT message as the cause of failure.

5.7.1.3 Access stratum indication via trusted WLAN using SCM

Not applicable.

5.7.1.4 Access stratum indication via trusted WLAN using MCM

If NBIFOM applies to a PDN connection, the network-initiated NBIFOM mode is the selected NBIFOM mode, the RAN rules control the WLAN access selection and traffic routing as described in 3GPP TS 24.302 [5], the RAN rules handling parameter is set, the PDN connection is a multi-access PDN connection for IP flows over trusted WLAN using MCM and 3GPP accesses, the move-traffic-to-WLAN indication specified in 3GPP TS 24.302 [5] is received from the access stratum layer of the 3GPP access, and the Local Operating Environment Information in the UE does not contain non-radio-related conditions that prohibit the use of WLAN access then the UE shall initiate the UE requested PDN connectivity modification procedure according to 3GPP TS 24.244 [6].

NOTE: The WLAN offload indication information element described in 3GPP TS 24.301 [4] and 3GPP TS 24.008 [3] does not influence execution of the Access stratum indication via trusted WLAN using MCM.

In the PDN MODIFICATION INDICATION message of the UE requested PDN connectivity modification procedure, the UE shall include the NBIFOM container IE. In the NBIFOM container IE, the UE shall include the NBIFOM Access stratum s status parameter with value indicating the indication received from the access stratum layer of the 3GPP access.

Upon receiving a PDN MODIFICATION REQUEST message of the TWAG initiated PDN connectivity modification procedure such that:

- a) the PDN MODIFICATION REQUEST message is initiated by the UE requested PDN connectivity modification procedure; and
- b) the IEs of the PDN MODIFICATION REQUEST message are acceptable;

then:

- a) if the PDN MODIFICATION REQUEST message does not contain the NBIFOM routing rules parameter in the NBIFOM container IE or does not contain the NBIFOM container IE, the UE shall send a PDN MODIFICATION ACCEPT message; and
- b) if the PDN MODIFICATION REQUEST contains the NBIFOM routing rules parameter in the NBIFOM container IE:
 - 1) if the UE accepts the requested routing rules indicated in the NBIFOM routing rules parameter:
 - A) the UE shall send a PDN MODIFICATION ACCEPT message; and
 - B) the UE shall apply the requested routing rules; and

- 2) if the UE rejects the requested routing rules indicated in the NBIFOM routing rules parameter, the UE shall send a PDN MODIFICATION REJECT message with the NBIFOM container IE. In the NBIFOM container IE, the UE shall include the NBIFOM status parameter with appropriate error value.

If however, the UE receives a PDN MODIFICATION REJECT message, the UE shall consider the NBIFOM status parameter of the NBIFOM container IE of the PDN MODIFICATION REJECT message as the cause of failure.

5.7.1.5 Access stratum indication via untrusted WLAN

If NBIFOM applies to a PDN connection, the network-initiated NBIFOM mode is the selected NBIFOM mode, the RAN rules control the WLAN access selection and traffic routing as described in 3GPP TS 24.302 [5], the RAN rules handling parameter is set, the PDN connection is a multi-access PDN connection for IP flows over 3GPP accesses and over untrusted WLAN, the move-traffic-to-WLAN indication specified in 3GPP TS 24.302 [5] is received from the access stratum layer of the 3GPP access, and the Local Operating Environment Information in the UE does not contain non-radio-related conditions that prohibit the use of WLAN access then the UE shall initiate the UE-initiated modification procedure according to 3GPP TS 24.302 [5].

NOTE: The WLAN offload indication information element described in 3GPP TS 24.301 [4] and 3GPP TS 24.008 [3] does not influence execution of the Access stratum indication via untrusted WLAN.

In the INFORMATIONAL request message of the UE-initiated modification procedure, the UE shall include the NBIFOM_GENERIC_CONTAINER Notify payload. In the NBIFOM_GENERIC_CONTAINER Notify payload, the UE shall include the NBIFOM Access stratum status parameter with value indicating the indication received from the access stratum layer of the 3GPP access.

