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Contents

Foreword

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

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y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.

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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 traffic can be routed over either a 3GPP access or a WLAN access or both. Each IP flow is routed at any single time only over one access.

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].

MCM	Multi-connection mode
NBIFOM	Network-based IP flow mobility
SCM	Single-connection mode

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) Attach 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 access usability change; and

g) Handling of RAN rule 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 Network-based IP flow mobility 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

Upon request 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 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

Upon request 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 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 to setup a PDN connection with NBIFOM support over trusted WLAN using SCM, the UE shall initiate
usage of single-connection mode procedure according to 3GPP TS 24.302 [5] subclause 6.4.2.6.2.

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 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].

the UE shall consider that NBIFOM applies to the PDN connection and shall consider the NBIFOM mode parameter included in the protocol configuration options as the selected NBIFOM mode.

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

Upon request 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 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 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 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 casue value 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 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 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 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 initiated PDN connection establishment procedure as specified in subclause 6.4.3.5.2 of 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 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 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 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 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 IKE_AUTH response message to the UE; and

c) if the Create Session Response message includes a reject cause, the ePDG shall also include a Notify payload indicating an error in the IKE_AUTH response message to the UE.

5.2 Attach to additional access network

5.2.1 UE procedures

5.2.1.1 UE-initiated addition of GERAN or UTRAN

If the NBIFOM applies to a PDN connection, then upon request to add GERAN or UTRAN 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 setup in subclause 5.2.1;

    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 GERAN or UTRAN is added to the PDN connection;

    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 UE-initiated addition of E-UTRAN

If the NBIFOM applies to a PDN connection, then upon request to add E-UTRAN 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 setup in subclause 5.2.1;

    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 E-UTRAN is added to the PDN connection;

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 UE-initiated addition of trusted WLAN using SCM

If the NBIFOM applies to a PDN connection, then upon request to add trusted WLAN using SCM to the PDN connection, the UE shall initiate the usage of single-connection mode procedure according to 3GPP TS 24.302 [5] subclause 6.4.2.6.2.

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 5.2.1;

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 trusted WLAN using SCM is added to the PDN connection.

5.2.1.4 UE-initiated addition of trusted WLAN using MCM

If the NBIFOM applies to a PDN connection, then upon request to add trusted WLAN using MCM 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 5.2.1;

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 UE-initiated addition of untrusted WLAN

If the NBIFOM applies to a PDN connection, then upon request 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 5.2.1;

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 the NBIFOM request.

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 untrusted WLAN access is added to the PDN connection; 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 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 E-UTRAN

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

5.2.2.3 UE-initiated addition of 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 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 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

If the NBIFOM applies to a PDN connection, the PDN connection is connected simultaneously 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 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:

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

b) if the PDN connection is connected simultaneously over GERAN or UTRAN and over trusted WLAN using SCM, the UE shall include the NBIFOM default access parameter in the first IP flow mobility procedure.

Upon receiving a MODIFY 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.

5.3.1.2 UE-initiated IP flow mobility over E-UTRAN

If the NBIFOM applies to a PDN connection, the PDN connection is connected simultaneously 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 PDN connection is connected simultaneously over E-UTRAN and over trusted WLAN using SCM, the UE shall include the NBIFOM default access parameter in the first IP flow mobility procedure.

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; 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 send 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.

Upon receiving 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 the NBIFOM applies to a PDN connection, the PDN connection is connected simultaneously over trusted WLAN using MCM and 3GPP access, 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 send a PDN MODIFICATION ACCEPT message; and

b) the UE shall apply the requested routing rules.

Upon receiving 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 the NBIFOM applies to a PDN connection, the PDN connection is connected simultaneously over untrusted WLAN access and 3GPP access, 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 send 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 send 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 the NBIFOM applies to a PDN connection, the PDN connection is connected simultaneously over GERAN or UTRAN and WLAN, and the network-initiated NBIFOM mode is the selected NBIFOM mode, then upon receiving:

 a) a REQUEST SECONDARY PDP CONTEXT ACTIVATION message of the secondary PDP context activation procedure requested by the network such that:

  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 of the network initiated PDP context modification procedure such that:

  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 initiate 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 send:

      1) the REQUEST SECONDARY PDP CONTEXT ACTIVATION REJECT message; or

      2) the MODIFY PDP 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.

