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

**Electronic meeting, 25 February – 5 March 2021**

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| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **24.301** | **CR** | **3496** | **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:*** | Correction on UE retry restriction for ESM causes #50#51#57#58#61 | | | | | | | | | |
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| ***Source to WG:*** | Huawei, HiSilicon | | | | | | | | | |
| ***Source to TSG:*** | C1 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | SAES17, SINE | | | | |  | ***Date:*** | | | 2021-02-10 |
|  |  | | | |  | |  | | |  |
| ***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)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | About retry restriction for PDN connectivity **reject** with ESM causes #50/#51/#57/#58/#61, it was specified as below:  "*If the ESM cause value is #50 "PDN type IPv4 only allowed", #51 "PDN type IPv6 only allowed", #57 "PDN type IPv4v6 only allowed", #58 "PDN type non IP only allowed" or #61 "PDN type Ethernet only allowed", the UE shall ignore the Back-off timer value IE provided by the network, if any. The UE shall not automatically send another PDN CONNECTIVITY REQUEST message for the same APN that was sent by the UE using the same PDN type until any of the following conditions is fulfilled:*  *- the PDN type which is used to access to the APN is changed;*"  The green text has already restricted the retry for the same PDN type is not allowed **until** the pink text. Then the whole sentence can be read as below:  " *The UE shall not automatically send another PDN CONNECTIVITY REQUEST message for the same APN that was sent by the UE using the same PDN type until* *the PDN type is changed*"  What does this sentence mean? Strange wording here as the whole logic is strange, e.g., if the PDN type is changed from the current requested PDN type to other types, then it is not "*using the same PDN type*". Hence basically, the real intention of above sentence is to say: when the PDN type is changed from the current requested PDN type to other types, then the retry is allowed.  However, here the case is: the UE has already requested a PDN type (e.g. "IPv4v6"), but the network only allows one type (e.g."IPv4" only), then subsequently the UE is only allowed to retry following two requests for the same APN:   1. The UE subsequently requests another PDN connectivity for "IPv4"; or 2. The UE subsequently requests another PDN connectivity for "IPv4v6".   As network has provided a very clear indication to the UE that only IPv4 is allowed, then above pink text does not make any sense here. The UE is not allowed to retry the PDN type which is not allowed by the network, otherwise, the retry will be rejected by the network with the same ESM cause again which causes unnecessary signalling load. For example, if the current requested PDN type is "IPv4v6", it was rejected with #50 "PDN type IPv4 only allowed". Then as per above sentence, the UE is allowed to retry "IPv6". But the network only allows "IPv4" and then rejects the request with #50 "PDN type IPv4 only allowed" again. This should be avoided.  Hence, to align with the wording given in section 6.2.2, "*using the same PDN type*" should be changed to "*to obtain a PDN type different from the one allowed by the network*" and then the whole bullet which included the pink text can be removed to avoid creating unnecessary signalling loop.  The similar above analysis can be applied to the similar case that retry restriction for PDN connectivity **accept** with ESM causes #50 and #51.  Also, the retry restriction for PDN connectivity **accept** with ESM causes #50 and #51 is missing in TS 24.301 while the retry restriction for PDU session establishment **accept** with 5GSM causes #50 and #51 was specified in TS 24.501 for 5G. It is better to add this to keep the consistent handling between 4G and 5G.  Finally, for retry restriction for PDN connectivity reject with ESM cause #50/#51/#57/#58/#61, there is below NOTE to indicate that re-attempt in A/Gb, Iu, or N1 mode is not allowed. The similar NOTE is required for retry restriction for PDN connectivity **accept** with ESM causes #50 and #51 as well:  "*NOTE 4: For the ESM cause values #50 "PDN type IPv4 only allowed", #51 "PDN type IPv6 only allowed", #57 "PDN type IPv4v6 only allowed", #58 "PDN type non IP only allowed" and #61 "PDN type Ethernet only allowed", re-attempt in A/Gb, Iu, or N1 mode for the same APN (or no APN, if no APN was indicated by the UE) using the same PDN type is not allowed.*" | | | | | | | | |
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| ***Summary of change:*** | | 1. It proposes to remove unnecessay condition (i.e. until the PDN type is changed) for retry restriction for PDN connectivity reject with ESM cause #50/#51/#57/#58/#61. 2. It proposes to add the missed retry restriction for PDN connectivity **accept** with ESM causes #50 and #51. 3. It proposes to add the similar NOTE to indicate that re-attempt in A/Gb, Iu, or N1 mode is not allowed for retry restriction for PDN connectivity **accept** with ESM causes #50 and #51 and and only the PDN type indicated by the network is allowed. | | | | | | | | |
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| ***Consequences if not approved:*** | | Unnecessary condition (i.e. until the PDN type is changed) for retry restriction for PDN connectivity **reject** with 5GSM causes #50/#51/#57/#58/#61, which will create unnecessary signalling loop.  The retry restriction for PDN connectivity **accept** with ESM causes #50 and #51 is missing.  The required NOTE for retry restriction for PDN connectivity **accept** with ESM causes #50 and #51 is missing. | | | | | | | | |
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| ***Clauses affected:*** | | 6.2.2, 6.5.1.3, 6.5.1.4.3 | | | | | | | | |
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|  | | **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:*** | |  | | | | | | | | |

