**3GPP TSG-CT WG1 Meeting #128-eC1-21XXXX**

**Electronic meeting, 25 February – 5 March 2021 *was C1-210958***

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| *CR-Form-v12.0* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **24.501** | **CR** | **3044** | **rev** | **1** | **Current version:** | **17.1.0** |  |
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| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME | **x** | Radio Access Network |  | Core Network |  |

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| ***Title:*** | Clarification on the handling of QoS flow description without associated QoS rule | | | | | | | | | |
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| ***Source to WG:*** | Huawei, HiSilicon | | | | | | | | | |
| ***Source to TSG:*** | C1 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | 5GProtoc17 | | | | |  | ***Date:*** | | | 2021-02-18 |
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| ***Category:*** | **F** |  | | | | | ***Release:*** | | | Rel-17 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) ... Rel-15 (Release 15) Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18)* | |
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| ***Reason for change:*** | | C1-206568 was approved to allow the UE to store a QoS flow description without associated QoS rule, for the reason that “*From UE point of view, a QoS flow description without associated QoS rule is just consuming memory, but it cannot be used to map any UL packets to a QoS flow.*”  However since the memory space is very limited to the NB-IoT device, such memory consumption may be unacceptable to the UE in NB-N1 mode. Moreover, according to the following text quoted from clause 5.3.21 of TS 24.501 specified, for the UE in NB-N1 mode, there is only one default QoS rule but no other non-default QoS rule. The problem scenario (i.e., UE stores a QoS flow description without associated QoS rule) will never happen in NB-N1 mode.  *A PDU session for a UE in NB-N1 mode shall only have one QoS rule and that is the default QoS rule. Reflective QoS is not supported in NB-N1 mode. Reflective QoS is not applicable for a PDU session with control plane only indication.*  Hence it is proposed to clarify that, only for the UE which is not in NB-N1 mode, it is not considered an error if the UE determines that after processing all QoS operations on QoS rules and QoS flow descriptions there is a QoS flow description that is not associated with any QoS rule. | | | | | | | | |
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| ***Summary of change:*** | | Add a condition (i.e., UE is not in NB-N1 mode) to the current description about the QoS flow description without associated QoS rule | | | | | | | | |
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| ***Consequences if not approved:*** | | Waste the memory space of the UE in NB-N1 mode, and conflict with the current description about error handling | | | | | | | | |
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| ***Clauses affected:*** | | 6.1.4.1, 6.3.2.4, 6.4.1.3 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

\*\*\*\*\* start of 1st change\*\*\*\*\*

#### 6.1.4.1 Coordination between 5GSM and ESM with N26 interface

Interworking with EPS is supported for a PDU session, if the PDU session includes the mapped EPS bearer context(s) or has association(s) between QoS flow and mapped EPS bearer after inter-system change from S1 mode to N1 mode. The SMF shall not include any mapped EPS bearer contexts associated with a PDU session for LADN and with a PDU session which is a multi-homed IPv6 PDU session. See coding of the Mapped EPS bearer contexts IE in subclause 9.11.4.8. In an MA PDU session, the UE shall have one set of the mapped EPS bearer contexts. The network can provide the set of the mapped EPS bearer contexts of the MA PDU session via either access of the MA PDU session. In an MA PDU session, the UE shall support modification or deletion via an access of a mapped EPS bearer context of the MA PDU session created via the same or the other access.

Upon inter-system change from N1 mode to S1 mode, the UE shall create the default EPS bearer context and the dedicated EPS bearer context(s) based on the parameters of the mapped EPS bearer contexts or the associations between QoS flow and mapped EPS bearer in the PDU session, if available. The EPS bearer identity assigned for the QoS flow of the default QoS rule becomes the EPS bearer identity of the default bearer in the corresponding PDN connection. If there is no EPS bearer identity assigned to the QoS flow of the default QoS rule of a PDU session associated with 3GPP access:

a) the PDU session is not an MA PDU session established over both 3GPP access and non-3GPP access, the UE shall perform a local release of the PDU session; or

b) the PDU session is an MA PDU session established over both 3GPP access and non-3GPP access, the UE shall perform a local release of the PDU session over 3GPP access and consider that the MA PDU session is established over non-3GPP access only.

If there is no EPS bearer identity assigned to the QoS flow(s) of a PDU session associated with 3GPP access which is not associated with the default QoS rule, unless the UE is the 5G-RG and the PDU session is an MA PDU session established over 3GPP access and over wireline access, the UE shall locally delete the QoS rules and the QoS flow description(s). The UE uses the parameters from each PDU session for which interworking with EPS is supported to create corresponding default EPS bearer context and optionally dedicated EPS bearer context(s) as follows:

a) the PDU session type of the PDU session shall be mapped to the PDN type of the default EPS bearer context as follows:

1) the PDN type shall be set to "non-IP" if the PDU session type is "Unstructured";

2) the PDN type shall be set to "IPv4" if the PDU session type is "IPv4";

3) the PDN type shall be set to "IPv6" if the PDU session type is "IPv6";

4) the PDN type shall be set to "IPv4v6" if the PDU session type is "IPv4v6";

5) the PDN type shall be set to "non-IP" if the PDU session type is "Ethernet", and the UE, the network or both of them do not support Ethernet PDN type in S1 mode; and

6) the PDN type shall be set to "Ethernet" if the PDU session type is "Ethernet" and the UE and the network support Ethernet PDN type in S1 mode;

b) the PDU address of the PDU session shall be mapped to the PDN address of the default EPS bearer context as follows:

1) the PDN address of the default EPS bearer context is set to the PDU address of the PDU session, if the PDU session type is "IPv4", "IPv6" or "IPv4v6"; and

2) the PDN address of the default EPS bearer context is set to zero, if the PDU session type is "Ethernet" or "Unstructured";

c) the DNN of the PDU session shall be mapped to the APN of the default EPS bearer context;

d) the APN-AMBR and extended APN-AMBR received in the parameters of the default EPS bearer context of the mapped EPS bearer contexts shall be mapped to the APN-AMBR and extended APN-AMBR of the default EPS bearer context;

e) for each PDU session in state PDU SESSION ACTIVE, PDU SESSION MODIFICATION PENDING or PDU SESSION INACTIVE PENDING:

1) if the UE is performing an inter-system change from N1 mode to WB-S1 mode, the UE shall set the state of the mapped EPS bearer context(s) to BEARER CONTEXT ACTIVE; or

2) if the UE is performing an inter-system change from N1 mode to NB-S1 mode, for the mapped EPS bearer context corresponding to the default EPS bearer, the UE shall set the state of the mapped EPS bearer context to BEARER CONTEXT ACTIVE. Additionally, if the UE is performing an inter-system change from WB-N1 mode to NB-S1 mode, for the mapped EPS bearer context corresponding to a dedicated EPS bearer, if any, the UE shall set the state of the mapped EPS bearer context to BEARER CONTEXT INACTIVE; and

f) for any other PDU session the UE shall set the state of the mapped EPS bearer context(s) to BEARER CONTEXT INACTIVE.

Additionally, for each mapped EPS bearer context or the association between QoS flow and mapped EPS bearer in the PDU session:

a) the EPS bearer identity shall be set to the EPS bearer identity received in the mapped EPS bearer context, or the EPS bearer identity associated with the QoS flow;

b) the EPS QoS parameters shall be set to the mapped EPS QoS parameters of the EPS bearer received in the mapped EPS bearer context, or the EPS QoS parameters associated with the QoS flow;

c) the extended EPS QoS parameters shall be set to the mapped extended EPS QoS parameters of the EPS bearer received in the mapped EPS bearer context, or the extended EPS QoS parameters associated with the QoS flow; and

d) the traffic flow template shall be set to the mapped traffic flow template of the EPS bearer received in the mapped EPS bearer context, or the stored traffic flow template associated with the QoS flow, if available.

After inter-system change from N1 mode to S1 mode, the UE shall associate the PDU session identity, the S-NSSAI, and the session-AMBR with the default EPS bearer context, and for each EPS bearer context mapped from one or more QoS flows, associate the QoS rule(s) for the QoS flow(s) and the QoS flow description(s) for the QoS flow(s) with the EPS bearer context.

If the PDU session is associated with the control plane only indication and supports interworking with EPS, after inter-system change from N1 mode to S1 mode, the UE shall associate the EPS bearer context(s) of the PDN connection corresponding to the PDU session with the control plane only indication.

After inter-system change from N1 mode to S1 mode, the UE and the SMF shall maintain the PDU session type of the PDU session until the PDN connection corresponding to the PDU session is released if the UE supports non-IP PDN type and the PDU session type is "Ethernet" or "Unstructured".

After inter-system change from N1 mode to S1 mode, the UE and the SMF shall maintain the following 5GSM attributions and capabilities associated with the PDU session until the PDN connection corresponding to the PDU session is released:

a) the always-on PDU session indication;

b) the maximum number of supported packet filters;

c) the support of reflective QoS;

d) the maximum data rate per UE for user-plane integrity protection supported by the UE for uplink and the maximum data rate per UE for user-plane integrity protection supported by the UE for downlink;

e) the support of multi-homed IPv6 PDU session; and

f) if the UE is the 5G-RG and the PDU session is an MA PDU session established over 3GPP access, the PDN connection of the default EPS bearer corresponding to the MA PDU session shall be considered as a user-plane resource of the MA PDU session.

After inter-system change from N1 mode to S1 mode, the UE shall deem that the following features are supported by the network on the PDN connection corresponding to the PDU session:

a) PS data off; and

b) Local address in TFT.

If there is a QoS flow used for IMS signalling, after inter-system change from N1 mode to S1 mode, the EPS bearer associated with the QoS flow for IMS signalling becomes the EPS bearer for IMS signalling.

When the UE is provided with a new session-AMBR in the Protocol configuration options IE or Extended protocol configuration options IE in the MODIFY EPS BEARER CONTEXT REQUEST message, the UE shall discard the corresponding association(s) and associate the new value(s) with the EPS bearer context.

The network may provide the UE with one or more QoS rules by including either one QoS rules parameter, or one QoS rules with the length of two octets parameter, but not both, in the Protocol configuration options IE or Extended protocol configuration options IE in the MODIFY EPS BEARER CONTEXT REQUEST message. The network may provide the UE with one or more QoS flow descriptions corresponding to the EPS bearer context being modified, by including either one QoS flow descriptions parameter, or one QoS flow descriptions with the length of two octets parameter, but not both, in the Protocol configuration options IE or Extended protocol configuration options IE in the MODIFY EPS BEARER CONTEXT REQUEST message.

When the UE is provided with one or more QoS flow descriptions or the EPS bearer identity of an existing QoS flow description is modified in the Protocol configuration options IE or Extended protocol configuration options IE in the MODIFY EPS BEARER CONTEXT REQUEST message, the UE shall check the EPS bearer identity included in the QoS flow description; and:

a) if the EPS bearer identity corresponds to the EPS bearer context being modified or the EPS bearer identity is not included, the UE shall store the QoS flow description and all the associated QoS rules, if any, for the EPS bearer context being modified for use during inter-system change from S1 mode to N1 mode; and

b) otherwise the UE shall locally delete the QoS flow description and all the associated QoS rules, if any, and include a Protocol configuration options IE or Extended protocol configuration options IE with a 5GSM cause parameter set to 5GSM cause #84 "syntactical error in the QoS operation" in the MODIFY EPS BEARER CONTEXT ACCEPT message.

When the UE is provided with one or more QoS rules, or one or more QoS flow descriptions in the Protocol configuration options IE or Extended protocol configuration options IE in the MODIFY EPS BEARER CONTEXT REQUEST message, the UE shall process the QoS rules sequentially starting with the first QoS rule and shall process the QoS flow descriptions sequentially starting with the first QoS flow description. The UE shall check the QoS rules and QoS flow descriptions for different types of errors as follows:

NOTE 1: If an error is detected in a QoS rule or a QoS flow description which requires sending a Protocol configuration options IE or Extended protocol configuration options IE with a 5GSM cause value, then the QoS rules parameter, the QoS rules with the length of two octets parameter, the QoS flow descriptions parameter and the QoS flow descriptions with the length of two octets parameter included in the Protocol configuration options IE or Extended protocol configuration options IE in the MODIFY EPS BEARER CONTEXT REQUEST message are discarded, if any.