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 the NBIFOM applies to a PDN connection, the PDN connection is connected simultaneously over E-UTRAN and WLAN, and the network-initiated NBIFOM mode is the selected NBIFOM mode, then 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 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 of the EPS bearer context modification procedure such that:

      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 send 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 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.

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 takes place during the TWAG initiated PDN connectivity modification procedure according to 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 send 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 send 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 takes place during the ePDG initiated modification procedure according to 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 contains 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 send 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 send 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 a Delete Bearer Request message, or 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 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].

5.3.2.2 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 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 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 a Delete Bearer Request message, or 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 to the UE as specified in 3GPP TS 24.008 [3].

Editor's notes: Network-initiated IP flow mobility over GERAN or UTRAN using other SM messages (e.g. REQUEST SECONDARY PDP CONTEXT ACTIVATION message and DEACTIVATE PDP CONTEXT REQUEST message) is FFS.

5.3.2.7 Network-initiated IP flow mobility over E-UTRAN

If the MME receives a Delete Bearer Request message, or 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 to the UE as specified in 3GPP 24.301 [4].

Editor's notes: Network-initiated IP flow mobility over E-UTRAN using other ESM messages (e.g. ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message and DEACTIVATE EPS BEARER CONTEXT REQUEST message) is FFS.

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 a Delete Bearer Request message, or 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 a Delete Bearer Request message, or 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 attribute 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 attribute; and

   b)   the ePDG shall include the NBIFOM_GENERIC_CONTAINER attribute in the CFG_REPLY configuration payload of 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 WLAN access network is maintained.

Once the procedure is completed, the UE uses the PDN connection over the maintained access network.

5.4.2   UE procedures

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

In order to remove the multi-access PDN connection over GERAN or UTRAN, 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 multi-access PDN connection via E-UTRAN

In order to remove the multi-access PDN connection over E-UTRAN, 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 multi-access PDN connection via trusted WLAN using SCM

In order to remove the multi-access PDN connection over trusted WLAN using SCM, 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 multi-access PDN connection via trusted WLAN using MCM

In order to remove the multi-access PDN connection over trusted WLAN using MCM, 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 multi-access PDN connection via untrusted WLAN

In order to remove the multi-access PDN connection over untrusted WLAN access network, 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 multi-access PDN connection via GERAN or UTRAN

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 multi-access PDN connection via E-UTRAN

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 the reactivation requested cause

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 on 3GPP access and WLAN access, the UE shall follow the procedures as specified in 3GPP TS 24.301 [4] to complete the EPS bearer context deactivation, and

then the UE shall initiate the release of the corresponding PDN connection over the WLAN access. 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 on 3GPP access and WLAN access, the UE shall also initiate the release of the corresponding PDN connection over the WLAN access. The UE shall then re-attach through E-UTRAN access using procedures specified in 3GPP TS 24.301 [4] and should 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.

Editor"s note: The procedure for the release of the connection on the WLAN side is FFS.

5.4.2.8 Network-initiated removal of multi-access PDN connection via trusted WLAN using SCM

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 multi-access PDN connection via trusted WLAN using MCM

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 the reactivation requested cause

Upon receipt of a PDN DISCONNECT REQUEST message to release a PDN connection with the cause "reactivation requested" over the trusted WLAN access as described in 3GPP TS 24.244 [6], if the PDN connection is established on both accesses, the UE shall initiate the release of the PDN connection over the 3GPP access, then re-establish the PDN connection at least over one access, the choice of the access being implementation specific.

5.4.2.10 Network-initiated removal of multi-access PDN connection via untrusted WLAN

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 the reactivation requested cause

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, the UE shall initiate the release of the PDN connection over the 3GPP access, then re-establish the PDN connection at least over one access, the choice of the access being implementation specific.