\* \* \* First Change \* \* \* \*

### 6.2.2 IP address allocation via NAS signalling

The UE shall set the PDN type IE in the PDN CONNECTIVITY REQUEST message, based on its IP stack configuration if it requests IP connectivity (e.g. the per APN settings specified in 3GPP TS 23.401 [10]) as follows:

a)- A UE, which is IPv6 and IPv4 capable and

- has not been allocated an IP address for this APN, shall set the PDN type IE to IPv4v6.

- has been allocated an IPv4 address for this APN and received the ESM cause #52 "single address bearers only allowed", and is requesting an IPv6 address, shall set the PDN type IE to IPv6.

- has been allocated an IPv6 address for this APN and received the ESM cause #52 "single address bearers only allowed", and is requesting an IPv4 address, shall set the PDN type IE to IPv4.

b) A UE, which is only IPv4 capable, shall set the PDN type IE to IPv4.

c) A UE, which is only IPv6 capable, shall set the PDN type IE to IPv6.

d) When the IP version capability of the UE is unknown in the UE (as in the case when the MT and TE are separated and the capability of the TE is not known in the MT), the UE shall set the PDN type IE to IPv4v6.

If the UE wants to use DHCPv4 for IPv4 address assignment, it shall indicate that to the network within the Protocol Configuration Options IE in the PDN CONNECTIVITY REQUEST.

If the UE wants to get PDN connectivity for non-IP, the UE shall set the PDN type IE in the PDN CONNECTIVITY REQUEST message to "non IP". If the UE wants to get PDN connectivity for Ethernet, the UE shall set the PDN type IE in the PDN CONNECTIVITY REQUEST message to "Ethernet".

On receipt of the PDN CONNECTIVITY REQUEST message sent by the UE, the network when allocating an IP address shall take into account the PDN type IE, the operator policies of the home and visited network, and the user's subscription data and:

- if the UE requests for PDN type IPv4v6, but the subscription is limited to IPv4 only or IPv6 only for the requested APN, the network shall override the PDN type requested by the UE to be limited to a single address PDN type (IPv4 or IPv6). In the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message sent to the UE, the network shall set the PDN type value to either "IPv4" or "IPv6" and the ESM cause value to #50 "PDN type IPv4 only allowed", or #51 "PDN type IPv6 only allowed", respectively. The UE shall not subsequently initiate another UE requested PDN connectivity procedure to the same APN to obtain a PDN type different from the one allowed by the network until:

a) all EPS bearer contexts to the given APN are deactivated at the UE as a result of:

i) EPS bearer context synchronization during tracking area updating or service request procedure;

ii) an EPS bearer context deactivation procedure initiated by the network;

iii) a local EPS bearer context deactivation without NAS signalling as specified in subclause 6.4.4.6;

iv) a detach procedure; or

v) a tracking area updating procedure or service request procedure that is rejected with a cause which results in the UE entering state EMM-DEREGISTERED;

b) void;

NOTE 1: Request to send another PDN CONNECTIVITY REQUEST message with a specific PDN type has to come from upper layers.

- if the UE requests PDN type IPv4v6, but the PDN GW configuration dictates the use of IPv4 addressing only or IPv6 addressing only for this APN, the network shall override the PDN type requested by the UE to limit it to a single address PDN type (IPv4 or IPv6). In the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message sent to the UE, the network shall set the PDN type value to either "IPv4" or "IPv6" and the ESM cause value to #50 "PDN type IPv4 only allowed", or #51 "PDN type IPv6 only allowed", respectively. The UE shall not subsequently initiate another UE requested PDN connectivity procedure to the same APN to obtain a PDN type different from the one allowed by the network until:

a) all EPS bearer contexts to the given APN are deactivated at the UE and the network as a result of:

i) EPS bearer context synchronization during tracking area updating or service request procedure;

ii) an EPS bearer context deactivation procedure initiated by the network;

iii) a local EPS bearer context deactivation without NAS signalling as specified in subclause 6.4.4.6;

iv) a detach procedure; or

v) a tracking area updating procedure or service request procedure that is rejected with a cause which results in the UE entering state EMM-DEREGISTERED ;

b) void;

NOTE 2: Request to send another PDN CONNECTIVITY REQUEST message with a specific PDN type has to come from upper layers.

- if the UE requests PDN type IPv4v6, but the operator uses single addressing per bearer, e.g. due to interworking with nodes of earlier releases, the network shall override the PDN type requested by the UE to a single IP version only. In the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message sent to the UE, the network shall set the PDN type value to either "IPv4" or "IPv6" and the ESM cause value to #52 "single address bearers only allowed". The UE should subsequently request another PDN connection for the other IP version using the UE requested PDN connectivity procedure to the same APN with a single address PDN type (IPv4 or IPv6) other than the one already activated;

NOTE 3: If the MT and TE are separated, the UE might not be able to use ESM cause #52 "single address bearers only allowed" as a trigger for activating a second single-IP-stack EPS bearer context.