NOTE 2: If the EPS bearer context modification procedure is rejected, then the QoS rules parameter, the QoS rules with the length of two octets parameter, the QoS flow descriptions parameter and the QoS flow descriptions with the length of two octets parameter included in the Protocol configuration options IE or Extended protocol configuration options IE in the MODIFY EPS BEARER CONTEXT REQUEST message are discarded, if any.

a) Semantic errors in QoS operations:

1) When the rule operation is "Modify existing QoS rule and add packet filters", "Modify existing QoS rule and replace all packet filters", "Modify existing QoS rule and delete packet filters" or "Modify existing QoS rule without modifying packet filters" on the default QoS rule and the DQR bit is set to "the QoS rule is not the default QoS rule".

2) When the rule operation is "Modify existing QoS rule and add packet filters", "Modify existing QoS rule and replace all packet filters", "Modify existing QoS rule and delete packet filters" or "Modify existing QoS rule without modifying packet filters" on a QoS rule which is not the default QoS rule and the DQR bit is set to "the QoS rule is the default QoS rule".

3) When the rule operation is "Create new QoS rule" and the DQR bit is set to "the QoS rule is the default QoS rule" when there's already a default QoS rule with different QoS rule identifier.

4) When the rule operation is "Delete existing QoS rule" on the default QoS rule.

5) When the rule operation is "Create new QoS rule", "Modify existing QoS rule and add packet filters", "Modify existing QoS rule and replace all packet filters", "Modify existing QoS rule and delete packet filters", or "Modify existing QoS rule without modifying packet filters" and two or more QoS rules associated with this PDU session would have identical precedence values.

6) When the rule operation is "Modify existing QoS rule and delete packet filters", the QoS rule is a QoS rule of a PDU session of IPv4, IPv6, IPv4v6 or Ethernet PDU session type, and the packet filter list in the resultant QoS rule is empty.

7) When the rule operation is "Create new QoS rule", and there is already an existing QoS rule with the same QoS rule identifier and the existing QoS rule is associated with a QoS flow description stored for the EPS bearer context being modified or the existing QoS rule is not associated with any QoS flow description.

8) When the rule operation is "Modify existing QoS rule and add packet filters", "Modify existing QoS rule and replace all packet filters", "Modify existing QoS rule and delete packet filters", or "Modify existing QoS rule without modifying packet filters" and there is no existing QoS rule with the same QoS rule identifier.

9) When the rule operation is "Delete existing QoS rule" and there is no existing QoS rule with the same QoS rule identifier.

10) When the flow description operation is "Create new QoS flow description" and there is already an existing QoS flow description with the same QoS flow identifier stored for the EPS bearer context being modified.

11) When the flow description operation is "Modify existing QoS flow description" and there is no existing QoS flow description with the same QoS flow identifier stored for the EPS bearer context being modified.

12) When the flow description operation is "Delete existing QoS flow description" and there is no existing QoS flow description with the same QoS flow identifier stored for the EPS bearer context being modified.

13) When the UE determines that:

i) the default EPS bearer context or a dedicated EPS bearer context is associated with one or more QoS flows and the default EPS bearer context is not associated with the default QoS rule.

ii) a dedicated EPS bearer context is associated with the default QoS rule.

14) When the rule operation is "Create new QoS rule", "Modify existing QoS rule and add packet filters", "Modify existing QoS rule and replace all packet filters", "Modify existing QoS rule and delete packet filters", "Modify existing QoS rule without modifying packet filters" or "Delete existing QoS rule" and there is already an existing QoS rule with the same QoS rule identifier associated with a QoS flow description stored for an EPS bearer context different from the EPS bearer context being modified and belonging to the same PDN connection as the EPS bearer context being modified.

15) When the flow description operation is "Create new QoS flow description", and there is already an existing QoS flow description with the same QoS flow identifier stored for an EPS bearer context different from the EPS bearer context being modified and belonging to the same PDN connection as the EPS bearer context being modified.

16) When the rule operation is "Create new QoS rule", "Modify existing QoS rule and add packet filters", "Modify existing QoS rule and replace all packet filters", "Modify existing QoS rule and delete packet filters", or "Modify existing QoS rule without modifying packet filters" and the resultant QoS rule is associated with a QoS flow description stored for an EPS bearer context different from the EPS bearer context being modified.

In case 4, the UE shall include a Protocol configuration options IE or Extended protocol configuration options IE with a 5GSM cause parameter set to 5GSM cause #83 "semantic error in the QoS operation" in the MODIFY EPS BEARER CONTEXT ACCEPT message.

In case 5, if the old QoS rule (i.e. the QoS rule that existed before the MODIFY EPS BEARER CONTEXT REQUEST message was received) is not the default QoS rule, the UE shall not diagnose an error, shall further process the new request and, if it was processed successfully, shall delete the old QoS rule which has identical precedence value. If the QoS rule is the default QoS rule, the UE shall include a Protocol configuration options IE or Extended protocol configuration options IE with a 5GSM cause parameter set to 5GSM cause #83 "semantic error in the QoS operation" in the MODIFY EPS BEARER CONTEXT ACCEPT message.

In case 6, if the QoS rule is not the default QoS rule, the UE shall delete the QoS rule. If the QoS rule is the default QoS rule, the UE shall include a Protocol configuration options IE or Extended protocol configuration options IE with a 5GSM cause parameter set to 5GSM cause #83 "semantic error in the QoS operation" in the MODIFY EPS BEARER CONTEXT ACCEPT message.

In case 7, if the existing QoS rule is not the default QoS rule and the DQR bit of the new QoS rule is set to "the QoS rule is not the default QoS rule", the UE shall not diagnose an error, further process the create request and, if it was processed successfully, delete the old QoS rule (i.e. the QoS rule that existed before the MODIFY EPS BEARER CONTEXT REQUEST message was received). If the existing QoS rule is the default QoS rule or the DQR bit of the new QoS rule is set to "the QoS rule is the default QoS rule", the UE shall include a Protocol configuration options IE or Extended protocol configuration options IE with a 5GSM cause parameter set to 5GSM cause #83 "semantic error in the QoS operation" in the MODIFY EPS BEARER CONTEXT ACCEPT message.

In case 9, the UE shall not diagnose an error, further process the delete request and, if it was processed successfully, consider the respective QoS rule as successfully deleted.

In case 10, the UE shall not diagnose an error, further process the create request and, if it was processed successfully, delete the old QoS flow description (i.e. the QoS flow description that existed before the MODIFY EPS BEARER CONTEXT REQUEST message was received).

In case 12, the UE shall not diagnose an error, further process the delete request and, if it was processed successfully, consider the respective QoS flow description as successfully deleted.

Otherwise, the UE shall include a Protocol configuration options IE or Extended protocol configuration options IE with a 5GSM cause parameter set to 5GSM cause #83 "semantic error in the QoS operation" in the MODIFY EPS BEARER CONTEXT ACCEPT message.

b) Syntactical errors in QoS operations:

1) When the rule operation is "Create new QoS rule", "Modify existing QoS rule and add packet filters", "Modify existing QoS rule and replace all packet filters" or "Modify existing QoS rule and delete packet filters" and the packet filter list in the QoS rule is empty.

2) When the rule operation is "Delete existing QoS rule" or "Modify existing QoS rule without modifying packet filters" with a non-empty packet filter list in the QoS rule.

3) When the rule operation is "Modify existing QoS rule and delete packet filters" and the packet filter to be deleted does not exist in the original QoS rule.

4) Void.

5) When there are other types of syntactical errors in the coding of the QoS rules parameter, the QoS rules with the length of two octets parameter, the QoS flow descriptions parameter or the QoS flow descriptions with the length of two octets parameter, such as a mismatch between the number of packet filters subfield, and the number of packet filters in the packet filter list.

6) When, the

A) rule operation is "Create new QoS rule", "Modify existing QoS rule and add packet filters", "Modify existing QoS rule and replace all packet filters", "Modify existing QoS rule and delete packet filters" or "Modify existing QoS rule without modifying packet filters", the UE determines that there is a resulting QoS rule for a QoS flow, and there is no QoS flow description with a QFI corresponding to the QFI of the resulting QoS rule.

B) flow description operation is "Delete existing QoS flow description", and the UE determines that there is a resulting QoS rule for a QoS flow with a QFI corresponding to the QFI of the QoS flow description that is deleted (i.e. there is no associated QoS flow description with the same QFI).

7) When the flow description operation is "Create new QoS flow description" or "Modify existing QoS flow description", and the UE determines that there is a QoS flow description of a GBR QoS flow (as described in 3GPP TS 23.501 [8] table 5.7.4-1) which lacks at least one of the mandatory parameters (i.e., GFBR uplink, GFBR downlink, MFBR uplink and MFBR downlink).

In case 3 the UE shall not diagnose an error, further process the deletion request and, if no error according to items c and d was detected, consider the respective packet filter as successfully deleted.

Otherwise the UE shall include a Protocol configuration options IE or Extended protocol configuration options IE with a 5GSM cause parameter set to 5GSM cause #84 "syntactical error in the QoS operation" in the MODIFY EPS BEARER CONTEXT ACCEPT message.

NOTE 3: It is not considered an error if the UE determines that after processing all QoS operations on QoS rules and QoS flow descriptions there is a QoS flow description that is not associated with any QoS rule and the UE is not in NB-N1 mode.

c) Semantic errors in packet filters:

1) When a packet filter consists of conflicting packet filter components which would render the packet filter ineffective, i.e. no IP packet will ever fit this packet filter. How the UE determines a semantic error in a packet filter is outside the scope of the present document.

The UE shall include a Protocol configuration options IE or Extended protocol configuration options IE with a 5GSM cause parameter set to 5GSM cause #44 "semantic errors in packet filter(s)" in the MODIFY EPS BEARER CONTEXT ACCEPT message.

d) Syntactical errors in packet filters:

1) When the rule operation is "Create new QoS rule", "Modify existing QoS rule and add packet filters" or "Modify existing QoS rule and replace all packet filters", and two or more packet filters in the resultant QoS rule would have identical packet filter identifiers.

2) When there are other types of syntactical errors in the coding of packet filters, such as the use of a reserved value for a packet filter component identifier.

In case 1, if two or more packet filters with identical packet filter identifiers are contained in the MODIFY EPS BEARER CONTEXT REQUEST message, the UE shall include a Protocol configuration options IE or Extended protocol configuration options IE with a 5GSM cause parameter set to 5GSM cause #45 "syntactical error in packet filter(s)" in the MODIFY EPS BEARER CONTEXT ACCEPT message. Otherwise, the UE shall not diagnose an error, further process the MODIFY EPS BEARER CONTEXT REQUEST message and, if it was processed successfully, delete the old packet filters which have the identical packet filter identifiers.

Otherwise the UE shall include a Protocol configuration options IE or Extended protocol configuration options IE with a 5GSM cause parameter set to 5GSM cause #45 "syntactical error in packet filter(s)" in the MODIFY EPS BEARER CONTEXT ACCEPT message.

If the UE detects different errors in the QoS rules and QoS flow descriptions as described in this subclause which requires sending a 5GSM cause parameter in the MODIFY EPS BEARER CONTEXT ACCEPT message, the UE shall include a single 5GSM cause parameter in the MODIFY EPS BEARER CONTEXT ACCEPT message.

NOTE 4: The 5GSM cause to use cannot be different from #44 "semantic error in packet filter(s)", #45 "syntactical errors in packet filter(s)", #83 "semantic error in the QoS operation" or #84 "syntactical error in the QoS operation". The selection of a 5GSM cause is up to UE implementation.