5.4.2 Network procedures

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

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

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

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

5.4.2.3 UE-initiated removal of multi-access PDN connection via trusted WLAN using SCM

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

5.4.2.4 UE-initiated removal of multi-access PDN connection via trusted WLAN using MCM

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

5.4.2.5 UE-initiated removal of multi-access PDN connection via untrusted WLAN

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].

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

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

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

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

5.4.2.8 Network-initiated removal of multi-access PDN connection via trusted WLAN using SCM

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

5.4.2.9 Network-initiated removal of multi-access PDN connection via trusted WLAN using MCM

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

5.4.2.10 Network-initiated removal of multi-access PDN connection via untrusted WLAN

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

If the NBIFOM applies to a PDN connection, the PDN connection is connected simultaneously 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 5.4.1.5.

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

If the NBIFOM applies to a PDN connection, the PDN connection is connected simultaneously 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; 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;

      2) the EPS bearer identity IE of the DEACTIVATE EPS BEARER CONTEXT REQUEST message indicates identity of a dedicated EPS bearer context; and

      3) the DEACTIVATE EPS BEARER CONTEXT REQUEST message does not contain the NBIFOM routing rules parameter in the NBIFOM container IE or does not contain the NBIFOM container IE;

then:

   a) if:

1) the ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message does not contain the NBIFOM routing rules parameter in the NBIFOM container IE or does not contain the NBIFOM container IE;

2) the MODIFY EPS BEARER CONTEXT REQUEST message does not contain the NBIFOM routing rules parameter in the NBIFOM container IE or does not contain the NBIFOM container IE; or

3) the ESM message is the DEACTIVATE EPS BEARER CONTEXT REQUEST message:

then the UE shall send 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) if:

1) the ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message contains the NBIFOM routing rules parameter in the NBIFOM container IE; or

2) the MODIFY EPS BEARER CONTEXT REQUEST message contains the NBIFOM routing rules parameter in the NBIFOM container IE:

then:

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

A) the UE shall send the ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT message or the MODIFY EPS BEARER CONTEXT 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) the ACTIVATE DEDICATED EPS BEARER CONTEXT REJECT message; or

B) 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.

Upon receiving 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 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 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.

Upon receiving 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 the NBIFOM applies to a PDN connection, the PDN connection is connected simultaneously 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 a Delete Bearer Request message, or 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 ACCEPT message to the UE as specified in 3GPP TS 24.008 [3].

   Editor's notes: it is FFS whether the network will receive the UE feedback to the provided routing rule.

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 or DEACTIVATE 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 access usability change

5.6.1 UE procedures

5.6.1.1 Usability change over GERAN or UTRAN

If the NBIFOM applies to a PDN connection, the PDN connection is connected simultaneously over GERAN or UTRAN and WLAN, the network-initiated NBIFOM mode is the selected NBIFOM mode, and:

a) the 3GPP access has been unusable and the UE detects that the 3GPP access becomes usable;

b) the trusted WLAN using SCM has been usable and the UE detects that the trusted WLAN using SCM becomes unusable;

c) the trusted WLAN using MCM has been usable and the UE detects that the trusted WLAN using MCM becomes unusable;

d) the untrusted WLAN has been usable and the UE detects that the untrusted WLAN becomes unusable; or

e) the trusted WLAN using SCM has been unusable and the UE detects that the trusted WLAN using SCM becomes 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 5.4.1.5.

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.

5.6.1.2 Usability change over E-UTRAN

If the NBIFOM applies to a PDN connection, the PDN connection is connected simultaneously over E-UTRAN and WLAN, the network-initiated NBIFOM mode is the selected NBIFOM mode, and:

a) the 3GPP access has been unusable and the UE detects that the 3GPP access becomes usable;

b) the trusted WLAN using SCM has been usable and the UE detects that the trusted WLAN using SCM becomes unusable;

c) the trusted WLAN using MCM has been usable and the UE detects that the trusted WLAN using MCM becomes unusable;

d) the untrusted WLAN has been usable and the UE detects that the untrusted WLAN becomes unusable; or

e) the trusted WLAN using SCM has been unusable and the UE detects that the trusted WLAN using SCM becomes 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; 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;