- if the network sets the PDN type to IPv4 or IPv4v6, the network shall include an IPv4 address in the PDN address information. In this case, if the IPv4 address is to be configured using DHCPv4, the network shall set the IPv4 address to 0.0.0.0; and

- if the network sets the PDN type to IPv6 or IPv4v6, the network shall include the interface identifier that the UE shall use for the link local address in the PDN address information.

The network shall include the PDN type and the PDN address information within the PDN address IE in the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message sent to the UE.

\* \* \* Next Change \* \* \* \*

#### 6.5.1.3 UE requested PDN connectivity procedure accepted by the network

Upon receipt of the PDN CONNECTIVITY REQUEST message, the MME checks whether the ESM information transfer flag is included. If the flag is included the MME waits for completion of the ESM information request procedure before proceeding with the PDN connectivity procedure. The MME then checks if connectivity with the requested PDN can be established. If no requested APN is included in the PDN CONNECTIVITY REQUEST message or the ESM INFORMATION RESPONSE message and the request type is different from "emergency" and from "handover of emergency bearer services" and from "RLOS", the MME shall use the default APN as the requested APN. If the request type is "emergency" or "handover of emergency bearer services", the MME shall use the APN configured for emergency bearer services or select the statically configured PDN GW for unauthenticated UEs, if applicable. If the request type is "RLOS", the MME shall use the APN configured for RLOS.

If the network receives a PDN CONNECTIVITY REQUEST message with the same combination of APN and PDN type as an already existing PDN connection, and multiple PDN connections for a given APN are allowed, the network retains the existing EPS bearer contexts for the PDN connection and proceeds with the requested PDN connectivity procedure.

If the lower layers provide a GW Transport Layer Address value identifying a L-GW together with the PDN CONNECTIVITY REQUEST message and a PDN connection is established as a LIPA PDN connection due to the PDN CONNECTIVITY REQUEST message, then the MME shall store the GW Transport Layer Address value as the P-GW address in the EPS bearer context of the LIPA PDN connection.

If the lower layers provide a SIPTO L-GW Transport Layer Address value identifying a L-GW together with the PDN CONNECTIVITY REQUEST message and a PDN connection is established as a SIPTO at the local network PDN connection due to the PDN CONNECTIVITY REQUEST message, then the MME shall store the SIPTO L-GW Transport Layer Address value as the P-GW address in the EPS bearer context of the SIPTO at the local network PDN connection.

If the lower layers provide a LHN-ID value together with the PDN CONNECTIVITY REQUEST message and a PDN connection is established as a SIPTO at the local network PDN connection due to the PDN CONNECTIVITY REQUEST message, then the MME shall store the LHN-ID value in the EPS bearer context of the SIPTO at the local network PDN connection.

NOTE 1: The receipt of a LHN-ID value during the establishment of the PDN connection, during tracking area updating procedure or during inter-MME handover can be used as an indication by the MME that the SIPTO at the local network PDN connection is established to a stand-alone GW (see 3GPP TS 23.401 [10]).

If connectivity with the requested PDN is accepted by the network, the MME shall initiate the default EPS bearer context activation procedure (see subclause 6.4.1).

If connectivity with the requested PDN is accepted and the network considers this PDN connection a LIPA PDN connection, then subject to operator policy the MME shall include in the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message the Connectivity type IE indicating "the PDN connection is considered a LIPA PDN connection".

If connectivity with the requested PDN is accepted, but with a restriction of IP version (i.e. both an IPv4 address and an IPv6 prefix is requested, but only one particular IP version, or only single IP version bearers are supported/allowed by the network), ESM cause #50 "PDN type IPv4 only allowed", #51 "PDN type IPv6 only allowed", or #52 "single address bearers only allowed", respectively, shall be included in the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message.

If connectivity with the requested PDN is accepted and the UE provided the Header compression configuration IE in the PDN CONNECTIVITY REQUEST message, the MME may include the Header compression configuration IE in the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message. Furthermore, if the MME decides that the associated PDN connection is only for control plane CIoT EPS optimization (see subclause 5.3.15), the MME shall include the Control plane only indication in the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message.

Upon receipt of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message, the UE shall stop timer T3482 and enter the state PROCEDURE TRANSACTION INACTIVE. The UE should ensure that the procedure transaction identity (PTI) assigned to this procedure is not released immediately. The way to achieve this is implementation dependent. While the PTI value is not released, the UE regards any received ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message with the same PTI value as a network retransmission (see subclause 7.3.1).

Upon receipt of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message with the Connectivity type IE indicating "the PDN connection is considered a LIPA PDN connection", the UE provides an indication to the upper layers that the connectivity is provided by a LIPA PDN connection.