Upon successful completion of an EPS attach procedure or tracking area updating procedure after inter-system change from N1 mode to S1 mode (see 3GPP TS 24.301 [15]), unless the UE is the 5G-RG and the PDU session is an MA PDU session established over 3GPP access and over wireline access,

a) the UE shall delete any UE derived QoS rules of each PDU session which has been transferred to EPS;

b) the UE and the SMF shall perform a local release of the PDU session(s) associated with 3GPP access which have not been transferred to EPS; and

c) the UE and the SMF shall perform a local release of QoS flow(s) which have not been transferred to EPS, of the PDU session(s) which have been transferred to EPS. The UE and the SMF shall also perform a local release of any QoS flow description not associated with any QoS rule and not associated with any mapped EPS bearer context. If there is a QoS flow description not associated with any QoS rule, but associated with a mapped EPS bearer context, and after the inter-system change from N1 mode to S1 mode the respective EPS bearer context is active, then the UE shall associate the QoS flow description with the EPS bearer context.

For PDU session(s) associated with non-3GPP access in 5GS, if present, the UE may:

a) keep some or all of these PDU sessions still associated with non-3GPP access in 5GS, if supported;

b) release some or all of these PDU sessions explicitly by initiating the UE requested PDU session release procedure(s); or

c) attempt to transfer some or all of these PDU sessions from N1 mode to S1 mode by initiating the UE requested PDN connectivity procedure(s) with the PDN CONNECTIVITY REQUEST message created as follows:

1) if the PDU session is an emergency PDU session, the request type shall be set to "handover of emergency bearer services". Otherwise the request type shall be set to "handover";

2) the PDU session type of the PDU session shall be mapped to the PDN type of the default EPS bearer context as follows:

i) the PDN type shall be set to "non-IP" if the PDU session type is "Unstructured";

ii) the PDN type shall be set to "IPv4" if the PDU session type is "IPv4";

iii) the PDN type shall be set to "IPv6" if the PDU session type is "IPv6";

iv) the PDN type shall be set to "IPv4v6" if the PDU session type is "IPv4v6";

v) the PDN type shall be set to "non-IP" if the PDU session type is "Ethernet" and the UE, the network or both of them do not support Ethernet PDN type in S1 mode; and

vi) the PDN type shall be set to "Ethernet" if the PDU session type is "Ethernet" and the UE and the network support Ethernet PDN type in S1 mode;

3) the DNN of the PDU session shall be mapped to the APN of the default EPS bearer context; and

4) the PDU session ID parameter in the PCO IE shall be set to the PDU session identity of the PDU session.

If a PDU session associated with non-3GPP access is transferred to EPS, the UE shall associate the PDU session identity with the default EPS bearer context and shall delete any UE derived QoS rules of such PDU session.

Interworking to 5GS is supported for a PDN connection, if the corresponding default EPS bearer context includes a PDU session identity, an S-NSSAI, if the PDN connection is a non-emergency PDN connection, session AMBR and one or more QoS flow descriptions received in the Protocol configuration options IE or Extended protocol configuration options IE (see 3GPP TS 24.301 [15]), or the default EPS bearer context has association with the PDU session identity, the S-NSSAI, if the PDU session is a non-emergency PDU session, the session-AMBR and one or more QoS flow descriptions after inter-system change from N1 mode to S1 mode.

For a PDN connection established in S1 mode, to enable the UE to attempt to transfer the PDN connection from S1 mode to N1 mode in case of inter-system change, the UE shall allocate a PDU session identity, indicate the allocated PDU session identity in the PDU session ID parameter in the Protocol configuration options IE of the PDN CONNECTIVITY REQUEST message and associate the allocated PDU session identity with the default EPS bearer context of the PDN connection. If an N5CW device supports 3GPP access and establishes a new PDN connection in S1 mode, the N5CW device shall refrain from allocating "PDU session identity value 15".

For a PDN connection established in S1 mode, the SMF assigning the QoS rules shall consider that the UE supports 16 packet filters for the corresponding PDU session until the UE indicates a higher number (as specified in subclause 6.4.2.2).

The network may provide the UE with one or more QoS rules by including either one QoS rules parameter, or one QoS rules with the length of two octets parameter, but not both, in the Protocol configuration options IE or Extended protocol configuration options IE in the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST or ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message. The network may provide the UE with one or more QoS flow descriptions corresponding to the EPS bearer context being activated, by including either one QoS flow descriptions parameter, or one QoS flow descriptions with the length of two octets parameter, but not both, in the Protocol configuration options IE or Extended protocol configuration options IE in the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST or ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message.

When the UE is provided with one or more QoS flow descriptions or the EPS bearer identity of an existing QoS flow description is modified in the Protocol configuration options IE or Extended protocol configuration options IE of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST or ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message, the UE shall check the EPS bearer identity included in the QoS flow description; and:

a) if the EPS bearer identity corresponds to the EPS bearer context being activated or the EPS bearer identity is not included, the UE shall store the QoS flow description and all the associated QoS rules, if any, for the EPS bearer context being activated for use during inter-system change from S1 mode to N1 mode; and

b) otherwise the UE shall locally delete the QoS flow description and all the associated QoS rules, if any, and include a Protocol configuration options IE or Extended protocol configuration options IE with a 5GSM cause parameter set to 5GSM cause #84 "syntactical error in the QoS operation" in the ACTIVATE DEFAULT EPS BEARER CONTEXT ACCEPT or ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT message.

When the UE is provided with one or more QoS rules, or one or more QoS flow descriptions in the Protocol configuration options IE or Extended protocol configuration options IE of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST or ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message, the UE shall process the QoS rules sequentially starting with the first QoS rule and shall process the QoS flow descriptions sequentially starting with the first QoS flow description. The UE shall check QoS rules and QoS flow descriptions for different types of errors as follows:

NOTE 5: If an error is detected in a QoS rule or a QoS flow description which requires sending a Protocol configuration options IE or Extended protocol configuration options IE with a 5GSM cause value, then the QoS rules parameter, the QoS rules with the length of two octets parameter, the QoS flow descriptions parameter and the QoS flow descriptions with the length of two octets parameter included in the Protocol configuration options IE or Extended protocol configuration options IE in the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST or ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message are discarded, if any.

NOTE 6: If the default EPS bearer context activation procedure or the dedicated EPS bearer context activation procedure is rejected, then the QoS rules parameter, the QoS rules with the length of two octets parameter, the QoS flow descriptions parameter and the QoS flow descriptions with the length of two octets parameter included in the Protocol configuration options IE or Extended protocol configuration options IE in the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST or ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message are discarded, if any.

a) Semantic errors in QoS operations:

1) When the rule operation is "Create new QoS rule" and the DQR bit is set to "the QoS rule is the default QoS rule" when there's already a default QoS rule.

2) When the rule operation is received in an ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message, the rule operation is "Create new QoS rule", and there is no rule with the DQR bit set to "the QoS rule is the default QoS rule".

3) When the rule operation is "Create new QoS rule" and two or more QoS rules associated with this PDU session would have identical precedence values.

4) When the rule operation is an operation other than "Create a new QoS rule".

5) When the flow description operation is an operation other than "Create new QoS flow description".

6) When the UE determines that:

i) the default EPS bearer context or a dedicated EPS bearer context is associated with one or more QoS flows and the default EPS bearer context is not associated with the default QoS rules.

ii) a dedicated EPS bearer context is associated with the default QoS rule.

7) When the flow description operation is received in an ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message, the flow description operation is "Create new QoS flow description" and there is already an existing QoS flow description with the same QoS flow identifier stored for an EPS bearer context different from the EPS bearer context being activated and belonging to the same PDN connection as the EPS bearer context being activated.

8) When the rule operation is received in an ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message, the rule operation is "Create new QoS rule" and there is already an existing QoS rule with the same QoS rule identifier stored for an EPS bearer context different from the EPS bearer context being activated and belonging to the same PDN connection as the EPS bearer context being activated.

9) When the rule operation is received in an ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message, the rule operation is "Create new QoS rule" and the resultant QoS rule is associated with a QoS flow description stored for an EPS bearer context different from the EPS bearer context being activated.

In case 4, if the rule operation is for a non-default QoS rule, the UE shall delete the QoS rule. If the QoS rule is the default QoS rule, the UE shall include a Protocol configuration options IE or Extended protocol configuration options IE with a 5GSM cause parameter set to 5GSM cause #83 "semantic error in the QoS operation" in the ACTIVATE DEFAULT EPS BEARER CONTEXT ACCEPT or ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT message.

Otherwise for all the cases above, the UE shall include a Protocol configuration options IE or Extended protocol configuration options IE with a 5GSM cause parameter set to 5GSM cause #83 "semantic error in the QoS operation" in the ACTIVATE DEFAULT EPS BEARER CONTEXT ACCEPT or ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT message.

b) Syntactical errors in QoS operations:

1) When the rule operation is "Create new QoS rule", the packet filter list in the QoS rule is empty, and the QoS rule is provided for a PDN connection of PDN type IPv4, IPv6, IPv4v6 or Ethernet, or for a PDN connection of PDN type "non-IP" and there is locally available information associated with the PDN connection that is set to "Ethernet".

2) Void.

3) When there are other types of syntactical errors in the coding of the QoS rules parameter, the QoS rules with the length of two octets parameter, the QoS flow descriptions parameter or the QoS flow descriptions with the length of two octets parameter, such as a mismatch between the number of packet filters subfield, and the number of packet filters in the packet filter list.

4) When, the

A) rule operation is "Create new QoS rule", the UE determines that there is a resulting QoS rule for a QoS flow, and there is no QoS flow description with a QFI corresponding to the QFI of the resulting QoS rule.

In case 1, case 3 or case 4, if the QoS rule is not the default QoS rule, the UE shall delete the QoS rule. If the QoS rule is the default QoS rule, the UE shall include a Protocol configuration options IE or Extended protocol configuration options IE with a 5GSM cause parameter set to 5GSM cause #84 "syntactical error in the QoS operation" in the ACTIVATE DEFAULT EPS BEARER CONTEXT ACCEPT or ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT message.

NOTE 7: It is not considered an error if the UE determines that after processing all QoS operations on QoS rules and QoS flow descriptions there is a QoS flow description that is not associated with any QoS rule and the UE is not in NB-N1 mode.

c) Semantic errors in packet filters:

1) When a packet filter consists of conflicting packet filter components which would render the packet filter ineffective, i.e. no IP packet will ever fit this packet filter. How the UE determines a semantic error in a packet filter is outside the scope of the present document.

The UE shall include a Protocol configuration options IE or Extended protocol configuration options IE with a 5GSM cause parameter set to 5GSM cause #44 "semantic errors in packet filter(s)" in the ACTIVATE DEFAULT EPS BEARER CONTEXT ACCEPT or ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT message.

d) Syntactical errors in packet filters:

1) When the rule operation is "Create new QoS rule" and two or more packet filters in the resultant QoS rule would have identical packet filter identifiers.

2) When there are other types of syntactical errors in the coding of packet filters, such as the use of a reserved value for a packet filter component identifier.

If the QoS rule is not the default QoS rule, the UE shall delete the QoS rule. If the QoS rule is the default QoS rule, the UE shall include a Protocol configuration options IE or Extended protocol configuration options IE with a 5GSM cause parameter set to 5GSM cause #45 "syntactical error in packet filter(s)" in the ACTIVATE DEFAULT EPS BEARER CONTEXT ACCEPT or ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT message.

If the UE detects different errors in the QoS rules and QoS flow descriptions as described in this subclause which requires sending a 5GSM cause parameter in the ACTIVATE DEFAULT EPS BEARER CONTEXT ACCEPT or ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT message, the UE shall include a single 5GSM cause parameter in the ACTIVATE DEFAULT EPS BEARER CONTEXT ACCEPT or ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT message.

NOTE 8: The 5GSM cause to use cannot be different from #44 "semantic error in packet filter(s)", #45 "syntactical errors in packet filter(s)", #83 "semantic error in the QoS operation" or #84 "syntactical error in the QoS operation". The selection of a 5GSM cause is up to UE implementation.