        2) the EPS bearer identity IE of the DEACTIVATE EPS BEARER CONTEXT REQUEST message indicates identity of a dedicated EPS bearer context; and

        3) the DEACTIVATE EPS BEARER CONTEXT REQUEST message does not contain the NBIFOM routing rules parameter in the NBIFOM container IE or does not contain the NBIFOM container IE;

then:

    a) if:

        1) the ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message does not contain the NBIFOM routing rules parameter in the NBIFOM container IE or does not contain the NBIFOM container IE;

        2) the MODIFY EPS BEARER CONTEXT REQUEST message does not contain the NBIFOM routing rules parameter in the NBIFOM container IE or does not contain the NBIFOM container IE; or

        3) the ESM message is the DEACTIVATE EPS BEARER CONTEXT REQUEST message:

        then the UE shall send 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) if:

1) the ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message contains the NBIFOM routing rules parameter in the NBIFOM container IE; or

2) the MODIFY EPS BEARER CONTEXT REQUEST message contains the NBIFOM routing rules parameter in the NBIFOM container IE:

then:

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

   A) the UE shall send the ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT message or the MODIFY EPS BEARER CONTEXT 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) the ACTIVATE DEDICATED EPS BEARER CONTEXT REJECT message; or

   B) 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.

Upon receiving 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   Usability change over trusted WLAN using SCM

Not applicable.

5.6.1.4   Usability change over trusted WLAN using MCM

If the NBIFOM applies to a PDN connection, the PDN connection is connected simultaneously over trusted WLAN using MCM and 3GPP access, the network-initiated NBIFOM mode is the selected NBIFOM mode, and:

   a) the trusted WLAN using MCM has been unusable and the UE detects that the trusted WLAN using MCM becomes usable; or

   b) the 3GPP access has been usable and the UE detects that the 3GPP access becomes 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.

Upon receiving 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 Usability change over untrusted WLAN

If the NBIFOM applies to a PDN connection, the PDN connection is connected simultaneously over untrusted WLAN access and 3GPP access, and the network-initiated NBIFOM mode is the selected NBIFOM mode, and:

a) the untrusted WLAN has been unusable and the UE detects that the untrusted WLAN becomes usable; or

b) the 3GPP access has been usable and the UE detects that the 3GPP access becomes 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.

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.

5.6.2 Network procedures

5.6.2.1 Usability change over GERAN or UTRAN

If the SGSN receives an NBIFOM container IE in a Delete Bearer Request message, or 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 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 to the UE as specified in 3GPP TS 24.008 [3].

5.6.2.2 Usability change

If the MME receives a Delete Bearer Request message, or 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 DEACTIVATE EPS BEARER CONTEXT REQUEST message, or 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 as specified in 3GPP TS 24.301 [4].

5.6.2.3 Usability change over trusted WLAN using SCM

Not applicable.

5.6.2.4 Usability change 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].

5.6.2.5 Usability change 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.

5.7 Handling of RAN rule indication

5.7.1 UE procedures

5.7.1.1 RAN rule indication via GERAN or UTRAN

If the 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 connected simultaneously 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 connected simultaneously 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 RAN rule 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 RAN rules 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 RAN rules status parameter using the network-initiated IP flow mobility over GERAN or UTRAN described in subclause 5.4.1.5.

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.

5.7.1.2 RAN rule indication via E-UTRAN

If the 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 connected simultaneously 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 connected simultaneously 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 RAN rule 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 RAN rules 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; 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;

2) the EPS bearer identity IE of the DEACTIVATE EPS BEARER CONTEXT REQUEST message indicates identity of a dedicated EPS bearer context; and

3) the DEACTIVATE EPS BEARER CONTEXT REQUEST message does not contain the NBIFOM routing rules parameter in the NBIFOM container IE or does not contain the NBIFOM container IE;

then:

a) if:

1) the ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message does not contain the NBIFOM routing rules parameter in the NBIFOM container IE or does not contain the NBIFOM container IE;