Upon receipt of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message, if the 3GPP PS data off UE status is "activated", the UE behaves as described in subclause 6.3.10.

Upon receipt of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message, if the SCEF or P-GW indicates acceptance of use of Reliable Data Service to transfer data for the PDN connection, the UE behaves as described in subclause 6.3.11.

Upon receipt of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message, if an S-NSSAI and the PLMN ID that this S-NSSAI relates to are provided in the protocol configuration options IE or extended protocol configuration options IE, the UE shall delete the stored S-NSSAI, if any, and shall store the S-NSSAI provided in the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message and the associated PLMN ID along with the corresponding PDU session ID that the UE provided in the PDN CONNECTIVITY REQUEST message. The usage of the PDU session ID and the corresponding S-NSSAI with the associated PLMN ID is specified in 3GPP TS 24.501 [54].

Upon receipt of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message with a session-AMBR and QoS rule(s), which correspond to the default EPS bearer of the PDN connectivity being activated, in the protocol configuration options IE or the extended protocol configuration options IE, the UE stores the session-AMBR and QoS rule(s) for use during inter-system change from S1 mode to N1 mode.

If the UE requests the PDN type "IPv4v6", receives the selected PDN type set to "IPv4" and the ESM cause value #50 "PDN type IPv4 only allowed", the UE shall not automatically send another PDN CONNECTIVITY REQUEST message for "IPv6" to the same APN (or no APN, if no APN was indicated by the UE) and the PDN type "IPv6" until:

- the UE is registered to a new PLMN;

- the UE is switched off; or

- the USIM is removed.

If the UE requests the PDN type "IPv4v6", receives the selected PDN type set to "IPv6" and the ESM cause value #51 "PDN type IPv6 only allowed", the UE shall not automatically send another PDN CONNECTIVITY REQUEST message for "IPv4" to the same APN (or no APN, if no APN was indicated by the UE) and the PDN type "IPv4" until:

- the UE is registered to a new PLMN;

- the UE is switched off; or

- the USIM is removed.

NOTE 2: For the ESM cause values #50 "PDN type IPv4 only allowed" and #51 "PDN type IPv6 only allowed", re-attempt in A/Gb, Iu, or N1 mode for the same APN (or no APN, if no APN was indicated by the UE) using the same PDN type is not allowed and only the PDN type indicated by the network is allowed.

\* \* \* Next Change \* \* \* \*

##### 6.5.1.4.3 Handling of network rejection due to ESM cause other than ESM cause #26

If the ESM cause value is different from #26 "insufficient resources", #50 "PDN type IPv4 only allowed", #51 "PDN type IPv6 only allowed", #54 "PDN connection does not exist", #57 "PDN type IPv4v6 only allowed", #58 "PDN type non IP only allowed", #61 "PDN type Ethernet only allowed", #65 "maximum number of EPS bearers reached", and #66 "requested APN not supported in current RAT and PLMN combination", and the Back-off timer value IE is included, the UE shall behave as follows:

1) if the PDN CONNECTIVITY REQUEST message was sent standalone, the UE shall take different actions depending on the timer value received in the Back-off timer value IE (if the UE is a UE configured to use AC11 – 15 in selected PLMN, exceptions are specified in subclause 6.3.6):

i) if the timer value indicates neither zero nor deactivated, the UE shall start the back-off timer with the value provided in the Back-off timer value IE for the PDN connectivity procedure and PLMN and APN combination and

- shall not send another PDN CONNECTIVITY REQUEST message in the PLMN for the same APN that was sent by the UE, until the back-off timer expires, the UE is switched off or the USIM is removed; and

- shall not send another PDN CONNECTIVITY REQUEST message in the PLMN without an APN and with request type different from "emergency" and from "handover of emergency bearer services" if no APN was included in the PDN CONNECTIVITY REQUEST message, until the back-off timer expires, the UE is switched off or the USIM is removed;

ii) if the timer value indicates that this timer is deactivated, the UE:

- shall not send another PDN CONNECTIVITY REQUEST message in the PLMN for the same APN until the UE is switched off or the USIM is removed; and

- shall not send another PDN CONNECTIVITY REQUEST message in the PLMN without an APN and with request type different from "emergency" and from "handover of emergency bearer services" if no APN was included in the PDN CONNECTIVITY REQUEST message, until the UE is switched off or the USIM is removed; and

iii) if the timer value indicates zero, the UE:

- may send another PDN CONNECTIVITY REQUEST message in the PLMN for the same APN; and

- may send another PDN CONNECTIVITY REQUEST message in the PLMN without an APN; and

