**3GPP TSG-CT WG1 Meeting #141eC1-232142**

**Online 17– 21 April 2023**

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
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|  |  | **CR** |  | **rev** |  | **Current version:** |  |  |
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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 | **X** |

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|  |
| ***Title:***  | Authorization of A2X Direct C2 Communications in EPS |
|  |  |
| ***Source to WG:*** | , Ericsson |
| ***Source to TSG:*** |  |
|  |  |
| ***Work item code:*** |  |  | ***Date:*** |  |
|  |  |  |  |  |
| ***Category:*** |  |  | ***Release:*** |  |
|  | *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 canbe 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-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
|  |  |
| ***Reason for change:*** | Clause 5.4.3 in 3GPP TS 23.256 states the following:*In EPS, the following procedure is used to request C2 authorization for Direct C2 Communication to the USS:**-The procedure for UE requested PDN connectivity for C2 authorization as specified in clause 5.2.5.3.1 with the following enhancements:* *-In step 1: When the UAV needs to establish a direct PC5 link required for connectivity to UAV-C (i.e. Direct C2 Communication), the C2 Aviation Payload sent by the UAV includes an indication that the authorization is also for Direct C2 Communication. In addition, the UAV includes the direct C2 pairing information (if available) in the C2 Aviation Payload.* *-In step 4: If the authorization request for Direct C2 Communication was included in step 1 and the C2 authorization is successful, the USS may include direct C2 pairing information containing the UAV-C's Application Layer ID in the C2 Authorization Payload which is further forwarded to the UE in the Naf\_Authentication\_AuthenticateAuthorize response.*The above indicates that there is a need to update the “UE requested PDN connectivity procedure initiation” and “EPS bearer context modification accepted by the UE” clauses to support direct C2 authorization. |
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| ***Summary of change:*** | 1. Update of “UE requested PDN connectivity procedure initiation” and “EPS bearer context modification accepted by the UE” clauses to support direct C2 communication authorization.
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| ***Consequences if not approved:*** | Authorization of direct C2 communicaiton is not possible in EPS. |
|  |  |
| ***Clauses affected:*** | 3.1, 6.3.13.3, 6.4.3.3, 6.5.1.2 |
|  |  |
|  | **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 \*\*\*\*\*

## 3.1 Definitions

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

The term "mobile station" (MS) in the present document is synonymous with the term "user equipment" (UE) as defined in 3GPP TR 21.905 [1].

**1x CS fallback capable UE:** A UE that uses a CS infrastructure for a voice call and other CS-domain services by falling back to cdma2000® 1x access network if the UE is served by E‑UTRAN when a CS service is requested.

**Aggregate maximum bit rate:** The maximum bit rate that limits the aggregate bit rate of a set of non-GBR bearers of a UE. Definition derived from 3GPP TS 23.401 [10].

**APN based congestion control:** Congestion control in session management where the network can reject session management requests from UEs or deactivate PDN connections when the associated APN is congested.

**Attached for emergency bearer services:** A UE is attached for emergency bearer services if it has only a PDN connection for emergency bearer services established.

**Attached for access to RLOS:** A UE is attached for access to RLOS if the UE requested access to RLOS during the attach procedure and has a PDN connection for RLOS established after completion of attach procedure.

**Current TAI:** A TAI of a selected PLMN broadcast in the cell on which the UE is camping. If the cell is a satellite E-UTRA cell broadcasting multiple TAIs of the selected PLMN, the UE NAS layer selects the TAI from these multiple TAIs as specified in clause 5.3.xx.

NOTE 1: For the purpose of this definition, the selected PLMN can either be the registered PLMN or a PLMN selected according to PLMN selection rules as specified in 3GPP TS 23.122 [5].

**Attached for EPS services with CP-CIoT EPS optimization:** A UE supporting CIoT EPS optimizations is attached for EPS services, and control plane CIoT EPS optimization along with one or more other CIoT EPS optimizations have been accepted by the network.

**Attached for EPS services with User plane CIoT EPS optimization:** A UE supporting CIoT EPS optimizations is attached for EPS services, and user plane CIoT EPS optimization along with one or more other CIoT EPS optimizations have been accepted by the network.

**Attached for EPS services with CIoT EPS optimization:** A UE is attached for EPS services with CP-CIoT EPS optimization or attached for EPS services with user plane CIoT EPS optimization.

**Chosen PLMN:** The same as selected PLMN as specified in 3GPP TS 23.122 [6].

**Control plane CIoT EPS optimization:** signalling optimizations to enable efficient transport of user data (IP, non-IP, Ethernet or SMS) over control plane via the MME including optional header compression of IP data.

**CS fallback cancellation request:** A request received from the MM sublayer to cancel a mobile originating CS fallback.

**CS fallback capable UE:** A UE that uses a CS infrastructure for a voice call and other CS-domain services by falling back to A/Gb or Iu mode if the UE is served by E‑UTRAN when a CS service is requested.

**CSG cell:** A cell in which only members of the CSG can get normal service. Depending on local regulation, the CSG cell can provide emergency bearer services also to subscribers who are not member of the CSG. Definition derived from 3GPP TS 23.401 [10].

**CSG ID:** A CSG ID is a unique identifier within the scope of one PLMN defined in 3GPP TS 23.003 [2] which identifies a Closed Subscriber Group (CSG) in the PLMN associated with a cell or group of cells to which access is restricted to members of the CSG.