Upon receiving an INFORMATIONAL request message of the ePDG-initiated modification procedure such that:

- a) the received INFORMATIONAL request message contains a PTI Notify payload with the Related Message ID field set to the Message ID field of the sent INFORMATIONAL request message; and
- b) the IEs of the received INFORMATIONAL request message are acceptable;

then:

- a) if the received INFORMATIONAL request message does not contain the NBIFOM routing rules parameter in the NBIFOM_GENERIC_CONTAINER Notify payload, the UE shall send an INFORMATIONAL response message without a Notify payload indicating an error; and
- b) if the received INFORMATIONAL request message contains the NBIFOM routing rules parameter in the NBIFOM_GENERIC_CONTAINER Notify payload:
 - 1) if the UE accepts the requested routing rules indicated in the NBIFOM routing rules parameter:
 - A) the UE shall send an INFORMATIONAL response message without a Notify payload indicating an error; and
 - B) the UE shall apply the requested routing rules; and
 - 2) if the UE rejects the requested routing rules indicated in the NBIFOM routing rules parameter, the UE shall send an INFORMATIONAL response message. In the INFORMATIONAL response message, the UE shall include a Notify payload indicating an error and shall include the NBIFOM_GENERIC_CONTAINER Notify payload. In the NBIFOM_GENERIC_CONTAINER Notify payload, the UE shall include the NBIFOM status parameter with appropriate error value.

If however, the UE receives an INFORMATIONAL request message of the ePDG-initiated modification procedure such that:

- a) the received INFORMATIONAL request message contains a Notify payload indicating an error; and
- b) the received INFORMATIONAL request message contains a PTI Notify payload with the Related Message ID field set to the Message ID field of the sent INFORMATIONAL request message;

then:

- a) the UE shall consider the NBIFOM status parameter of the NBIFOM_GENERIC_CONTAINER Notify payload of the INFORMATIONAL request message as the cause of failure; and
- b) the UE shall send an INFORMATIONAL response message.

5.7.2 Network procedures

5.7.2.1 Access stratum indication via GERAN or UTRAN

If the SGSN receives an NBIFOM container IE in an Update Bearer Request message or a Create Bearer Request message as specified in 3GPP TS 29.274 [7] from the SGW, the SGSN shall include the received NBIFOM container IE in the MODIFY PDP CONTEXT REQUEST message or the REQUEST SECONDARY PDP CONTEXT ACTIVATION message to the UE as specified in 3GPP TS 24.008 [3].

If the SGSN receives a Bearer Resource Failure Indication message including NBIFOM container IE from the SGW as specified in 3GPP TS 29.274 [7], the SGSN shall include the received NBIFOM container IE in the MODIFY PDP CONTEXT REJECT message to the UE as specified in 3GPP TS 24.008 [3].

5.7.2.2 Access stratum indication via E-UTRAN

If the MME receives an NBIFOM container IE in an Update Bearer Request message, or a Create Bearer Request message as specified in 3GPP TS 29.274 [7] from the SGW, the MME shall include the received NBIFOM container IE in the MODIFY EPS BEARER CONTEXT REQUEST message, or the ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message to the UE as specified in 3GPP TS 24.301 [4].

If the MME receives a Bearer Resource Failure Indication message including NBIFOM container IE from the SGW as specified in 3GPP TS 29.274 [7], the MME shall include the received NBIFOM container IE in the BEARER RESOURCE MODIFICATION REJECT message or BEARER RESOURCE ALLOCATION REJECT message to the UE as specified in 3GPP TS 24.301 [4].

5.7.2.3 Access stratum indication via trusted WLAN using SCM

Not applicable.

5.7.2.4 Access stratum indication via trusted WLAN using MCM

If the TWAG receives an Update Bearer Request message or a Create Bearer Request message including NBIFOM container IE from the PDN GW as specified 3GPP TS 29.274 [7], TWAG shall include the NBIFOM container IE in the PDN MODIFICATION REQUEST message to the UE as specified in 3GPP TS 24.244 [6].

If the TWAG receives a Bearer Resource Failure Indication message including NBIFOM container IE from the PDN GW as specified in 3GPP TS 29.274 [7], the TWAG shall include the NBIFOM container IE in the PDN MODIFICATION REJECT message to the UE as specified in 3GPP TS 24.244 [6].