2) if the PDN CONNECTIVITY REQUEST message was sent together with an ATTACH REQUEST, the UE shall take different actions depending on the timer value received in the Back-off timer value IE and on the integrity protection of the ATTACH REJECT message (if the UE is a UE configured to use AC11 – 15 in selected PLMN, exceptions are specified in subclause 6.3.6):

i) if the ATTACH REJECT message is not integrity protected, the UE shall start the back-off timer with a random value from a default range specified in table 11.2.3(see 3GPP TS 24.008 [13]), and:

a) shall not initiate a new attach procedure or send another PDN CONNECTIVITY REQUEST message in the PLMN with the same APN that was sent by the UE, until the back-off timer expires, the UE is switched off or the USIM is removed; and

b) shall not initiate a new attach procedure or send another PDN CONNECTIVITY REQUEST message in the PLMN without an APN and with request type different from "emergency" and from "handover of emergency bearer services", if the UE did not provide any APN during the attach procedure and the request type was different from "emergency", until the back-off timer expires, the UE is switched off or the USIM is removed; and

ii) if the ATTACH REJECT message is integrity protected, the UE shall proceed as follows:

a) if the timer value indicates neither zero nor deactivated, the UE shall start the back-off timer with the value provided in the Back-off timer value IE for the PDN connectivity procedure and PLMN and APN combination and:

- shall not initiate a new attach procedure or send another PDN CONNECTIVITY REQUEST message in the PLMN with the same APN that was sent by the UE, until the back-off timer expires, the UE is switched off or the USIM is removed; and

- shall not initiate a new attach procedure or send another PDN CONNECTIVITY REQUEST message in the PLMN without an APN and with request type different from "emergency" and from "handover of emergency bearer services", if the UE did not provide any APN during the attach procedure and the request type was different from "emergency" and from "handover of emergency bearer services", until the back-off timer expires, the UE is switched off or the USIM is removed;

b) if the timer value indicates that this timer is deactivated, the UE:

- shall not initiate a new attach procedure or send another PDN CONNECTIVITY REQUEST message in the PLMN with the same APN that was sent by the UE, until the UE is switched off or the USIM is removed; and

- shall not initiate a new attach procedure or send another PDN CONNECTIVITY REQUEST message in the PLMN without an APN and with request type different from "emergency" and from "handover of emergency bearer services", if the UE did not provide any APN during the attach procedure and the request type was different from "emergency" and from "handover of emergency bearer services", until the UE is switched off or the USIM is removed; and

c) if the timer value indicates that this timer is zero, the UE shall proceed as specified in subclause 5.5.1.2.6 item d.

If the Back-off timer value IE is not included and the PDN CONNECTIVITY REQUEST was sent standalone, then the UE shall ignore the Re-attempt indicator IE provided by the network in PDN CONNECTIVITY REJECT, if any.

1) Additionally, if the ESM cause value is #8 "operator determined barring", #27 "missing or unknown APN", #32 "service option not supported", or #33 "requested service option not subscribed", the UE shall proceed as follows:

- if the UE is registered in the HPLMN or in a PLMN that is within the EHPLMN list (if the EHPLMN list is present), the UE shall behave as described above in the present subclause, using the configured SM\_RetryWaitTime value as specified in 3GPP TS 24.368 [15A] or in USIM file NASCONFIG as specified in 3GPP TS 31.102 [17], if available, as back-off timer value; and

- otherwise, if the UE is not registered in its HPLMN or in a PLMN that is within the EHPLMN list (if the EHPLMN list is present), or if the SM\_RetryWaitTime value is not configured, the UE shall behave as described above in the present subclause, using the default value of 12 minutes for the back-off timer.

2) For ESM cause values different from #8 "operator determined barring", #27 "missing or unknown APN", #32 "service option not supported", or #33 "requested service option not subscribed", the UE behaviour regarding the start of a back-off timer is unspecified.

The UE shall not stop any back-off timer upon a PLMN change or inter-system change. If the network indicates that a back-off timer for the PDN connectivity procedure and PLMN and APN combination is deactivated, then it remains deactivated upon a PLMN change or inter-system change.

NOTE 1: This means the back-off timer can still be running or be deactivated for the given ESM procedure and PLMN and APN combination when the UE returns to the PLMN or when it performs inter-system change back from A/Gb or Iu mode or N1 mode to S1 mode. Thus the UE can still be prevented from sending another PDN CONNECTIVITY REQUEST message in the PLMN for the same APN.

If the Back-off timer value IE is not included and the PDN CONNECTIVITY REQUEST was sent together with an ATTACH REQUEST, the UE shall ignore the Re-attempt indicator IE provided by the network in PDN CONNECTIVITY REJECT, if any, and proceed as specified in subclause 5.5.1.2.6, item d.

If the back-off timer is started upon receipt of a PDN CONNECTIVITY REJECT (i.e. the timer value was provided by the network, a configured value is available or the default value is used as explained above) or the back-off timer is deactivated, the UE behaves as follows:

1) after a PLMN change the UE may send a PDN CONNECTIVITY REQUEST message for the same APN in the new PLMN, if the back-off timer is not running and is not deactivated for the PDN connectivity procedure and the combination of new PLMN and APN;

Furthermore as an implementation option, for the ESM cause values #8 "operator determined barring", #27 "missing or unknown APN", #32 "service option not supported" or #33 "requested service option not subscribed", if the network does not include a Re-attempt indicator IE, the UE may decide not to automatically send another PDN CONNECTIVITY REQUEST message for the same APN that was sent by the UE using the same PDN type, or the UE may decide not to automatically send another PDN CONNECTIVITY REQUEST message included in an ATTACH REQUEST message without an APN using the same PDN type if the UE did not provide any APN in the PDN connectivity procedure, if the UE is registered to a new PLMN which is in the list of equivalent PLMNs.