Upon inter-system change from S1 mode to N1 mode, the UE uses the parameters from the default EPS bearer context of each PDN connection for which interworking to 5GS is supported to create a corresponding PDU session associated with 3GPP access as follows, unless the UE is the 5G-RG and the PDN connection is a user-plane resource of an MA PDU session:

a) the PDN type of the default EPS bearer context shall be mapped to the PDU session type of the PDU session as follows:

1) if the PDN type is "non-IP":

- the PDU session type is set to the locally available information associated with the PDN connection (either "Ethernet" or "Unstructured"), if available; or

- otherwise, the PDU session type is set to "Unstructured";

2) if the PDN type is "IPv4" the PDU session type is set to "IPv4";

3) if the PDN type is "IPv6", the PDU session type is set to "IPv6";

4) if the PDN type is "IPv4v6", the PDU session type is set to "IPv4v6"; and

5) if the PDN type is "Ethernet", the PDU session type is "Ethernet";

b) the PDN address of the default EPS bearer context shall be mapped to PDU address of the PDU session, if the PDN type is "IPv4", "IPv6" or "IPv4v6";

c) the APN of the default EPS bearer context shall be mapped to the DNN of the PDU session;

d) for each default EPS bearer context in state BEARER CONTEXT ACTIVE the UE shall set the state of the mapped PDU session to PDU SESSION ACTIVE; and

e) for any other default EPS bearer context the UE shall set the state of the mapped PDU session to PDU SESSION INACTIVE.

Additionally, the UE shall set:

a) the PDU session identity of the PDU session to the PDU session identity included by the UE in the Protocol configuration options IE or Extended protocol configuration options IE in the PDN CONNECTIVITY REQUEST message, or the PDU session identity associated with the default EPS bearer context;

b) the S-NSSAI of the PDU session to the S-NSSAI included by the network in the Protocol configuration options IE or Extended protocol configuration options IE in the ACTIVATE DEFAULT EPS BEARER REQUEST message, or the S-NSSAI associated with the default EPS bearer context, if the PDN connection is a non-emergency PDN connection;

c) the session-AMBR of the PDU session to the session-AMBR included by the network in the Protocol configuration options IE or Extended protocol configuration options IE in the ACTIVATE DEFAULT EPS BEARER REQUEST message or the MODIFY EPS BEARER CONTEXT REQUEST message, or the session-AMBR associated with the default EPS bearer context;

d) the SSC mode of the PDU session to "SSC mode 1"; and

e) the always-on PDU session indication to the always-on PDU session indication maintained in the UE, if any.

Upon inter-system change from S1 mode to N1 mode, for each PDN connection which is a user-plane resource of MA PDU session and for which interworking to 5GS is supported, the 5G-RG shall consider that the MA PDU session is established over 3GPP access and, unless the MA PDU session is established over wireline access too, the 5G-RG shall set the session-AMBR of the PDU session to the session-AMBR included by the network in the Protocol configuration options IE or Extended protocol configuration options IE in the ACTIVATE DEFAULT EPS BEARER REQUEST message or the MODIFY EPS BEARER CONTEXT REQUEST message, or the session-AMBR associated with the default EPS bearer context of the PDN connection.

Additionally, for each EPS bearer context of the PDN connection, the UE shall create QoS flow(s) each of which is associated with the QoS flow description received in the Protocol configuration options IE or Extended protocol configuration options IE in the ACTIVATE DEFAULT EPS BEARER REQUEST message, ACTIVATE DEDICATED EPS BEARER REQUEST message, and/or MODIFY EPS BEARER REQUEST message (see 3GPP TS 24.301 [15]), or the QoS flow description associated with EPS bearer context, unless:

a) the UE is the 5G-RG;

b) the PDU session is an MA PDU session which:

1) is established over wireline access; and

2) has a PDN connection as a user-plane resource; and

c) the QoS flow already exists over the wireline access.

Additionally, for each EPS bearer context of the PDN connection, the UE shall create QoS rules(s), if any, each of which is associated with the QoS rule received in the Protocol configuration options IE or Extended protocol configuration options IE in the ACTIVATE DEFAULT EPS BEARER REQUEST message, ACTIVATE DEDICATED EPS BEARER REQUEST message, or MODIFY EPS BEARER CONTEXT REQUEST message (see 3GPP TS 24.301 [15]), or the QoS rules associated with EPS bearer context, unless:

a) the UE is the 5G-RG;

b) the PDU session is an MA PDU session which:

1) is established over wireline access; and

2) has a PDN connection as a user-plane resource; and

c) the QoS rule already exists over the wireline access.

Additionally, for each PDU session which was created at inter-system change from S1 mode to N1 mode from a corresponding PDN connection of the "Ethernet" PDN type, the UE shall consider that Ethernet PDN type in S1 mode is supported by the network and the SMF shall consider that Ethernet PDN type in S1 mode is supported by the UE.

The UE and the network shall locally release the PDN connection(s) and EPS bearer context(s) associated with the 3GPP access which have not been transferred to 5GS.

After inter-system change from S1 mode to N1 mode, for each QoS flow mapped from a EPS bearer context the UE shall associate the EPS bearer identity, the EPS QoS parameters, the extended EPS QoS parameters, and the traffic flow template, if available, of the EPS bearer context with the QoS flow.

After inter-system change from S1 mode to N1 mode, for each QoS flow of an MA PDU session which:

a) is established over wireline access; and

b) has a PDN connection as a user-plane resource;

such that the QoS flow was received in the Protocol configuration options IE or Extended protocol configuration options IE in the ACTIVATE DEFAULT EPS BEARER REQUEST message, ACTIVATE DEDICATED EPS BEARER REQUEST message, MODIFY EPS BEARER CONTEXT REQUEST message, ACTIVATE DEFAULT EPS BEARER REQUEST message, ACTIVATE DEDICATED EPS BEARER REQUEST message, or MODIFY EPS BEARER CONTEXT REQUEST message (see 3GPP TS 24.301 [15]), or associated with EPS bearer context, the 5G-RG shall associate the EPS bearer identity, the EPS QoS parameters, the extended EPS QoS parameters, and the traffic flow template, if available, of the EPS bearer context with the QoS flow.

If the EPS bearer context(s) of the PDN connection are associated with the control plane only indication, and the PDN connection supports interworking to 5GS, after inter-system change from S1 mode to N1 mode, the UE shall associate the PDU session corresponding to the PDN connection with the control plane only indication.

If there is an EPS bearer used for IMS signalling, after inter-system change from S1 mode to N1 mode, the QoS flow of the default QoS rule in the corresponding PDU session is used for IMS signalling.

For a PDN connection established when in S1 mode, upon the first inter-system change from S1 mode to N1 mode, the SMF shall determine the PDU session indication as specified in subclause 6.3.2.2.

When the UE is provided with one or more mapped EPS bearer contexts in the Mapped EPS bearer contexts IE of the PDU SESSION MODIFICATION COMMAND message, the UE shall process the mapped EPS bearer contexts sequentially starting with the first mapped EPS bearer context.

When the UE is provided with a new EPS bearer identity, a new EPS QoS parameters, a new extended EPS QoS parameters, a new APN-AMBR or a new extended APN-AMBR in the Mapped EPS bearer context IE of the PDU SESSION MODIFICATION COMMAND message for a QoS flow, the UE shall discard the corresponding association(s) and associate the new value(s) with the QoS flow.

When the UE is provided with a new traffic flow template in the Mapped EPS bearer contexts IE of the PDU SESSION MODIFICATION COMMAND message for a QoS flow, the UE shall check the traffic flow template for different types of TFT IE errors as specified in subclause 6.3.2.3.

When a QoS flow is deleted, the associated EPS bearer context information that are mapped from the deleted QoS flow shall be deleted from the UE and the network if there is no other existing QoS flow associated with this EPS bearer context. When the EPS bearer identity of a QoS flow is deleted, the associated EPS bearer context information that are mapped from the deleted EPS bearer identity shall be deleted from the UE and the network if there is no other existing QoS flow associated with this EPS bearer context. When an EPS bearer is released, all the associated QoS flow descriptions and QoS rules that are mapped from the released EPS bearer shall be deleted from the UE and the network.

NOTE 9: If T3584 is running or deactivated for the S-NSSAI and optionally the DNN combination, the UE is allowed to initate ESM procedures in EPS with or without APN corresponding to that DNN, and if the APN is congested in EPS, the MME can send a back-off timer for the APN to the UE as specified in 3GPP TS 24.301 [15].

For the case of handover of an existing PDU session from 3GPP access to non-3GPP access,

- upon receipt of the PDU SESSION ESTABLISHMENT ACCEPT message, the UE locally deletes the EPS bearer identities for the PDU session, if any (see subclause 6.4.1.3); and

- after successful handover, the network shall locally delete the EPS bearer identities for the PDU session, if any.

\*\*\*\*\* end of 1st change\*\*\*\*\*

\*\*\*\*\* start of 2nd change\*\*\*\*\*

#### 6.3.2.4 Network-requested PDU session modification procedure not accepted by the UE

Upon receipt of a PDU SESSION MODIFICATION COMMAND message and a PDU session ID, using the NAS transport procedure as specified in subclause 5.4.5, if the UE rejects the PDU SESSION MODIFICATION COMMAND message, the UE shall create a PDU SESSION MODIFICATION COMMAND REJECT message.

If the PDU SESSION MODIFICATION COMMAND message contains the PTI value allocated in the UE-requested PDU session modification procedure, the UE shall stop the timer T3581. The UE should ensure that the PTI value assigned to this procedure is not released immediately.

NOTE 1: The way to achieve this is implementation dependent. For example, the UE can ensure that the PTI value assigned to this procedure is not released during the time equal to or greater than the default value of timer T3591.

While the PTI value is not released, the UE regards any received PDU SESSION MODIFICATION COMMAND message with the same PTI value as a network retransmission (see subclause 7.3.1).

The UE shall set the 5GSM cause IE of the PDU SESSION MODIFICATION COMMAND REJECT message to indicate the reason for rejecting the PDU session modification.

The 5GSM cause IE typically indicates one of the following 5GSM cause values:

#26 insufficient resources;

#44 semantic error in packet filter(s);

#45 syntactical error in packet filter(s);

#83 semantic error in the QoS operation; or

#84 syntactical error in the QoS operation.

If the selected SSC mode of the PDU session is "SSC mode 3" and the PDU SESSION MODIFICATION COMMAND messages includes 5GSM cause #39 "reactivation requested", while the UE does not have sufficient resources for initiating the PDU session establishment procedure as specified in subclause 6.4.1 then the UE shall set cause IE to #26 "insufficient resources".

If the PDU SESSION MODIFICATION COMMAND message includes a request to add a new authorized QoS rule, or a request to modify the authorized QoS rules, or both, and the UE decides to reject the request due to e.g. the supported number of authorized QoS rules or number of packet filters associated with a PDU session having reached the maximum number, then the UE shall set the 5GSM cause IE to #26 "insufficient resources".

NOTE 2: The maximum number of supported authorized QoS rules or packet filters associated with a PDU session is implementation specific.

If the PDU SESSION MODIFICATION COMMAND message includes a request to add a new authorized QoS flow description, or a request to modify the authorized QoS flow descriptions, or both and the UE decides to reject the request due to e.g. the supported number of authorized QoS flow descriptions, then the UE shall set the 5GSM cause IE to #26 "insufficient resources".

NOTE 3: The maximum number of supported authorized QoS flow descriptions associated with a PDU session is implementation specific.

If the PDU SESSION MODIFICATION COMMAND message includes the Authorized QoS rules IE, the UE shall process the QoS rules sequentially starting with the first QoS rule. The UE shall check the QoS rule and the QoS flow description provided in the PDU SESSION MODIFICATION COMMAND message for different types of errors as follows:

NOTE 4: If an error is detected in a QoS rule or a QoS flow description which requires rejecting the PDU SESSION MODIFICATION COMMAND message, then the Authorized QoS rules IE, the Authorized QoS flow descriptions IE, the Mapped EPS bearer contexts IE and any other IE (RQ timer value IE, Always-on PDU session indication IE, etc) included in the PDU SESSION MODIFICATION COMMAND message are discarded, if any.

a) Semantic errors in QoS operations:

1) When the rule operation is "Modify existing QoS rule and add packet filters", "Modify existing QoS rule and replace all packet filters", "Modify existing QoS rule and delete packet filters" or "Modify existing QoS rule without modifying packet filters" on the default QoS rule and the DQR bit is set to "the QoS rule is not the default QoS rule".