5.7.2.5 Access stratum indication via untrusted WLAN

Once the ePDG receives an INFORMATIONAL request message including NBIFOM container IE from the UE, the ePDG shall send the INFORMATIONAL response message to the UE as specified in subclause 6.7.2 of 3GPP TS 23.161 [2].

If the ePDG receives an Update Bearer Request message, or a Create Bearer Request message, or a Bearer Resource Failure Indication message including NBIFOM container IE from the PDN GW as specified in 3GPP TS 29.274 [7]:

- a) the ePDG shall construct the NBIFOM_GENERIC_CONTAINER Notify payload as specified in 3GPP TS 24.302 [5] and copy the NBIFOM container contents from the NBIFOM container IE into the NBIFOM container contents field of the NBIFOM_GENERIC_CONTAINER Notify payload;
- b) the ePDG shall include the NBIFOM_GENERIC_CONTAINER Notify payload in the INFORMATIONAL request message to the UE;

- c) the ePDG shall include a PTI notify payload as specified in subclause 7.4.2.1 of 3GPP TS 24.302 [5] in the INFORMATIONAL request message to the UE; and
- d) if receiving the Bearer Resource Failure Indication message, the ePDG shall also include a Notify payload indicating an error in the INFORMATIONAL request message to the UE.

6 PDUs and parameters specific to the present document

6.0 General

The sending entity shall set value of a spare bit to zero. The receiving entity shall ignore value of a spare bit.

The sending entity shall not set value of a field to a reserved value. The receiving entity shall discard a message carrying a field with value set to a reserved value.

6.1 NBIFOM parameter list

6.1.1 General

The purpose of the NBIFOM parameter list is to transfer parameters associated with the network-based IP flow mobility (NBIFOM).

The NBIFOM parameter list is coded as shown in figure 6.1.1-1 and table 6.1.1-1.