2) if the network does not include the Re-attempt indicator IE to indicate whether re-attempt in A/Gb or Iu mode or N1 mode is allowed, or the UE ignores the Re-attempt indicator IE, e.g. because the Back-off timer value IE is not included, then:

- if the UE is registered in its HPLMN or in a PLMN that is within the EHPLMN list (if the EHPLMN list is present), the UE shall apply the configured SM\_RetryAtRATChange value as specified in 3GPP TS 24.368 [15A] or in USIM file NASCONFIG as specified in 3GPP TS 31.102 [17], if available, to determine whether the UE may attempt a PDP context activation procedure for the same PLMN and APN combination in A/Gb or Iu mode or a PDU session establishment procedure for the same PLMN and APN combination in N1 mode; and

- if the UE is not registered in its HPLMN or in a PLMN that is within the EHPLMN list (if the EHPLMN list is present), or if the NAS configuration MO as specified in 3GPP TS 24.368 [15A] is not available and the value for inter-system change is not configured in the USIM file NASCONFIG, then the UE behaviour regarding a PDP context activation procedure for the same PLMN and APN combination in A/Gb or Iu mode and a PDU session establishment procedure for the same PLMN and APN combination in N1 mode are unspecified; and

3) if the network includes the Re-attempt indicator IE indicating that re-attempt in an equivalent PLMN is not allowed, then depending on the timer value received in the Back-off timer value IE, for each combination of a PLMN from the equivalent PLMN list and the APN the UE shall start a back-off timer for the PDN connectivity procedure with the value provided by the network, or deactivate the respective back-off timer as follows:

- if the Re-attempt indicator IE additionally indicates that re-attempt in A/Gb or Iu mode or N1 mode is allowed, the UE shall start or deactivate the back-off timer for S1 mode only; and

- otherwise the UE shall start or deactivate the back-off timer for A/Gb, Iu, S1 and N1 mode.

If the back-off timer for a PLMN and APN combination was started or deactivated in A/Gb or Iu mode upon receipt of an ACTIVATE PDP CONTEXT REJECT message (see 3GPP TS 24.008 [13]) and the network indicated that re-attempt in S1 mode is allowed, then this back-off timer does not prevent the UE from sending a PDN CONNECTIVITY REQUEST message in this PLMN for the same APN after inter-system change to S1 mode. If the network indicated that re-attempt in S1 mode is not allowed, the UE shall not send any PDN CONNECTIVITY REQUEST message in this PLMN for the same APN after inter-system change to S1 mode until the timer expires, the UE is switched off or the USIM is removed.

If a back-off timer for a PLMN and APN combination, in combination with any S-NSSAI or without S-NSSAI (see 3GPP TS 24.501 [54]) was started or deactivated in N1 mode upon receipt of a PDU SESSION ESTABLISHMENT REJECT message (see 3GPP TS 24.501 [54]) and the network indicated that re-attempt in S1 mode is allowed, then this back-off timer does not prevent the UE from sending a PDN CONNECTIVITY REQUEST message in this PLMN for the same APN after inter-system change to S1 mode. If the network indicated that re-attempt in S1 mode is not allowed, the UE shall not send any PDN CONNECTIVITY REQUEST message in this PLMN for the same APN after inter-system change to S1 mode until the timer expires, the UE is switched off or the USIM is removed. If more than one back-off timers for the same PLMN and APN combination was started in N1 mode with an indication from the network that re-attempt in S1 mode is not allowed and no back-off timer for the same PLMN and APN combination was deactivated in N1 mode, the UE shall not send any PDN CONNECTIVITY REQUEST message in this PLMN for the same APN after inter-system change to S1 mode until all timers have expired. If at least one back-off timer for the same PLMN and APN combination was deactivated in N1 mode, the UE shall not send any PDN CONNECTIVITY REQUEST message in this PLMN for the same APN until the UE is switched off or the USIM is removed.

NOTE 2: The back-off timer is used to describe a logical model of the required UE behaviour. This model does not imply any specific implementation, e.g. as a timer or timestamp.

NOTE 3: Reference to back-off timer in this section can either refer to use of timer T3396 or to use of a different packet system specific timer within the UE. Whether the UE uses T3396 as a back-off timer or it uses different packet system specific timers as back-off timers is left up to UE implementation. This back-off timer is stopped when the UE is switched off or the USIM is removed.

When the back-off timer is running or the timer is deactivated, the UE is allowed to initiate an attach procedure or PDN connectivity procedure if the procedure is for emergency bearer services.