2) When the rule operation is "Modify existing QoS rule and add packet filters", "Modify existing QoS rule and replace all packet filters", "Modify existing QoS rule and delete packet filters" or "Modify existing QoS rule without modifying packet filters" on a QoS rule which is not the default QoS rule and the DQR bit is set to "the QoS rule is the default QoS rule".

3) When the rule operation is "Create new QoS rule" and the DQR bit is set to "the QoS rule is the default QoS rule" when there's already a default QoS rule with different QoS rule identifier.

4) When the rule operation is "Delete existing QoS rule" on the default QoS rule.

5) When the rule operation is "Create new QoS rule", "Modify existing QoS rule and add packet filters", "Modify existing QoS rule and replace all packet filters", "Modify existing QoS rule and delete packet filters ", or "Modify existing QoS rule without modifying packet filters" and two or more QoS rules associated with this PDU session would have identical precedence values, and the UE is not in NB-N1 mode.

6) When the rule operation is "Modify existing QoS rule and delete packet filters", the QoS rule is a QoS rule of a PDU session of IPv4, IPv6, IPv4v6 or Ethernet PDU session type, and the packet filter list in the resultant QoS rule is empty.

7) When the rule operation is "Create new QoS rule", there is already an existing QoS rule with the same QoS rule identifier and the UE is not in NB-N1 mode.

8) When the rule operation is "Modify existing QoS rule and add packet filters", "Modify existing QoS rule and replace all packet filters", "Modify existing QoS rule and delete packet filters" or "Modify existing QoS rule without modifying packet filters", the associated QoS rule does not exist and the UE is not in NB-N1 mode.

9) When the rule operation is different than "Delete existing QoS rule", the DQR bit of the QoS rule is set to "the QoS rule is not the default QoS rule" and the UE is in NB-N1 mode.

10) When the rule operation is "Create new QoS rule", the DQR bit is set to "the QoS rule is not the default QoS rule", and the PDU session type of the PDU session is "Unstructured".

11) When the rule operation is "Delete existing QoS rule" and there is no existing QoS rule with the same QoS rule identifier.

12) When the flow description operation is "Create new QoS flow description", there is already an existing QoS flow description with the same QoS flow identifier and the UE is not in NB-N1 mode.

13) When the flow description operation is "Modify existing QoS flow description", the associated QoS flow description does not exist and the UE is not in NB-N1 mode.

14) When the flow description operation is "Delete existing QoS flow description" and there is no existing QoS flow description with the same QoS flow identifier.

15) When the flow description operation is different than "Delete existing QoS flow description", the QFI is not the same as the QFI of the default QoS rule and the UE is in NB-N1 mode.

16) When the flow description operation is "Create new QoS flow description" or "Modify existing QoS flow description", the QFI associated with the QoS flow description is not the same as the QFI of the default QoS rule, and the PDU session type of the PDU session is "Unstructured".

In case 4, the UE shall initiate a PDU session release procedure by sending a PDU SESSION RELEASE REQUEST message with 5GSM cause #83 "semantic error in the QoS operation".

In case 5, if the old QoS rule (i.e. the QoS rule that existed before the PDU SESSION MODIFICATION COMMAND message was received) is not the default QoS rule, the UE shall not diagnose an error, shall further process the new request and, if it was processed successfully, shall delete the old QoS rule which has identical precedence value. Furthermore, after sending the PDU SESSSION MODIFICATION COMPLETE for the ongoing PDU session modification procedure, the UE shall send a PDU SESSION MODIFICATION REQUEST message with 5GSM cause #83 "semantic error in the QoS operation" to delete the QoS rule.

In case 5, if the old QoS rule (i.e. the QoS rule that existed before the PDU SESSION MODIFICATION COMMAND message was received) is the default QoS rule, the UE shall initiate a PDU session release procedure by sending a PDU SESSION RELEASE REQUEST message with 5GSM cause #83 "semantic error in the QoS operation".

In case 6, if the QoS rule is not the default QoS rule, after sending the PDU SESSSION MODIFICATION COMPLETE for the ongoing PDU session modification procedure, the UE shall send a PDU SESSION MODIFICATION REQUEST message with 5GSM cause #83 "semantic error in the QoS operation" to delete the QoS rule.

In case 6, if the QoS rule is the default QoS rule, the UE shall initiate a PDU session release procedure by sending a PDU SESSION RELEASE REQUEST message with 5GSM cause #83 "semantic error in the QoS operation".

In case 7, if the existing QoS rule is not the default QoS rule and the DQR bit of the new QoS rule is set to "the QoS rule is not the default QoS rule", the UE shall not diagnose an error, further process the create request and, if it was processed successfully, delete the old QoS rule. If the existing QoS rule is the default QoS rule or the DQR bit of the new QoS rule is set to "the QoS rule is the default QoS rule", the UE shall reject the PDU SESSION MODIFICATION COMMAND message with 5GSM cause #83 "semantic error in the QoS operation".

In case 9 or case 10, after sending the PDU SESSSION MODIFICATION COMPLETE for the ongoing PDU session modification procedure, the UE shall send a PDU SESSION MODIFICATION REQUEST message with 5GSM cause #83 "semantic error in the QoS operation" to delete the QoS rule.

In case 11, the UE shall not diagnose an error, further process the delete request and, if it was processed successfully, consider the respective QoS rule as successfully deleted.

In case 12, the UE shall not diagnose an error, further process the create request and, if it was processed successfully, delete the old QoS flow description.

In case 14, the UE shall not diagnose an error, further process the delete request and, if it was processed successfully, consider the respective QoS flow description as successfully deleted.

In case 15 or case 16, after sending the PDU SESSSION MODIFICATION COMPLETE for the ongoing PDU session modification procedure, the UE shall send a PDU SESSION MODIFICATION REQUEST message with 5GSM cause #83 "semantic error in the QoS operation" to delete the QoS flow description.

Otherwise, the UE shall reject the PDU SESSION MODIFICATION COMMAND message with 5GSM cause #83 "semantic error in the QoS operation".

b) Syntactical errors in QoS operations:

1) When the rule operation is "Create new QoS rule", "Modify existing QoS rule and add packet filters", "Modify existing QoS rule and replace all packet filters" or "Modify existing QoS rule and delete packet filters", the PDU session type of the PDU session is IPv4, IPv6, IPv4v6 or Ethernet PDU session type, and the packet filter list in the QoS rule is empty.

2) When the rule operation is "Delete existing QoS rule" or "Modify existing QoS rule without modifying packet filters" with a non-empty packet filter list in the QoS rule.

3) When the rule operation is "Modify existing QoS rule and delete packet filters" and the packet filter to be deleted does not exist in the original QoS rule.

4) Void.

5) When there are other types of syntactical errors in the coding of the QoS rules IE, such as a mismatch between the number of packet filters subfield, and the number of packet filters in the packet filter list.

6) When the rule operation is "Create new QoS rule", "Modify existing QoS rule and add packet filters" or "Modify existing QoS rule and replace all packet filters", the DQR bit is set to "the QoS rule is the default QoS rule", the PDU session type of the PDU session is "Unstructured", and the packet filter list in the QoS rule is not empty.

7) When, the

A) rule operation is "Create new QoS rule", "Modify existing QoS rule and add packet filters", "Modify existing QoS rule and replace all packet filters", "Modify existing QoS rule and delete packet filters" or "Modify existing QoS rule without modifying packet filters", the UE determines that there is a resulting QoS rule for a GBR QoS flow (as described in 3GPP TS 23.501 [8] table 5.7.4-1), and there is no QoS flow description with a QFI corresponding to the QFI of the resulting QoS rule.

B) flow description operation is "Delete existing QoS flow description", and the UE determines that there is a resulting QoS rule for a GBR QoS flow (as described in 3GPP TS 23.501 [8] table 5.7.4-1) with a QFI corresponding to the QFI of the QoS flow description that is deleted (i.e. there is no associated QoS flow description with the same QFI).

8) When the flow description operation is "Create new QoS flow description" or "Modify existing QoS flow description", and the UE determines that there is a QoS flow description of a GBR QoS flow (as described in 3GPP TS 23.501 [8] table 5.7.4-1) which lacks at least one of the mandatory parameters (i.e., GFBR uplink, GFBR downlink, MFBR uplink and MFBR downlink).

In case 3 the UE shall not diagnose an error, further process the deletion request and, if no error according to items c and d was detected, consider the respective packet filter as successfully deleted.

In case 6, after completion of the PDU session modification procedure, the UE shall send a PDU SESSION MODIFICATION REQUEST message with 5GSM cause #84 "syntactical error in the QoS operations" to delete all the packet filters for the default QoS rule.

In case 7, if the QoS rules IE contains at least one other valid QoS rule, the UE shall not diagnose an error and shall further process the request, if no error according to items c and d was detected. After completion of the PDU session modification procedure, the UE shall delete the QoS rule for which no corresponding QoS flow description is available and initiate UE requested PDU session modification procedure with 5GSM cause #84 "syntactical error in the QoS operation" to delete the QoS rule for which it has deleted.

In case 8, if the default QoS rule is associated with the QoS flow description which lacks at least one of the mandatory parameters, after completion of the PDU session modification procedure, the UE shall initiate a PDU session release procedure by sending a PDU SESSION RELEASE REQUEST message with 5GSM cause #84 "syntactical error in the QoS operation". Otherwise, if the QoS rules IE contains at least one other valid QoS rule or the QoS flow description IE contains at least one other valid QoS flow description, the UE shall not diagnose an error and shall further process the request, if no error according to items c and d was detected. After completion of the PDU session modification procedure, the UE shall delete the QoS flow description which lacks at least one of the mandatory parameters and the associated QoS rule(s), if any, and initiate UE requested PDU session modification procedure with 5GSM cause #84 "syntactical error in the QoS operation" to delete the QoS flow description and the associated QoS rule(s), if any, which it has deleted.

Otherwise the UE shall reject the PDU SESSION MODIFICATION COMMAND message with 5GSM cause #84 "syntactical error in the QoS operation".

NOTE 5: It is not considered an error if the UE determines that after processing all QoS operations on QoS rules and QoS flow descriptions there is a QoS flow description that is not associated with any QoS rule and the UE is not in NB-N1 mode.

c) Semantic errors in packet filters:

1) When a packet filter consists of conflicting packet filter components which would render the packet filter ineffective, i.e. no IP packet will ever fit this packet filter. How the UE determines a semantic error in a packet filter is outside the scope of the present document.

The UE shall reject the PDU SESSION MODIFICATION COMMAND message with 5GSM cause #44 "semantic error in packet filter(s)".

d) Syntactical errors in packet filters:

1) When the rule operation is "Create new QoS rule", "Modify existing QoS rule and add packet filters" or "Modify existing QoS rule and replace all packet filters", and two or more packet filters in the resultant QoS rule would have identical packet filter identifiers.

2) When there are other types of syntactical errors in the coding of packet filters, such as the use of a reserved value for a packet filter component identifier.

In case 1, if two or more packet filters with identical packet filter identifiers are contained in the PDU SESSION MODIFICATION COMMAND message, the UE shall reject the PDU SESSION MODIFICATION COMMAND with 5GSM cause #45 "syntactical errors in packet filter(s)". Otherwise, the UE shall not diagnose an error, further process the PDU SESSION MODIFICATION COMMAND message and, if it was processed successfully, replace the old packet filter with the new packet filter which have the identical packet filter identifiers.

Otherwise the UE shall reject the PDU SESSION MODIFICATION COMMAND message with 5GSM cause #45 "syntactical errors in packet filter(s)".

If:

a) the UE detects errors in QoS rules that require to delete at least one QoS rule as described above which requires sending a PDU SESSION MODIFICATION REQUEST message to delete the erroneous mapped EPS bearer contexts; and

b) optionally, if the UE detects different errors in the mapped EPS bearer contexts as described in subclause 6.3.2.3 which requires sending a PDU SESSION MODIFICATION REQUEST message to delete the erroneous QoS rules;

the UE, after sending the PDU SESSSION MODIFICATION COMPLETE message for the ongoing PDU session modification procedure, may send a single PDU SESSION MODIFICATION REQUEST message to delete the erroneous QoS rules, and optionally to delete the erroneous mapped EPS bearer contexts. The UE shall include a 5GSM cause IE in the PDU SESSION MODIFICATION REQUEST message.