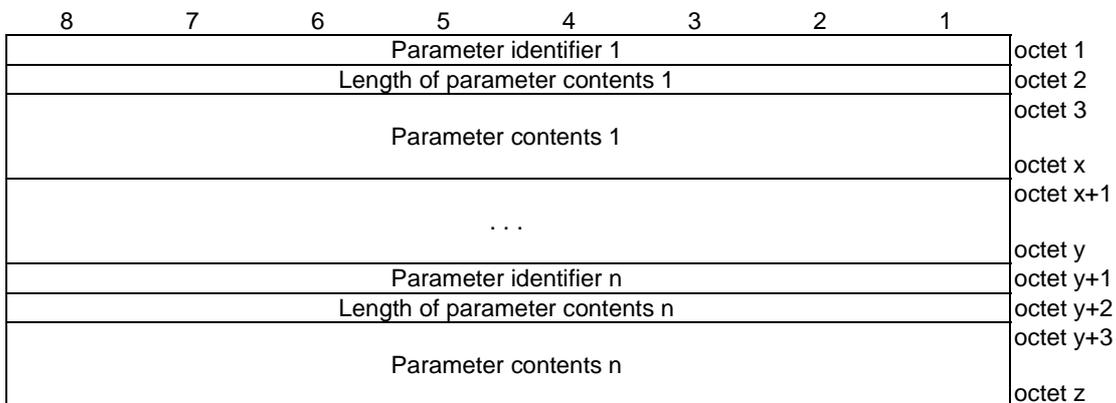


Figure 6.1.1-1: NBIFOM parameter list

Table 6.1.1-1: NBIFOM parameter list

<p>The NBIFOM parameter list contains a list of parameters, each one in a separate unit consisting of a parameter identifier field, a length of parameter contents field and a parameter contents field.</p> <p>The parameter identifier field of a unit contains the hexadecimal coding of the parameter identifier. Bit 8 of the parameter identifier field contains the most significant bit.</p> <p>The length of parameter contents field of a unit contains the binary coded representation of the length of the parameter contents field of the unit. Bit 8 of the length of parameter contents field contains the most significant bit.</p> <p>The parameter contents field of a unit contains the binary coded representation of the value of the parameter identified in the parameter identifier field of the unit. Bit 8 of the parameter contents field contains the most significant bit.</p> <p>If the parameter list contains a unit with a parameter identifier that is not supported by the receiving entity, the receiving entity ignores the unit and the receiving entity continues handling the rest of the units in the parameter list.</p> <p>The receiving entity does not assume that a certain order of units will be used in the parameter list.</p> <p>In this version of the protocol, the following parameter identifiers are specified:</p> <p>MS to network direction:</p> <ul style="list-style-type: none">- 00H (Not assigned).- 01H (NBIFOM mode);- 02H (NBIFOM default access);- 03H (NBIFOM status);- 04H (NBIFOM routing rules);- 05H (NBIFOM IP flow mapping);- 06H (Not assigned);- 07H (NBIFOM Access stratum status); and- 08H (NBIFOM access usability indication).- 09H to FFH (Not assigned). <p>Network to MS direction:</p> <ul style="list-style-type: none">- 00H (Not assigned).- 01H (NBIFOM mode);- 02H (NBIFOM default access);- 03H (NBIFOM status);- 04H (NBIFOM routing rules);- 05H (Not assigned);- 06H (NBIFOM RAN rules handling);- 07H (Not assigned); and- 08H (Not assigned).- 09H to FFH (Not assigned).
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6.1.2 NBIFOM default access parameter

When the parameter identifier field of a unit in the NBIFOM parameter list indicates the NBIFOM default access, the length of parameter contents field is set to one and the parameter contents field is coded according to table 6.1.2-1.

Table 6.1.2-1: Parameter contents field of a unit carrying NBIFOM default access parameter

The parameter contents field is coded as follows:								
8	7	6	5	4	3	2	1	
0	0	0	0	0	0	0	1	3GPP access
0	0	0	0	0	0	1	0	non-3GPP access
All other values are reserved.								

6.1.3 NBIFOM status parameter

When the parameter identifier field of a unit in the NBIFOM parameter list indicates the NBIFOM status, the length of parameter contents field is set to one and the parameter contents field is coded according to table 6.1.3-1.

Table 6.1.3-1: Parameter contents field of a unit carrying NBIFOM status parameter

The status parameter is coded as follows:								
8	7	6	5	4	3	2	1	
0	0	0	0	0	0	0	0	Accepted
0	0	0	1	1	0	1	0	Insufficient resources
0	0	1	0	0	1	0	1	Requested service option not subscribed
0	0	1	0	0	0	1	0	Service option temporarily out of order
0	0	1	1	1	1	1	1	Request rejected, unspecified
0	0	1	1	1	0	0	1	Incorrect indication in the routing rule operation
0	0	1	1	1	0	1	0	Unknown information in IP flow filter(s)
0	1	1	0	1	1	1	1	Protocol error, unspecified
1	0	0	0	0	0	1	0	Unknown routing access information
All other values are interpreted as "Protocol error, unspecified".								

Status parameter #26 – Insufficient resources

This status code is used by the UE or by the network to indicate that the requested routing rule cannot be accepted due to insufficient resources for the requested routing access.

Status parameter #33 – Requested service option not subscribed

This status code is used when the UE requested routing access cannot be used to transport the requested service due to the restriction of subscription.

Status parameter #34 – Service option temporarily out of order

This status code is used when the requested routing rule cannot be accepted due to temporary outage of one or more functions required for supporting the service via the requested routing access.

Status parameter #31 – Request rejected, unspecified

This status code is used by the network or by the UE to indicate that the requested routing rule cannot be accepted due to unspecified reasons.

Status parameter #57 – Incorrect indication in the routing rule operation

This status code is used by the network or the UE to indicate that the requested routing rule cannot be accepted due to incorrect operation code included in the request.

Status parameter #58 – Unknown information in IP flow filter(s)

This status code is used by the network or the UE to indicate that the requested routing rule cannot be accepted due to unknown information included in the routing rule's IP flow filter(s).

Status parameter #111 – Protocol error, unspecified

This status code is used to report a protocol error event only when no other status code in the protocol error class applies.

Status parameter #130 –Unknown routing access information

This status code is used by the network or by the UE to indicate that the requested routing rule cannot be accepted due to unknown routing access information.

6.1.4 NBIFOM routing rules

When the parameter identifier field of a unit in the NBIFOM parameter list indicates the NBIFOM routing rules, the parameter contents field is coded according to figure 6.1.4-1 and table 6.1.4-1.