2) the MODIFY EPS BEARER CONTEXT REQUEST message does not contain the NBIFOM routing rules parameter in the NBIFOM container IE or does not contain the NBIFOM container IE; or

3) the ESM message is the DEACTIVATE EPS BEARER CONTEXT REQUEST message:

then the UE shall send 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) if:

1) the ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message contains the NBIFOM routing rules parameter in the NBIFOM container IE; or

2) the MODIFY EPS BEARER CONTEXT REQUEST message contains the NBIFOM routing rules parameter in the NBIFOM container IE:

then:

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

A) the UE shall send the ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT message or the MODIFY EPS BEARER CONTEXT 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) the ACTIVATE DEDICATED EPS BEARER CONTEXT REJECT message; or

B) 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.

Upon receiving 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 RAN rule indication via trusted WLAN using SCM

Not applicable.

5.7.1.4 RAN rule indication via trusted WLAN using MCM

If the 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 connected simultaneously over trusted WLAN using MCM and 3GPP access, 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 RAN rule 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 RAN rules 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.

Upon receiving 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 RAN rule indication via untrusted WLAN

If the 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 connected simultaneously over 3GPP access 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 RAN rule 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 RAN rules 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.

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.

5.7.2 Network procedures

5.7.2.1 RAN rule indication via GERAN or UTRAN

If the SGSN receives an NBIFOM container IE in a Delete Bearer Request message, 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 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 to the UE as specified in 3GPP TS 24.008 [3].

5.7.2.2 RAN rule indication via E-UTRAN

If the MME receives an NBIFOM container IE in a Delete Bearer Request message, or 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 DEACTIVATE EPS BEARER CONTEXT REQUEST message, or 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 to the UE as specified in 3GPP TS 24.301 [4].

5.7.2.3 RAN rule indication via trusted WLAN using SCM

Not applicable.

5.7.2.4 RAN rule 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 RAN rule 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 attribute 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

6.1 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.

8	7	6	5	4	3	2	1	
Parameter identifier 1								octet 1
Length of parameter contents 1								octet 2
Parameter contents 1								octet 3 — octet x
. . .								octet x+1 — octet y
Parameter identifier n								octet y+1
Length of parameter contents n								octet y+2
Parameter contents n								octet y+3 — octet z
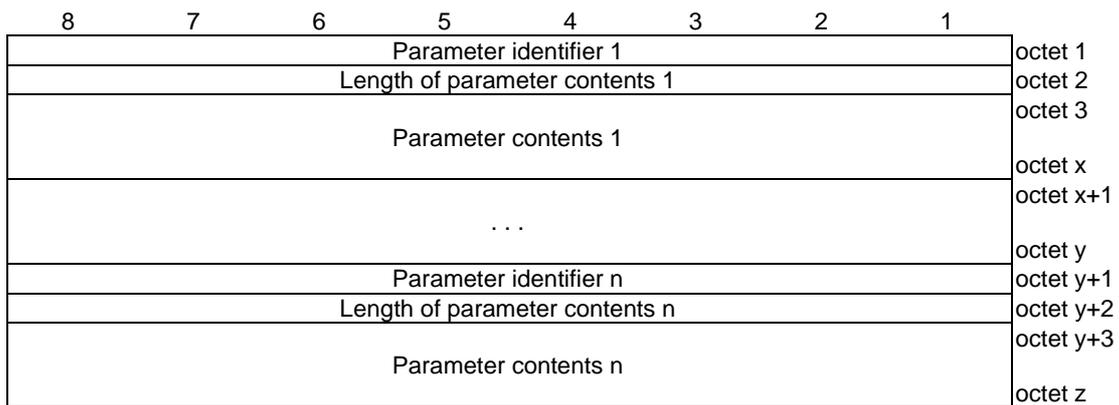
Figure 6.1.1-1: NBIFOM parameter list

Table 6.1.1-1: NBIFOM parameter list

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.

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.

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.

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.

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.

The receiving entity does not assume that a certain order of units will be used in the parameter list.