NOTE 6: The 5GSM cause to use cannot be different from #41 "semantic error in the TFT operation", #42 "syntactical error in the TFT operation", #44 "semantic error in packet filter(s)", #45 "syntactical errors in packet filter(s)", #83 "semantic error in the QoS operation", #84 "syntactical error in the QoS operation", or #85 "Invalid mapped EPS bearer identity". The selection of a 5GSM cause is up to UE implementation.

The UE shall transport the PDU SESSION MODIFICATION COMMAND REJECT message and the PDU session ID, using the NAS transport procedure as specified in subclause 5.4.5.

Upon receipt of a PDU SESSION MODIFICATION COMMAND REJECT message with 5GSM cause value in state PDU SESSION MODIFICATION PENDING, the SMF shall stop timer T3591, enter the state PDU SESSION ACTIVE and abort the PDU session modification procedure.

\*\*\*\*\* end of 2nd change\*\*\*\*\*

\*\*\*\*\* start of 3rd change\*\*\*\*\*

#### 6.4.1.3 UE-requested PDU session establishment procedure accepted by the network

If the connectivity with the requested DN is accepted by the network, the SMF shall create a PDU SESSION ESTABLISHMENT ACCEPT message.

If the UE requests establishing an emergency PDU session, the network shall not check for service area restrictions or subscription restrictions when processing the PDU SESSION ESTABLISHMENT REQUEST message.

The SMF shall set the Authorized QoS rules IE of the PDU SESSION ESTABLISHMENT ACCEPT message to the authorized QoS rules of the PDU session and may include the authorized QoS flow descriptions IE of the PDU SESSION ESTABLISHMENT ACCEPT message set to the authorized QoS flow descriptions of the PDU session.

NOTE 1: This is applicable also if the PDU session establishment procedure was initiated to perform handover of an existing PDU session between 3GPP access and non-3GPP access, and even if the authorized QoS rules and authorized QoS flow descriptions for source and target access of the handover are the same.

The SMF shall ensure that the number of the packet filters used in the authorized QoS rules of the PDU Session does not exceed the maximum number of packet filters supported by the UE for the PDU session. If the received request type is "initial emergency request", the SMF shall set the Authorized QoS flow descriptions IE according to the initial QoS parameters used for establishing emergency services configured in the SMF emergency configuration data.

SMF shall set the Authorized QoS flow descriptions IE to the authorized QoS flow descriptions of the PDU session, if:

a) the Authorized QoS rules IE contains at least one GBR QoS flow;

b) the QFI is not the same as the 5QI of the QoS flow identified by the QFI; or

c) the QoS flow can be mapped to an EPS bearer as specified in subclause 4.11.1 of 3GPP TS 23.502 [9].

If interworking with EPS is supported for the PDU session, the SMF shall set in the PDU SESSION ESTABLISHMENT ACCEPT message:

a) the Mapped EPS bearer contexts IE to the EPS bearer contexts mapped from one or more QoS flows of the PDU session; and

b) the EPS bearer identity parameter in the Authorized QoS flow descriptions IE to the EPS bearer identity corresponding to the QoS flow, for each QoS flow which can be transferred to EPS.

If the "Create new EPS bearer" operation code in the Mapped EPS bearer contexts IE was received, and there is no corresponding Authorized QoS flow descriptions IE in the PDU SESSION ESTABLISHMENT ACCEPT message, the UE shall send a PDU SESSION MODIFICATION REQUEST message including a Mapped EPS bearer contexts IE to delete the mapped EPS bearer context.

Furthermore, the SMF shall store the association between the QoS flow and the mapped EPS bearer context, for each QoS flow which can be transferred to EPS.

The SMF shall set the selected SSC mode IE of the PDU SESSION ESTABLISHMENT ACCEPT message to:

a) the received SSC mode in the SSC mode IE included in the PDU SESSION ESTABLISHMENT REQUEST message based on one or more of the PDU session type, the subscription and the SMF configuration;

b) either the default SSC mode for the data network listed in the subscription or the SSC mode associated with the SMF configuration, if the SSC mode IE is not included in the PDU SESSION ESTABLISHMENT REQUEST message.

If the PDU session is an emergency PDU session, the SMF shall set the Selected SSC mode IE of the PDU SESSION ESTABLISHMENT ACCEPT message to "SSC mode 1". If the PDU session is a non-emergency PDU session of "Ethernet" or "Unstructured" PDU session type, the SMF shall set the Selected SSC mode IE to "SSC mode 1" or "SSC mode 2". If the PDU session is a non-emergency PDU session of "IPv4", "IPv6" or "IPv4v6" PDU session type, the SMF shall set the selected SSC mode IE to "SSC mode 1", "SSC mode 2", or "SSC mode 3".

If the PDU session is a non-emergency PDU session, the SMF shall set the S-NSSAI IE of the PDU SESSION ESTABLISHMENT ACCEPT message to:

a) the S-NSSAI of the PDU session; and

b) the mapped S-NSSAI (if available in roaming scenarios).

The SMF shall set the Selected PDU session type IE of the PDU SESSION ESTABLISHMENT ACCEPT message to the selected PDU session type, i.e. the PDU session type of the PDU session.

If the PDU SESSION ESTABLISHMENT REQUEST message includes a PDU session type IE set to "IPv4v6", the SMF shall select "IPv4", "IPv6" or "IPv4v6" as the Selected PDU session type. If the subscription, the SMF configuration, or both, are limited to IPv4 only or IPv6 only for the DNN selected by the network, the SMF shall include the 5GSM cause value #50 "PDU session type IPv4 only allowed", or #51 "PDU session type IPv6 only allowed", respectively, in the 5GSM cause IE of the PDU SESSION ESTABLISHMENT ACCEPT message.

If the selected PDU session type is "IPv4", the SMF shall include the PDU address IE in the PDU SESSION ESTABLISHMENT ACCEPT message and shall set the PDU address IE to an IPv4 address is allocated to the UE in the PDU session.

If the selected PDU session type is "IPv6", the SMF shall include the PDU address IE in the PDU SESSION ESTABLISHMENT ACCEPT message and shall set the PDU address IE to an interface identifier for the IPv6 link local address allocated to the UE in the PDU session.

If the selected PDU session type is "IPv4v6", the SMF shall include the PDU address IE in the PDU SESSION ESTABLISHMENT ACCEPT message and shall set the PDU address IE to an IPv4 address and an interface identifier for the IPv6 link local address, allocated to the UE in the PDU session.

If the selected PDU session type of a PDU session established by the W-AGF acting on behalf of the FN-RG is "IPv4v6" or "IPv6", the SMF shall also indicate the SMF's IPv6 link local address in the PDU address IE of the PDU SESSION ESTABLISHMENT ACCEPT message.

If the PDU session is a non-emergency PDU session, the SMF shall set the DNN IE of the PDU SESSION ESTABLISHMENT ACCEPT message to the DNN determined by the AMF of the PDU session.

The SMF shall set the Session-AMBR IE of the PDU SESSION ESTABLISHMENT ACCEPT message to the Session-AMBR of the PDU session.

If the selected PDU session type is "IPv4", "IPv6", "IPv4v6" or "Ethernet" and if the PDU SESSION ESTABLISHMENT REQUEST message includes a 5GSM capability IE with the RQoS bit set to "Reflective QoS supported", the SMF shall consider that reflective QoS is supported for QoS flows belonging to this PDU session and may include the RQ timer IE set to an RQ timer value in the PDU SESSION ESTABLISHMENT ACCEPT message.

If the selected PDU session type is "IPv4", "IPv6", "IPv4v6" or "Ethernet" and if the PDU SESSION ESTABLISHMENT REQUEST message includes a Maximum number of supported packet filters IE, the SMF shall consider this number as the maximum number of packet filters that can be supported by the UE for this PDU session. Otherwise the SMF considers that the UE supports 16 packet filters for this PDU session.

The SMF shall consider that the maximum data rate per UE for user-plane integrity protection supported by the UE for uplink and the maximum data rate per UE for user-plane integrity protection supported by the UE for downlink are valid for the lifetime of the PDU session.

If the value of the RQ timer is set to "deactivated" or has a value of zero, the UE considers that RQoS is not applied for this PDU session.

NOTE 2: If the 5G core network determines that reflective QoS is to be used for a QoS flow, the SMF sends reflective QoS indication (RQI) to UPF to activate reflective QoS. If the QoS flow is established over 3GPP access, the SMF also includes reflective QoS Attribute (RQA) in QoS profile of the QoS flow during QoS flow establishment.

If the selected PDU session type is "IPv6" or "IPv4v6" and if the PDU SESSION ESTABLISHMENT REQUEST message includes a 5GSM capability IE with the MH6-PDU bit set to "Multi-homed IPv6 PDU session supported", the SMF shall consider that this PDU session is supported to use multiple IPv6 prefixes.

If the selected PDU session type is "Ethernet", the PDU SESSION ESTABLISHMENT REQUEST message includes a 5GSM capability IE with the EPT-S1 bit set to "Ethernet PDN type in S1 mode supported" and the network supports Ethernet PDN type in S1 mode, the SMF shall set the EPT-S1 bit of the 5GSM network feature support IE of the PDU SESSION ESTABLISHMENT ACCEPT message to "Ethernet PDN type in S1 mode supported".

If the DN authentication of the UE was performed and completed successfully, the SMF shall set the EAP message IE of the PDU SESSION ESTABLISHMENT ACCEPT message to an EAP-success message as specified in IETF RFC 3748 [34], provided by the DN.

Based on local policies or configurations in the SMF and the Always-on PDU session requested IE in the PDU SESSION ESTABLISHMENT REQUEST message (if available), if the SMF determines that either:

a) the requested PDU session needs to be established as an always-on PDU session (e.g. because the PDU session is for TSC, for URLLC, or for both), the SMF shall include the Always-on PDU session indication IE in the PDU SESSION ESTABLISHMENT ACCEPT message and shall set the value to "Always-on PDU session required"; or

b) the requested PDU session shall not be established as an always-on PDU session and:

i) if the UE included the Always-on PDU session requested IE, the SMF shall include the Always-on PDU session indication IE in the PDU SESSION ESTABLISHMENT ACCEPT message and shall set the value to "Always-on PDU session not allowed"; or

ii) if the UE did not include the Always-on PDU session requested IE, the SMF shall not include the Always-on PDU session indication IE in the PDU SESSION ESTABLISHMENT ACCEPT message.

If the PDU session is an MA PDU session, the SMF shall include the ATSSS container IE in the PDU SESSION ESTABLISHMENT ACCEPT message. The SMF shall set the content of the ATSSS container IE as specified in 3GPP TS 24.193 [13B]. If the UE requests to establish user plane resources over the second access of an MA PDU session which has already been established over the first access and the parameters associated with ATSSS previously provided to the UE are not to be updated, the "ATSSS container contents" shall not be included in the ATSSS container IE in the PDU SESSION ESTABLISHMENT ACCEPT message.

If the PDU session is a single access PDU session containing the MA PDU session information IE with the value set to "MA PDU session network upgrade is allowed" and:

a) if the SMF decides to establish a single access PDU session, the SMF shall not include the ATSSS container IE in the PDU SESSION ESTABLISHMENT ACCEPT message; or

b) if the SMF decides to establish an MA PDU session, the SMF shall include the ATSSS container IE in the PDU SESSION ESTABLISHMENT ACCEPT message, which indicates to the UE that the requested single access PDU session was established as an MA PDU Session.

If the network decides that the PDU session is only for control plane CIoT 5GS optimization, the SMF shall include the control plane only indication in the PDU SESSION ESTABLISHMENT ACCEPT message.

If:

a) the UE provided the IP header compression configuration IE in the PDU SESSION ESTABLISHMENT REQUEST message; and

b) the SMF supports IP header compression for control plane CIoT 5GS optimization;

the SMF shall include the IP header compression configuration IE in the PDU SESSION ESTABLISHMENT ACCEPT message.