8	7	6	5	4	3	2	1	
Length of routing rule 1								octet 1
Routing rule identifier 1								octet 2
Routing access 1	0 Spare	0 Spare	0 Spare	Operation code 1				octet 3
Routing rule priority 1								octet 4
Routing filter 1								octet 5
...								octet x octet x+1
Length of routing rule n								octet y
Routing rule identifier n								octet y+1
Routing access n	0 Spare	0 Spare	0 Spare	Operation code n				octet y+2 octet y+3
Routing rule priority n								octet y+4
Routing filter n								octet y+5
								octet z

Figure 6.1.4-1: Parameter contents field of a unit carrying NBIFOM routing rules parameter

Table 6.1.4-1: Parameter contents field of a unit carrying NBIFOM routing rules parameter

<p>Routing rules (octets 1 to z)</p> <p>The routing rules contain a list of routing rules, each one in a separate unit consisting of a length of routing rule field, and the routing rule contents. The routing rule contents consist of a routing rule identifier field, a routing access field, an operation code field, a routing rule priority field, and a routing filter field.</p> <p>The length of routing rule field (octet 1) of a unit contains the binary coded representation of the length of the routing rule contents of the unit. Bit 8 of the length of routing filter field contains the most significant bit.</p> <p>Routing rule identifier (octet 2) uniquely identifies the routing rule within one multi-access PDN connection. The routing rule identifier is allocated by the entity creating the routing rule, i.e. by the UE in the UE-initiated NBIFOM mode and by the PDN GW in the network-initiated NBIFOM mode.</p> <p>Operation code (bits 1-3 in octet 3)</p> <p>Bits</p> <table border="0"> <thead> <tr> <th>3</th> <th>2</th> <th>1</th> <th></th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>0</td> <td>Spare</td> </tr> <tr> <td>0</td> <td>0</td> <td>1</td> <td>Create routing rule</td> </tr> <tr> <td>0</td> <td>1</td> <td>0</td> <td>Delete routing rule</td> </tr> <tr> <td>0</td> <td>1</td> <td>1</td> <td>Replace existing routing rule</td> </tr> <tr> <td>1</td> <td>0</td> <td>0</td> <td>Reserved</td> </tr> </tbody> </table> <p>The values from "100" to "111" are reserved.</p> <p>Routing access (bits 8-7 in octet 3)</p> <p>Bits</p> <table border="0"> <thead> <tr> <th>8</th> <th>7</th> <th></th> </tr> </thead> <tbody> <tr> <td>0</td> <td>1</td> <td>3GPP access</td> </tr> <tr> <td>1</td> <td>0</td> <td>non-3GPP access</td> </tr> </tbody> </table> <p>The values "00" and "11" are reserved.</p> <p>Routing rule priority (octet 4) indicates the order of the routing rule application when the IP packet matches more than one routing filter. The lower value indicates higher priority.</p> <p>Routing filter (octet 5 to octet x) contains a routing filter and is coded according to figure 6.1.4-2 and table 6.1.4-2.</p>	3	2	1		0	0	0	Spare	0	0	1	Create routing rule	0	1	0	Delete routing rule	0	1	1	Replace existing routing rule	1	0	0	Reserved	8	7		0	1	3GPP access	1	0	non-3GPP access
3	2	1																															
0	0	0	Spare																														
0	0	1	Create routing rule																														
0	1	0	Delete routing rule																														
0	1	1	Replace existing routing rule																														
1	0	0	Reserved																														
8	7																																
0	1	3GPP access																															
1	0	non-3GPP access																															

8	7	6	5	4	3	2	1	
H	G	F	E	D	C	B	A	octet 1
Z	Z	N	M	L	K	J	I	octet 2
Z	Z	Z	Z	Z	Z	Z	Z	octet 3
Z	Z	Z	Z	Z	Z	Z	Z	octet 4
(A) Source IPv4 address								octet 5 octet 8
(B) Destination IPv4 address								octet a octet a+3
(C) Source IPv6 address								octet b octet b+15
(D) Destination IPv6 address								octet c octet c+15
(E) Source address prefix length								octet d
(F) Destination address prefix length								octet e
(G) IPsec security parameter Index								octet f octet f+3
(H) Protocol type next header								octet g
(I) Start source port range								octet h octet h+3
(J) End source port range								octet i octet i+3
(K) Start destination port range								octet j octet j+3
(L) End destination port range								octet k octet k+3
(M) Type of service								octet l
(N) Flow label								octet m octet m+3

Figure 6.1.4-2: Routing filter

Table 6.1.4-2: Routing filter

Routing filter component type indication 'A' to 'N' flags (octet 1 - octet 4)

Each flag in this field indicates whether the corresponding field is present in the IE as shown in Figure 6.1.4-2.