If the ESM cause value is #50 "PDN type IPv4 only allowed", #51 "PDN type IPv6 only allowed", #57 "PDN type IPv4v6 only allowed", #58 "PDN type non IP only allowed" or #61 "PDN type Ethernet only allowed", the UE shall ignore the Back-off timer value IE provided by the network, if any. The UE shall not automatically send another PDN CONNECTIVITY REQUEST message for the same APN that was sent by the UE to obtain a PDN type different from the one allowed by the network until any of the following conditions is fulfilled:

- the UE is registered to a new PLMN, and either the network did not include a Re-attempt indicator IE in the PDN CONNECTIVITY REJECT message or the Re-attempt indicator IE included in the message indicated that re-attempt in an equivalent PLMN is allowed;

- the UE is registered to a new PLMN which was not in the list of equivalent PLMNs at the time when the PDN CONNECTIVITY REJECT message was received;

- the UE is switched off; or

- the USIM is removed.

For the ESM cause values #50 "PDN type IPv4 only allowed", #51 "PDN type IPv6 only allowed", #57 "PDN type IPv4v6 only allowed", #58 "PDN type non IP only allowed" and #61 "PDN type Ethernet only allowed", the UE shall ignore the value of the RATC bit in the Re-attempt indicator IE provided by the network, if any.

NOTE 4: For the ESM cause values #50 "PDN type IPv4 only allowed", #51 "PDN type IPv6 only allowed", #57 "PDN type IPv4v6 only allowed", #58 "PDN type non IP only allowed" and #61 "PDN type Ethernet only allowed", re-attempt in A/Gb, Iu, or N1 mode for the same APN (or no APN, if no APN was indicated by the UE) using the same PDN type is not allowed and only the PDN type indicated by the network is allowed.

Furthermore as an implementation option, for the SM cause values #50 "PDN type IPv4 only allowed", #51 "PDN type IPv6 only allowed", #57 "PDN type IPv4v6 only allowed", #58 "PDN type non IP only allowed" and #61 "PDN type Ethernet only allowed", if the network does not include a Re-attempt indicator IE the UE may decide not to automatically send another PDN CONNECTIVITY REQUEST message for the same APN that was sent by the UE using the same PDN type, if the UE is registered to a new PLMN which is in the list of equivalent PLMNs.

NOTE 5: Request to send another PDN CONNECTIVITY REQUEST message with a specific PDN type has to come from upper layers.

If the ESM cause value is #65 "maximum number of EPS bearers reached", the UE shall determine the PLMN's maximum number of EPS bearer contexts in S1 mode (see subclause 6.5.0) as the number of active EPS bearer contexts it has. The UE shall ignore the Back-off timer value IE and Re-attempt indicator IE provided by the network, if any.

NOTE 6: In some situations, when attempting to establish multiple EPS bearer contexts, the number of active EPS bearer contexts that the UE has when ESM cause #65 is received is not equal to the maximum number of EPS bearer contexts reached in the network.

NOTE 7: When the network supports emergency bearer services, it is not expected that ESM cause #65 is returned by the network when the UE requests a PDN connection for emergency bearer services.

The PLMN's maximum number of EPS bearer contexts in S1 mode applies to the PLMN in which the ESM cause #65 "maximum number of EPS bearers reached" is received. When the UE is switched off, when the USIM is removed, or when there is a change in the value indicated by the network in the 15 bearers bit of the EPS network feature support IE, the UE shall clear all previous determinations representing PLMNs maximum number of EPS bearer contexts in S1 mode. Upon successful registration with a new PLMN, the UE may clear previous determinations representing any PLMN's maximum number(s) of EPS bearer contexts in S1 mode.

If the ESM cause value is #66 "requested APN not supported in current RAT and PLMN combination", the UE shall take different actions depending on the Back-off timer value IE and the Re-attempt indicator IE optionally included:

1) If the PDN CONNECTIVITY REQUEST message was sent standalone, the Back-off timer value IE is not included, and either the Re-attempt indicator IE is not included or the Re-attempt indicator IE is included indicating that re-attempt in an equivalent PLMN is allowed, the UE shall not send another PDN CONNECTIVITY REQUEST message for the same APN in the current PLMN in S1 mode until the UE is switched off or the USIM is removed;

2) if the PDN CONNECTIVITY REQUEST message was sent standalone, the Back-off timer value IE is not included, and the Re-attempt indicator IE is included and indicates that re-attempt in an equivalent PLMN is not allowed, the UE shall not send a PDN CONNECTIVITY REQUEST message for the same APN in any PLMN in the list of equivalent PLMNs in S1 mode until the UE is switched off or the USIM is removed;