If:

a) the UE provided the Ethernet header compression configuration IE in the PDU SESSION ESTABLISHMENT REQUEST message; and

b) the SMF supports Ethernet header compression for control plane CIoT 5GS optimization;

the SMF shall include the Ethernet header compression configuration IE in the PDU SESSION ESTABLISHMENT ACCEPT message.

The SMF shall send the PDU SESSION ESTABLISHMENT ACCEPT message.

Upon receipt of a PDU SESSION ESTABLISHMENT ACCEPT message and a PDU session ID, using the NAS transport procedure as specified in subclause 5.4.5, the UE shall stop timer T3580, shall release the allocated PTI value and shall consider that the PDU session was established.

If the PDU session establishment procedure was initiated to perform handover of an existing PDU session between 3GPP access and non-3GPP access, then upon receipt of the PDU SESSION ESTABLISHMENT ACCEPT message the UE shall locally delete any authorized QoS rules and authorized QoS flow descriptions stored for the PDU session before processing the new received authorized QoS rules and authorized QoS flow descriptions, if any.

NOTE 3: For the case of handover from 3GPP access to non-3GPP access, deletion of the QoS flow descriptions implies deletion of the associated EPS bearer identities, if any, and according to subclause 6.1.4.1 also deletion of the associated EPS bearer contexts. Regarding the reverse direction, for PDU sessions via non-3GPP access the network does not allocate associated EPS bearer identities (see 3GPP TS 23.502 [9], subclause 4.11.1.4.1).

For an MA PDU session already established on a single access, upon receipt of PDU SESSION ESTABLISHMENT ACCEPT message over the other access:

a) the UE shall delete the stored authorized QoS rules;

b) if the authorized QoS flow descriptions IE is included in the PDU SESSION ESTABLISHMENT ACCEPT message, the UE shall delete the stored authorized QoS flow descriptions; and

c) if the mapped EPS bearer contexts IE is included in the PDU SESSION ESTABLISHMENT ACCEPT message, the UE shall delete the stored mapped EPS bearer contexts.

The UE shall store the authorized QoS rules, and the session-AMBR received in the PDU SESSION ESTABLISHMENT ACCEPT message for the PDU session. The UE shall also store the authorized QoS flow descriptions if it is included in the Authorized QoS flow descriptions IE of the PDU SESSION ESTABLISHMENT ACCEPT message for the PDU session.

If the number of the authorized QoS rules, the number of the packet filters, or the number of the authorized QoS flow descriptions associated with the PDU session have reached the maximum number supported by the UE upon receipt of a PDU SESSION ESTABLISHMENT ACCEPT message, then the UE may initiate the PDU session release procedure by sending a PDU SESSION RELEASE REQUEST message with 5GSM cause #26 "insufficient resources".

For a PDU session that is being established with the request type set to "initial request", "initial emergency request" or "MA PDU request", or a PDU session that is being transferred from EPS to 5GS and established with the request type set to "existing PDU session" or "existing emergency PDU session" or a PDU session that is being handed over between non-3GPP access and 3GPP access and established with the request type set to "existing PDU session" or "existing emergency PDU session ", the UE shall verify the authorized QoS rules and the authorized QoS flow descriptions provided in the PDU SESSION ESTABLISHMENT ACCEPT message for different types of errors as follows:

a) Semantic errors in QoS operations:

1) When the rule operation is "Create new QoS rule", and the DQR bit is set to "the QoS rule is the default QoS rule" when there's already a default QoS rule.

2) When the rule operation is "Create new QoS rule", and there is no rule with the DQR bit set to "the QoS rule is the default QoS rule".

3) When the rule operation is "Create new QoS rule" and two or more QoS rules associated with this PDU session would have identical precedence values.

4) When the rule operation is an operation other than "Create new QoS rule".

5) When the rule operation is "Create new QoS rule", the DQR bit is set to "the QoS rule is not the default QoS rule", the request type is "initial request" and the UE is in NB-N1 mode.

6) When the rule operation is "Create new QoS rule" and two or more QoS rules associated with this PDU session would have identical QoS rule identifier values.

7) When the rule operation is "Create new QoS rule", the DQR bit is set to "the QoS rule is not the default QoS rule", and the PDU session type of the PDU session is "Unstructured".

8) When the flow description operation is an operation other than "Create new QoS flow description".

9) When the flow description operation is "Create new QoS flow description", the request type is "initial request", the QFI associated with the QoS flow description is not the same as the QFI of the default QoS rule and the UE is NB-N1 mode.

10) When the flow description operation is "Create new QoS flow description", the QFI associated with the QoS flow description is not the same as the QFI of the default QoS rule, and the PDU session type of the PDU session is "Unstructured".

In case 4, case 5, or case 7 if the rule operation is for a non-default QoS rule, the UE shall send a PDU SESSION MODIFICATION REQUEST message to delete the QoS rule with 5GSM cause #83 "semantic error in the QoS operation".

In case 8, case 9, or case 10, the UE shall send a PDU SESSION MODIFICATION REQUEST message to delete the QoS flow description with 5GSM cause #83 "semantic error in the QoS operation".

Otherwise for all the cases above, the UE shall initiate a PDU session release procedure by sending a PDU SESSION RELEASE REQUEST message with 5GSM cause #83 "semantic error in the QoS operation".

b) Syntactical errors in QoS operations:

1) When the rule operation is "Create new QoS rule", the QoS rule is a QoS rule of a PDU session of IPv4, IPv6, IPv4v6 or Ethernet PDU session type, and the packet filter list in the QoS rule is empty.

2) When the rule operation is "Create new QoS rule", the DQR bit is set to "the QoS rule is the default QoS rule", the PDU session type of the PDU session is "Unstructured", and the packet filter list in the QoS rule is not empty.

3) When there are other types of syntactical errors in the coding of the QoS rules IE, such as a mismatch between the number of packet filters subfield, and the number of packet filters in the packet filter list.

4) When, the

A) rule operation is "Create new QoS rule", the UE determines that there is a resulting QoS rule for a GBR QoS flow (as described in 3GPP TS 23.501 [8] table 5.7.4-1), and there is no QoS flow description with a QFI corresponding to the QFI of the resulting QoS rule.

B) request type is "existing PDU session" or "existing emergency PDU session", the flow description operation is "Delete existing QoS flow description", and the UE determines that there is a resulting QoS rule for a GBR QoS flow (as described in 3GPP TS 23.501 [8] table 5.7.4-1) with a QFI corresponding to the QFI of the QoS flow description that is deleted (i.e. there is no associated QoS flow description with the same QFI).

5) When the flow description operation is "Create new QoS flow description", and the UE determines that there is a QoS flow description of a GBR QoS flow (as described in 3GPP TS 23.501 [8] table 5.7.4-1) which lacks at least one of the mandatory parameters (i.e., GFBR uplink, GFBR downlink, MFBR uplink and MFBR downlink).

In case 1, case 3 or case 4, if the QoS rule is not the default QoS rule, the UE shall send a PDU SESSION MODIFICATION REQUEST message including a requested QoS rule IE to delete the QoS rule with 5GSM cause #84 "syntactical error in the QoS operation". Otherwise, if the QoS rule is the default QoS rule, the UE shall initiate a PDU session release procedure by sending a PDU SESSION RELEASE REQUEST message with 5GSM cause #84 "syntactical error in the QoS operation".

In case 2, if the QoS rule is the default QoS rule, the UE shall send a PDU SESSION MODIFICATION REQUEST message including a requested QoS rule IE to delete all the packet filters of the default QoS rule. The UE shall include the 5GSM cause #84 "syntactical error in the QoS operation".

In case 5, if the default QoS rule is associated with the QoS flow description which lacks at least one of the mandatory parameters, the UE shall initiate a PDU session release procedure by sending a PDU SESSION RELEASE REQUEST message with 5GSM cause #84 "syntactical error in the QoS operation". Otherwise, the UE shall send a PDU SESSION MODIFICATION REQUEST message to delete the QoS flow description which lacks at least one of the mandatory parameters and the associated QoS rule(s), if any, with 5GSM cause #84 "syntactical error in the QoS operation".

NOTE 4: It is not considered an error if the UE determines that after processing all QoS operations on QoS rules and QoS flow descriptions there is a QoS flow description that is not associated with any QoS rule and the UE is not in NB-N1 mode.

c) Semantic errors in packet filters:

1) When a packet filter consists of conflicting packet filter components which would render the packet filter ineffective, i.e. no IP packet will ever fit this packet filter. How the UE determines a semantic error in a packet filter is outside the scope of the present document.

If the QoS rule is the default QoS rule, the UE shall initiate a PDU session release procedure by sending a PDU SESSION RELEASE REQUEST message with 5GSM cause #44 "semantic error in packet filter(s)". Otherwise, the UE shall send a PDU SESSION MODIFICATION REQUEST message to delete the QoS rule with 5GSM cause #44 "semantic error in packet filter(s)".

d) Syntactical errors in packet filters:

1) When the rule operation is "Create new QoS rule" and two or more packet filters in the resultant QoS rule would have identical packet filter identifiers.

2) When there are other types of syntactical errors in the coding of packet filters, such as the use of a reserved value for a packet filter component identifier.

If the QoS rule is the default QoS rule, the UE shall initiate a PDU session release procedure by sending a PDU SESSION RELEASE REQUEST message with 5GSM cause #45 "syntactical errors in packet filter(s)". Otherwise, the UE shall send a PDU SESSION MODIFICATION REQUEST message to delete the QoS rule with 5GSM cause #45 "syntactical errors in packet filter(s)".

If the Always-on PDU session indication IE is included in the PDU SESSION ESTABLISHMENT ACCEPT message and:

a) the value of the IE is set to "Always-on PDU session required", the UE shall consider the established PDU session as an always-on PDU session; or

b) the value of the IE is set to "Always-on PDU session not allowed", the UE shall not consider the established PDU session as an always-on PDU session.

The UE shall not consider the established PDU session as an always-on PDU session if the UE does not receive the Always-on PDU session indication IE in the PDU SESSION ESTABLISHMENT ACCEPT message.

The UE shall store the mapped EPS bearer contexts, if received in the PDU SESSION ESTABLISHMENT ACCEPT message. Furthermore, the UE shall also store the association between the QoS flow and the mapped EPS bearer context, for each QoS flow which can be transferred to EPS, based on the received EPS bearer identity parameter in Authorized QoS flow descriptions IE and the mapped EPS bearer contexts. The UE shall check each mapped EPS bearer context for different types of errors as follows:

NOTE 5: An error detected in a mapped EPS bearer context does not cause the UE to discard the Authorized QoS rules IE and Authorized QoS flow descriptions IE included in the PDU SESSION ESTABLISHMENT ACCEPT, if any.

a) Semantic error in the mapped EPS bearer operation:

1) When the operation code is an operation code other than "Create new EPS bearer" and the PDU session is being established with the request type set to "initial request" or "initial emergency request".

2) When the operation code is "Create new EPS bearer" and there is already an existing mapped EPS bearer context with the same EPS bearer identity associated with any PDU session.

3) When the operation code is "Create new EPS bearer" or "Modify existing EPS bearer" and the resulting mapped EPS bearer context has invalid or missing mandatory parameters (e.g., mapped EPS QoS parameters or traffic flow template for a dedicated EPS bearer context).

In case 2, if the existing mapped EPS bearer context is associated with the PDU session that is being established, the UE shall not diagnose an error, further process the create request and, if it was process successfully, delete the old EPS bearer context.

Otherwise, the UE shall initiate a PDU session modification procedure by sending a PDU SESSION MODIFICATION REQUEST message to delete the mapped EPS bearer context with 5GSM cause #85 "Invalid mapped EPS bearer identity".

b) if the mapped EPS bearer context includes a traffic flow template, the UE shall check the traffic flow template for different types of TFT IE errors as follows:

1) Semantic errors in TFT operations:

i) When the TFT operation is an operation other than "Create a new TFT"

The UE shall initiate a PDU session modification procedure by sending a PDU SESSION MODIFICATION REQUEST message to delete the mapped EPS bearer context with 5GSM cause #41 "semantic error in the TFT operation".

2) Syntactical errors in TFT operations:

i) When the TFT operation = "Create a new TFT" and the packet filter list in the TFT IE is empty.

ii) When there are other types of syntactical errors in the coding of the TFT IE, such as a mismatch between the number of packet filters subfield, and the number of packet filters in the packet filter list.