IPv4 address field and IPv6 address field shall not be present in the same routing rule item, i.e. if 'A' flag, 'B' flag or both are set, then 'C' flag and 'D' flag are not set.

End source port range can be present only when start source port range is present, i.e. if 'J' flag is set, then 'I' flag is set.

End destination port range can be present only when start destination port range is present, i.e. if 'L' flag is set, then 'K' flag is set.

The sending entity sets 'Z' flags to zero. If a 'Z' flag is set to zero, the receiving entity ignores the 'Z' flag. If a 'Z' flag is set to one, the receiving entity ignores the routing rule.

Source IPv4 address indicates the source IPv4 address of the uplink packet to be matched and indicates the destination IPv4 address of the downlink packet to be matched. If 'A' flag is set, then this field is present otherwise this field is not present.

Destination IPv4 address indicates the destination IPv4 address of the uplink packet to be matched and indicates the source IPv4 address of the downlink packet to be matched. If 'B' flag is set, then this field is present otherwise this field is not present.

Source IPv6 address indicates the source IPv6 address of the uplink packet to be matched and indicates the destination IPv6 address of the downlink packet to be matched. If 'C' flag is set, then this field is present otherwise this field is not present.

Destination IPv6 address indicates the destination IPv6 address of the uplink packet to be matched and indicates the source IPv6 address of the downlink packet to be matched. If 'D' flag is set, then this field is present otherwise this field is not present.

Source address prefix length indicates the subnet length of IPv4 source address or the prefix length of the IPv6 source address of the uplink packet to be matched and indicates the subnet length of IPv4 destination address or the prefix length of the IPv6 destination address of the downlink packet to be matched. If 'E' flag is set, then this field is present otherwise this field is not present.

Destination address prefix length indicates the subnet length of IPv4 destination address or the prefix length of the IPv6 destination address of the uplink packet to be matched and indicates the subnet length of IPv4 source address or the prefix length of the IPv6 source address of the downlink packet to be matched. If 'F' flag is set, then this field is present otherwise this field is not present.

IPSec security parameter index indicates the 32-bit IPSec SPI value of the packet to be matched. If 'G' flag is set, then this field is present otherwise this field is not present.

Protocol type next header indicates the 8-bit protocol type (for IPv4) or next header (for IPv6) value of the packet to be matched. If 'H' flag is set, then this field is present otherwise this field is not present.

Start source port range indicates the first value of a range of port numbers of the source port of the uplink packet to be matched and indicates the first value of a range of port numbers of the destination port of the downlink packet to be matched. If 'I' flag is set, then this field is present otherwise this field is not present.

End source port range indicates the end value of a range of port numbers of the source port of the uplink packet to be matched and indicates the end value of a range of port numbers of the destination port of the downlink packet to be matched. If 'J' flag is set, then this field is present otherwise this field is not present.

Start destination port range indicates the first value of a range of port numbers of the destination port of the uplink packet to be matched and indicates the first value of a range of port numbers of the source port of the downlink packet to be matched. If 'K' flag is set, then this field is present otherwise this field is not present.

End destination port range indicates the end value of a range of port numbers of the destination port of the uplink packet to be matched and indicates the end value of a range of port numbers of the source port of the downlink packet to be matched. If 'L' flag is set, then this field is present otherwise this field is not present.

Type of service indicates the type of service value of the packet to be matched. If 'M' flag is set, then this field is present otherwise this field is not present.

Flow label indicates the 20-bit IPv6 flow label value of the packet to be matched. The bits 8 through 5 of the first octet of this field are spare. If 'N' flag is set, then this field is present otherwise this field is not present.