3) if the PDN CONNECTIVITY REQUEST message was sent standalone and the Back-off timer value IE is included, the UE shall take different actions depending on the timer value received in the Back-off timer value IE (if the UE is a UE configured to use AC11 – 15 in selected PLMN, exceptions are specified in subclause 6.3.6):

i) if the timer value indicates neither zero nor deactivated, the UE shall start the back-off timer with the value provided in the Back-off timer value IE for the PLMN and APN combination and shall not send another PDN CONNECTIVITY REQUEST for the same APN in the current PLMN in S1 mode until the back-off timer expires, the UE is switched off or the USIM is removed;

ii) if the timer value indicates that this timer is deactivated, the UE shall not send another PDN CONNECTIVITY REQUEST message for the same APN in the current PLMN in S1 mode until the UE is switched off or the USIM is removed; and

iii) if the timer value indicates that this timer is zero, the UE may send a PDN CONNECTIVITY REQUEST message for the same APN in the current PLMN; and

4) if the PDN CONNECTIVITY REQUEST message was sent together with an ATTACH REQUEST, the UE shall take different actions depending on the integrity protection of the ATTACH REJECT message (if the UE is a UE configured to use AC11 – 15 in selected PLMN, exceptions are specified in subclause 6.3.6):

i) if the ATTACH REJECT message is not integrity protected, regardless whether the Back-off timer IE is included, the UE shall start the back-off timer with a random value from a default range specified in table 11.2.3(see 3GPP TS 24.008 [13]), and shall not initiate a new attach procedure or send another PDN CONNECTIVITY REQUEST message in the current PLMN in S1 mode with the same APN that was sent by the UE, until the back-off timer expires, the UE is switched off or the USIM is removed; and

ii) if the ATTACH REJECT message is integrity protected, the UE shall proceed as follows:

a) if the Back-off timer value IE is included and the timer value indicates neither zero nor deactivated, the UE shall start the back-off timer with the value provided in the Back-off timer value IE for the PDN connectivity procedure and PLMN and APN combination and shall not initiate a new attach procedure or send another PDN CONNECTIVITY REQUEST message in the current PLMN in S1 mode with the same APN that was sent by the UE, until the back-off timer expires, the UE is switched off or the USIM is removed;

b) if the Back-off timer value IE is included and the timer value indicates that this timer is deactivated, the UE shall not initiate a new attach procedure or send another PDN CONNECTIVITY REQUEST message in the current PLMN in S1 mode with the same APN that was sent by the UE, until the UE is switched off or the USIM is removed;

c) if the Back-off timer value IE is included and the timer value indicates that this timer is zero, the UE shall proceed as specified in subclause 5.5.1.2.6 item d;

d) if the Back-off timer value IE is not included, and either the Re-attempt indicator IE is not included or the Re-attempt indicator IE is included indicating that re-attempt in an equivalent PLMN is allowed, the UE shall not initiate a new attach procedure or send another PDN CONNECTIVITY REQUEST message for the same APN in the current PLMN in S1 mode until the UE is switched off or the USIM is removed; and

e) if the Back-off timer value IE is not included, and the Re-attempt indicator IE is included and indicates that re-attempt in an equivalent PLMN is not allowed, the UE shall not initiate a new attach procedure or send a PDN CONNECTIVITY REQUEST message for the same APN in any PLMN in the list of equivalent PLMNs in S1 mode until the UE is switched off or the USIM is removed.

NOTE 8: Receiving ESM cause value #66 during an attach procedure without APN is not expected and the UE behaviour is implementation specific.

If the network includes the Re-attempt indicator IE indicating that re-attempt in an equivalent PLMN is not allowed, then

- for cases 3.i, 4.i and 4.ii.a the UE shall additionally start a back-off timer with the value provided in the Back-off timer value IE for the PDN connectivity procedure for each combination of a PLMN from the equivalent PLMN list and the APN; and

- for cases 3.ii and 4.ii.b the UE shall deactivate the respective back-off timers for the PDN connectivity procedure for each combination of a PLMN from the equivalent PLMN list and the APN.

For the ESM cause value #66 "requested APN not supported in current RAT and PLMN combination" the UE shall ignore the value of the RATC bit in the Re-attempt indicator IE provided by the network, if any.

As an implementation option, for cases 1, 3.i, 3.ii, 4.iv, 4.v.a and 4.v.b, if the Re-attempt indicator IE is not included, the UE may decide not to automatically send another PDN CONNECTIVITY REQUEST message for the same APN in a PLMN which is in the list of equivalent PLMNs.

If the ESM cause value is #54 "PDN connection does not exist", the UE shall ignore the Back-off timer value IE and Re-attempt indicator IE provided by the network, if any, and take different actions as follows:

- if the PDN CONNECTIVITY REQUEST message was sent standalone, the UE shall set the request type to "initial request" in the subsequent PDN CONNECTIVITY REQUEST message to establish a PDN connectivity to the same APN;

- if the PDN CONNECTIVITY REQUEST message was sent together with an ATTACH REQUEST message, the UE shall set the request type to "initial request" in the PDN CONNECTIVITY REQUEST message which is included in the subsequent ATTACH REQUEST message to establish a PDN connectivity to the same APN.

NOTE 9: User interaction is necessary in some cases when the UE cannot re-activate the EPS bearer context(s) automatically.

\* \* \* End of Change \* \* \* \*