The UE shall initiate a PDU session modification procedure by sending a PDU SESSION MODIFICATION REQUEST message with to delete the mapped EPS bearer context 5GSM cause #42 "syntactical error in the TFT operation".

3) Semantic errors in packet filters:

i) When a packet filter consists of conflicting packet filter components which would render the packet filter ineffective, i.e. no IP packet will ever fit this packet filter. How the UE determines a semantic error in a packet filter is outside the scope of the present document.

ii) When the resulting TFT does not contain any packet filter which applicable for the uplink direction.

The UE shall initiate a PDU session modification procedure by sending a PDU SESSION MODIFICATION REQUEST message to delete the mapped EPS bearer context with 5GSM cause #44 "semantic errors in packet filter(s)".

4) Syntactical errors in packet filters:

i) When the TFT operation = "Create a new TFT" and two or more packet filters in the resultant TFT would have identical packet filter identifiers.

ii) When the TFT operation = "Create a new TFT" and two or more packet filters in all TFTs associated with this PDN connection would have identical packet filter precedence values.

iii) When there are other types of syntactical errors in the coding of packet filters, such as the use of a reserved value for a packet filter component identifier.

In case ii, if the old packet filters do not belong to the default EPS bearer context, the UE shall not diagnose an error and shall delete the old packet filters which have identical filter precedence values.

In case ii, if one or more old packet filters belong to the default EPS bearer context, the UE shall initiate a PDU session modification procedure by sending a PDU SESSION MODIFICATION REQUEST message to delete the mapped EPS bearer context with 5GSM cause #45 "syntactical errors in packet filter(s)".

In cases i and iii the UE shall initiate a PDU session modification procedure by sending a PDU SESSION MODIFICATION REQUEST message to delete the mapped EPS bearer context with 5GSM cause #45 "syntactical error in packet filter(s)".

If the UE detects different errors in the mapped EPS bearer contexts, QoS rules or QoS flow descriptions, the UE may send a single PDU SESSION MODIFICATION REQUEST message to delete the erroneous mapped EPS bearer contexts, QoS rules or QoS flow descriptions. In that case, the UE shall include a single 5GSM cause in the PDU SESSION MODIFICATION REQUEST message.

NOTE 6: The 5GSM cause to use cannot be different from: #41 "semantic error in the TFT operation", #42 "syntactical error in the TFT operation", #44 "semantic error in packet filter(s)", #45 "syntactical errors in packet filter(s)", #83 "semantic error in the QoS operation", #84 "syntactical error in the QoS operation", and #85 "Invalid mapped EPS bearer identity". The selection of a 5GSM cause is up to the UE implementation.

The UE shall only use the Control plane CIoT 5GS optimization for this PDU session if the Control plane only indication is included in the PDU SESSION ESTABLISHMENT ACCEPT message.

If the UE requests the PDU session type "IPv4v6" and:

a) the UE receives the selected PDU session type set to "IPv4" and does not receive the 5GSM cause value #50 "PDU session type IPv4 only allowed"; or

b) the UE receives the selected PDU session type set to "IPv6" and does not receive the 5GSM cause value #51 "PDU session type IPv6 only allowed";

the UE may subsequently request another PDU session for the other IP version using the UE-requested PDU session establishment procedure to the same DNN (or no DNN, if no DNN was indicated by the UE) and the same S-NSSAI associated with (if available in roaming scenarios) a mapped S-NSSAI (or no S-NSSAI, if no S-NSSAI was indicated by the UE) with a single address PDN type (IPv4 or IPv6) other than the one already activated.

If the UE requests the PDU session type "IPv4v6", receives the selected PDU session type set to "IPv4" and the 5GSM cause value #50 "PDU session type IPv4 only allowed", the UE shall not subsequently request another PDU session for "IPv6" using the UE-requested PDU session establishment procedure to the same DNN (or no DNN, if no DNN was indicated by the UE) and the same S-NSSAI associated with (if available in roaming scenarios) a mapped S-NSSAI (or no S-NSSAI, if no S-NSSAI was indicated by the UE) and the PDU session type "IPv6" until:

- the UE is registered to a new PLMN;

- the PDU session type which is used to access the DNN (or no DNN, if no DNN was indicated by the UE) and the S-NSSAI (or no S-NSSAI, if no S-NSSAI was indicated by the UE) is changed;

- the UE is switched off; or

- the USIM is removed or the entry in the "list of subscriber data" for the current SNPN is updated.

If the UE requests the PDU session type "IPv4v6", receives the selected PDU session type set to "IPv6" and the 5GSM cause value #51 "PDU session type IPv6 only allowed", the UE shall not subsequently request another PDU session for "IPv4" using the UE-requested PDU session establishment procedure to the same DNN (or no DNN, if no DNN was indicated by the UE) and the same S-NSSAI associated with (if available in roaming scenarios) a mapped S-NSSAI (or no S-NSSAI, if no S-NSSAI was indicated by the UE) and the PDU session type "IPv4" until:

- the UE is registered to a new PLMN;

- the PDU session type which is used to access the DNN (or no DNN, if no DNN was indicated by the UE) and the S-NSSAI (or no S-NSSAI, if no S-NSSAI was indicated by the UE) is changed;

- the UE is switched off; or

- the USIM is removed or the entry in the "list of subscriber data" for the current SNPN is updated.

If the selected PDU session type of the PDU session is "Unstructured" or "Ethernet", the UE supports inter-system change from N1 mode to S1 mode, the UE does not support establishment of a PDN connection for the PDN type set to "non-IP" in S1 mode, and the parameters list field of one or more authorized QoS flow descriptions received in the Authorized QoS flow descriptions IE of the PDU SESSION ESTABLISHMENT ACCEPT message contains an EPS bearer identity (EBI), then the UE shall locally remove the EPS bearer identity (EBI) from the parameters list field of such one or more authorized QoS flow descriptions. Additionally the UE shall also initiate a PDU session modification procedure by sending a PDU SESSION MODIFICATION REQUEST message to delete the mapped EPS bearer context with 5GSM cause #85 "Invalid mapped EPS bearer identity".

If the selected PDU session type of the PDU session is "Ethernet", the UE supports inter-system change from N1 mode to S1 mode, the UE does not support establishment of a PDN connection for the PDN type set to "non-IP" in S1 mode, the UE, the network or both of them do not support Ethernet PDN type in S1 mode, and the parameters list field of one or more authorized QoS flow descriptions received in the Authorized QoS flow descriptions IE of the PDU SESSION ESTABLISHMENT ACCEPT message contains an EPS bearer identity (EBI), then the UE shall locally remove the EPS bearer identity (EBI) from the parameters list field of such one or more authorized QoS flow descriptions. Additionally, the UE shall also initiate a PDU session modification procedure by sending a PDU SESSION MODIFICATION REQUEST message to delete the mapped EPS bearer context with 5GSM cause #85 "Invalid mapped EPS bearer identity".

If the UE receives an IPv4 Link MTU parameter, an Ethernet Frame Payload MTU parameter, or an Unstructured Link MTU parameter in the Extended protocol configuration options IE of the PDU SESSION ESTABLISHMENT ACCEPT message, the UE shall pass to the upper layer the received IPv4 link MTU size, the received Ethernet frame payload MTU size, or the unstructured link MTU size.

NOTE 7: The IPv4 link MTU size corresponds to the maximum length of user data packet that can be sent via N3 interface for a PDU session of the "IPv4" PDU session type.

NOTE 8: The Ethernet frame payload MTU size corresponds to the maximum length of a payload of an Ethernet frame that can be sent via N3 interface for a PDU session of the "Ethernet" PDU session type.

NOTE 9: The unstructured link MTU size correspond to the maximum length of user data packet that can be sent either via the control plane or via N3 interface for a PDU session of the "Unstructured" PDU session type.

If the 5G-RG receives an ACS information parameter in the Extended protocol configuration options IE of the PDU SESSION ESTABLISHMENT ACCEPT message, the 5G-RG shall pass the ACS URL in the received ACS information parameter to the upper layer.

If the UE has indicated support for CIoT 5GS optimizations and receives a small data rate control parameters container in the Extended protocol configuration options IE in the PDU SESSION ESTABLISHMENT ACCEPT message, the UE shall store the small data rate control parameters value and use the stored small data rate control parameters value as the maximum allowed limit of uplink user data for the PDU session in accordance with 3GPP TS 23.501 [8].

If the UE has indicated support for CIoT 5GS optimizations and receives an additional small data rate control parameters for exception data container in the Extended protocol configuration options IE in the PDU SESSION ESTABLISHMENT ACCEPT message, the UE shall store the additional small data rate control parameters for exception data value and use the stored additional small data rate control parameters for exception data value as the maximum allowed limit of uplink exception data for the PDU session in accordance with 3GPP TS 23.501 [8].

If the UE has indicated support for CIoT 5GS optimizations and receives an initial small data rate control parameters container or an initial additional small data rate control parameters for exception data container in the Extended protocol configuration options IE in the PDU SESSION ESTABLISHMENT ACCEPT message, the UE shall use these parameters for the newly established PDU Session. When the validity period of the initial parameters expire, the parameters received in a small data rate control parameters container or an additional small data rate control parameters for exception data container shall be used.

If the UE receives a Serving PLMN rate control IE in the PDU SESSION ESTABLISHMENT ACCEPT message, the UE shall store the Serving PLMN rate control IE value and use the stored serving PLMN rate control value as the maximum allowed limit of uplink control plane user data for the corresponding PDU session in accordance with 3GPP TS 23.501 [8].

If the UE receives an APN rate control parameters container or an additional APN rate control for exception data parameters container in the Extended protocol configuration options IE in the PDU SESSION ESTABLISHMENT ACCEPT message, the UE shall store these parameters and use them to limit the rate at which it generates uplink user data messages for the PDN connection corresponding to the PDU session if the PDU session is transferred to EPS upon inter-system change from N1 mode to S1 mode in accordance with 3GPP TS 24.301 [15]. The received APN rate control parameters and additional APN rate control for exception data parameters shall replace any previously stored APN rate control parameters and additional APN rate control for exception data parameters, respectively, for this PDN connection.

If the UE receives an initial APN rate control parameters container or an initial additional APN rate control for exception data parameters container in the Extended protocol configuration options IE in the PDU SESSION ESTABLISHMENT ACCEPT message, the UE shall store these parameters in the APN rate control status and use them to limit the rate at which it generates exception data messages for the PDN connection corresponding to the PDU session if the PDU session is transferred to EPS upon inter-system change from N1 mode to S1 mode in accordance with 3GPP TS 24.301 [15]. The received APN rate control status shall replace any previously stored APN rate control status for this PDN connection.

NOTE 10: In the PDU SESSION ESTABLISHMENT ACCEPT message, the SMF provides either APN rate control parameters container, or initial APN rate control parameters container, in the Extended protocol configuration options IE, but not both.

NOTE 11: In the PDU SESSION ESTABLISHMENT ACCEPT message, the SMF provides either additional APN rate control for exception data parameters container, or initial additional APN rate control for exception data parameters container, in the Extended protocol configuration options IE, but not both.

If the network accepts the use of Reliable Data Service to transfer data for the PDU session, the network shall include the Extended protocol configuration options IE in the PDU SESSION ESTABLISHMENT ACCEPT message and include the Reliable Data Service accepted indicator. The UE behaves as described in subclause 6.2.15.

If the UE indicates support of DNS over (D)TLS by providing DNS server security information indicator to the network and the network wants to enforce the use of DNS over (D)TLS, the network may include the Extended protocol configuration options IE in the PDU SESSION ESTABLISHMENT ACCEPT message and include the DNS server security information with length of two octets. Upon receiving the DNS server security information, the UE shall pass it to the upper layer. The UE shall use this information to send the DNS over (D)TLS (See 3GPP TS 33.501 [24]).

NOTE 12: Support of DNS over (D)TLS is based on the informative requirements as specified in 3GPP TS 33.501 [24] and it is implemented based on the operator requirement.

\*\*\*\*\* end of 3rd change\*\*\*\*\*