6.1.5 NBIFOM IP flow mapping parameter

When the parameter identifier field of a unit in the NBIFOM parameter list indicates the NBIFOM IP flow mapping, the parameter contents field is coded according to figure 6.1.4-1 and table 6.1.4-1.

NOTE: Coding of the parameter contents field of the NBIFOM IP flow mapping parameter is the same as coding of the parameter contents field of the NBIFOM routing rules parameter.

6.1.6 NBIFOM RAN rules handling parameter

When the parameter identifier field of a unit in the NBIFOM parameter list indicates the NBIFOM RAN rules handling, the length of parameter contents field is set to one and the parameter contents field is coded according to table 6.1.6-1.

Table 6.1.6-1: Parameter contents field of a unit carrying NBIFOM RAN rules handling parameter

The parameter contents field is coded as follows:								
8	7	6	5	4	3	2	1	
0	0	0	0	0	0	0	1	RAN rules handling parameter is not set
0	0	0	0	0	0	1	0	RAN rules handling parameter is set
All other values are reserved.								

6.1.7 NBIFOM Access stratum status parameter

When the parameter identifier field of a unit in the NBIFOM parameter list indicates the NBIFOM Access stratumstatus, the length of parameter contents field is set to one and the parameter contents field is coded according to table 6.1.7-1.

Table 6.1.7-1: Parameter contents field of a unit carrying NBIFOM Access stratumstatus parameter

The parameter contents field is coded as follows:								
8	7	6	5	4	3	2	1	
0	0	0	0	0	0	0	1	no indication
0	0	0	0	0	0	1	0	move-traffic-from-WLAN indication
0	0	0	0	0	0	1	1	move-traffic-to-WLAN indication
All other values are reserved.								

6.1.8 NBIFOM access usability indication

When the parameter identifier field of a unit in the NBIFOM parameter list indicates the NBIFOM access usability indication, the length of parameter contents field is set to one and the parameter contents field is coded according to figure 6.1.8-1 and table 6.1.8-1.



Figure 6.1.8-1: Parameter contents field of a unit carrying NBIFOM access usability indication parameter

Table 6.1.8-1: Parameter contents field of a unit carrying NBIFOM access usability indication parameter

3GPP access usable value (octet 1)	
Bit	
2 1	
0 0	no change in usability of 3GPP access.
0 1	3GPP access becomes usable
1 0	3GPP access becomes unusable.
1 1	reserved.
WLAN access usable value (octet 1)	
Bit	
4 3	
0 0	no change in usability of WLAN access.
0 1	WLAN access becomes usable.
1 0	WLAN access becomes unusable.
1 1	reserved.

6.1.9 NBIFOM mode parameter

When the parameter identifier field of a unit in the NBIFOM parameter list indicates the NBIFOM mode, the length of parameter contents field is set to one and the parameter contents field is coded according to table 6.1.9-1.

Table 6.1.9-1: Parameter contents field of a unit carrying NBIFOM mode parameter

The parameter contents field is coded as follows:								
8	7	6	5	4	3	2	1	
0	0	0	0	0	0	0	1	UE-initiated NBIFOM mode
0	0	0	0	0	0	1	0	Network-initiated NBIFOM mode
All other values are reserved.								