In this version of the protocol, the following parameter identifiers are specified:

MS to network direction:

- 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 RAN rules status); and

- 08H (NBIFOM access usability indication).

- 09H to FFH (Not assigned).

Network to MS direction:

- 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).

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
								octet y
Length of routing rule n								octet y+1
Routing rule identifier n								octet y+2
Routing access n		0 Spare	0 Spare	0 Spare	Operation code n			octet y+3
Routing rule priority n								octet y+4
Routing filter n								octet y+5
								octet z
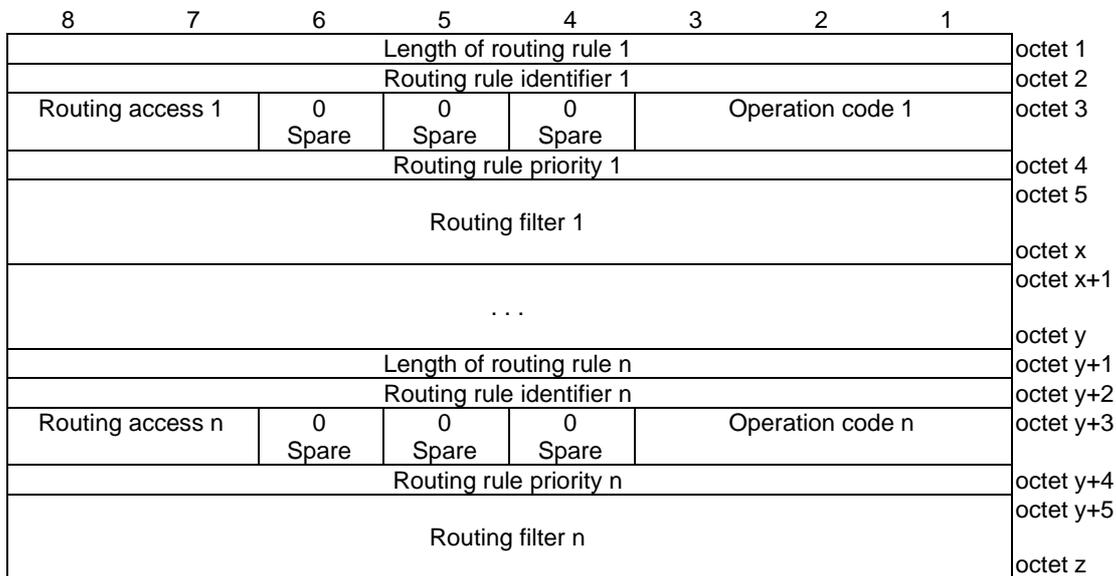
Figure 6.1.4-1: Parameter contents field of a unit carrying NBIFOM routing rules parameter

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

Routing rules (octets 1 to z)

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.

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.

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.

Operation code (bits 1-3 in octet 3)

Bits

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

The values from "100" to "111" are reserved.

Routing access (bits 8-7 in octet 3)

Bits

8 7

0 1 3GPP access

1 0 non-3GPP access

The values "00" and "11" are reserved.

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.

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.

7	6	5	4	3	2	1	0	
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 7 through 4 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 RAN rules status parameter

When the parameter identifier field of a unit in the NBIFOM parameter list indicates the NBIFOM RAN rules status, 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 RAN rules status 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.

8	7	6	5	4	3	2	1	
0	0	0	0	WLAN access		3GPP access		octet 1
Spare	Spare	Spare	Spare	usable value		usable value		
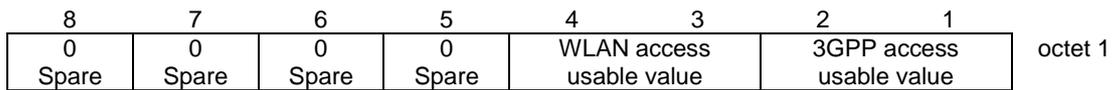
Figure 6.1.8-1: Parameter contents field of a unit carrying NBIFOM access usability indication parameter

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#95bis				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

History

Document history		
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