Annex A (informative): Change history

Change history								
Date	TSG #	TSG Doc.	CR	Rev	Subject/Comment	Old	New	
2015-10					Draft skeleton provided		0.0.0	
2015-10	CT1#94				Includes the following contribution agreed by CT1 at CT1#94: C1-153313, C1-153824, C1-153940.	0.0.0	0.1.0	
2015-11	CT1#95				Includes the following contribution agreed by CT1 at CT1#95: C1-154620, C1-154622, C1-154623, C1-154624, C1-154625, C1-154626, C1-154629, C1-154710, C1-154838, C1-154843.	0.1.0	0.2.0	
2015-12	CT-70	CP-150736			Version 1.0.0 created for presentation for information	0.2.0	1.0.0	
2016-01	CT1#95 bis				Includes the following contribution agreed by CT1 at CT1#95bis: C1-160040, C1-160536, C1-160537, C1-160538, C1-160539, C1-160540, C1-160541, C1-160542, C1-160544, C1-160545, C1-160547, C1-160549, C1-160550, C1-160729, C1-160730, C1-160781.	1.0.0	1.1.0	
2016-02	CT1#96				Includes the following contribution agreed by CT1 at CT1#96: C1-160995, C1-161289, C1-161290, C1-161291, C1-161406, C1-161408, C1-161410, C1-161411, C1-161449, C1-161450, C1-161462, C1-161463.	1.1.0	1.2.0	
2016-03	CT-71	CP-160058			Version 2.0.0 created for presentation for approval	1.2.0	2.0.0	
2016-03	CT-71				Version 13.0.0 created after approval	2.0.0	13.0.0	
2016-06	CT-72	CP-160325	0001		Corrections for sematic of spare bits and reserved values	13.0.0	13.1.0	
2016-06	CT-72	CP-160325	0002		Corrections for SCM protocol configuration options item	13.0.0	13.1.0	
2016-06	CT-72	CP-160325	0003		Corrections for NBIFOM_GENERIC_CONTAINER attribute	13.0.0	13.1.0	
2016-06	CT-72	CP-160325	0004		Corrections for bit numbering in Figure 6.1.4-2	13.0.0	13.1.0	
2016-06	CT-72	CP-160325	0005		Update abbreviations list	13.0.0	13.1.0	
2016-06	CT-72	CP-160325	0006	2	Removal of editor's notes and correction to Network-initiated IP flow mobility procedure	13.0.0	13.1.0	
2016-06	CT-72	CP-160325	0009	1	UE-initiated IP flow mobility	13.0.0	13.1.0	
2016-06	CT-72	CP-160325	0010	1	Scenario about the removal of an access from NBIFOM PDN	13.0.0	13.1.0	
2016-06	CT-72	CP-160325	0011	1	Re-title, re-naming, adjusting referencings, re-wordings and typo corrections	13.0.0	13.1.0	
2016-06	CT-72	CP-160325	0012	1	Perform 3GPP access specific procedures only when UE is in that 3GPP access	13.0.0	13.1.0	
2016-06	CT-72	CP-160325	0015		Correction to UE-initiated PDN connection establishment procedure	13.0.0	13.1.0	
2016-06	CT-72	CP-160325	0016	1	IP flow mobility procedure over which UE indicates default access	13.0.0	13.1.0	
2016-06	CT-72	CP-160325	0017	1	Correction of references to a non-existent subclause	13.0.0	13.1.0	
2016-06	CT-72	CP-160325	0018		BEARER RESOURCE ALLOCATION REJECT message	13.0.0	13.1.0	
2016-06	CT-72	CP-160325	0019	1	Network-initiated IP flow mobility over untrusted WLAN	13.0.0	13.1.0	
2016-06	CT-72	CP-160325	0020	1	Usability change and RAN rule indication	13.0.0	13.1.0	
2016-06	CT-72	CP-160325	0013	3	NW-initiated access removal for reactivation requested case	13.0.0	13.1.0	
2016-06	CT-72	CP-160325	0021	2	UE feedback over GERAN or UTRAN	13.0.0	13.1.0	

Change history							
Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
2016-09	CT#73	CP-160506	0022	2	F	Correction to removal of an access from a multi-access PDN connection procedure with reactivation requested cause	13.2.0
2016-12	CT#74	CP-160735	0023		F	UE-initiated IP flow mapping	13.3.0
2016-12	CT#74	CP-160735	0024		F	Add the RCLWI case to the NBIFOM procedure	13.3.0
2017-03	CT#75					Upgrade to Rel-14	14.0.0
2017-06	CT#76	CP-171092	0026	1	F	Correction to the UE behavior for the UE-initiated IP flow mobility over GERAN or UTRAN	14.1.0
2018-06	SA#80	-	-	-	-	Update to Rel-15 version (MCC)	15.0.0
2020-07	SA-88e	-	-	-	-	Update to Rel-16 version (MCC)	16.0.0
2022-03	SA-95e	-	-	-	-	Update to Rel-17 version (MCC)	17.0.0
2024-04	-	-	-	-	-	Update to Rel-18 version (MCC)	18.0.0

History

Document history		
V18.0.0	May 2024	Publication