**CSG selection**: A UE supporting CSG selection selects CSG cell either automatically based on the list of allowed CSG identities or manually based on user selection of CSG on indication of list of available CSGs. Definition derived from 3GPP TS 23.122 [6].

NOTE 1: Void.

**Dedicated bearer:** An EPS bearer that is associated with uplink packet filters in the UE and downlink packet filters in the PDN GW where the filters only match certain packets. Definition derived from 3GPP TS 23.401 [10].

**Default bearer:** An EPS bearer that gets established with every new PDN connection. Its context remains established throughout the lifetime of that PDN connection. A default EPS bearer is a non-GBR bearer. Definition derived from 3GPP TS 23.401 [10].

**Emergency EPS bearer context:** A default EPS bearer context activated with request type "emergency" or "handover of emergency bearer services", or any dedicated EPS bearer context associated to this default EPS bearer context.

**EMM context:** An EMM context is established in the UE and the MME when an attach procedure is successfully completed.

**EMM-CONNECTED mode:** A UE is in EMM-CONNECTED mode when a NAS signalling connection between UE and network is established or after indication from the lower layers that the RRC connection has been resumed when the UE was in EMM-IDLE mode with suspend indication. The term EMM-CONNECTED mode used in the present document corresponds to the term ECM-CONNECTED state used in 3GPP TS 23.401 [10].

**EMM-IDLE mode:** A UE is in EMM-IDLE mode when no NAS signalling connection between UE and network exists or when RRC connection suspend has been indicated by lower layers. The term EMM-IDLE mode used in the present document corresponds to the term ECM-IDLE state used in 3GPP TS 23.401 [10].

**EPS security context:** In the present specification, EPS security context is used as a synonym for EPS NAS security context specified in 3GPP TS 33.401 [19].

**EPS services:** Services provided by PS domain. Within the context of this specification, EPS services is used as a synonym for GPRS services in 3GPP TS 24.008 [13].

**Evolved packet core network:** The successor to the 3GPP Release 7 packet-switched core network, developed by 3GPP within the framework of the 3GPP System Architecture Evolution (SAE).

**Evolved packet system:** The evolved packet system (EPS) or evolved 3GPP packet-switched domain consists of the evolved packet core network and the evolved universal terrestrial radio access network. Definition derived from 3GPP TS 23.401 [10].

**GBR bearer:** An EPS bearer that uses dedicated network resources related to a guaranteed bit rate (GBR) value, which are permanently allocated at EPS bearer establishment/modification. Definition derived from 3GPP TS 23.401 [10].

**General NAS level mobility management congestion control:** The type of congestion control that is applied at a general overload or congestion situation in the network, e.g. lack of processing resources.

**Group specific session management congestion control:** Type of congestion control at session management level that is applied to reject session management requests from UEs belonging to a particular group when one or more group congestion criteria as specified in 3GPP TS 23.401 [10] are met.

**Highest ranked ACDC category: The** ACDC category with the lowest value as defined in 3GPP TS 24.105 [35].

**Initial NAS message:** A NAS message is considered as an initial NAS message, if this NAS message can trigger the establishment of a NAS signalling connection. For instance, the ATTACH REQUEST message is an initial NAS message.

**In NB-S1 mode:** Indicates this paragraph applies only to a system which operates in NB-S1 mode. For a multi-access system this case applies if the current serving radio access network or the current serving satellite access network provides access to network services via E-UTRA by NB-IoT (see 3GPP TS 36.300 [20], 3GPP TS 36.331 [22], 3GPP TS 36.306 [44]).

**In WB-S1 mode:** Indicates this paragraph applies only to a system which operates in WB-S1 mode. For a multi-access system this case applies if the system operates in S1 mode, but not in NB-S1 mode. WB-S1 mode also includes satellite access.

**In WB-S1/CE mode:** Indicates this paragraph applies only when a UE, which is a CE mode B capable UE (see 3GPP TS 36.306 [44]), is operating in CE mode A or B in WB-S1 mode.

**IPv4v6 capability:** Capability of the IP stack associated with a UE to support a dual stack configuration with both an IPv4 address and an IPv6 address allocated.

**Kilobit:** 1000 bits.

**Last Visited Registered TAI:** A TAI which is contained in the TAI list that the UE registered to the network and which identifies the tracking area last visited by the UE. If the cell is a satellite cell broadcasting multiple TAIs, a TAI which is contained in the TAI list that the UE registered to the network and last selected by the UE as the current TAI.

**Linked Bearer Identity:** This identity indicates to which default bearer the additional bearer resource is linked.

**LIPA PDN connection:** A PDN connection, for which the default EPS bearer context or default PDP context was activated with an APN authorized to use LIPA. The network authorizes an APN for using LIPA based on the subscription profile (see 3GPP TS 29.272 [16C]) and subsequently the network considers this PDN connection a LIPA PDN connection.

**Lower layer failure**: A failure reported by the AS to the NAS that cannot be corrected on AS level. When the AS indicates a lower layer failure to NAS, the NAS signalling connection is not available.

**Mapped EPS security context:** A mapped security context to be used in EPS. Definition derived from 3GPP TS 33.401 [19].

**Mapped GUTI:** A GUTI which is mapped from a P-TMSI and an RAI allocated previously by an SGSN or a 5G-GUTI previously allocated by an AMF. Mapping rules are defined in 3GPP TS 23.003 [2]. Definition derived from 3GPP TS 23.401 [10].

**Megabit:** 1,000,000 bits.

**Message header:** A standard L3 message header as defined in 3GPP TS 24.007 [12].

**MME area:** An area containing tracking areas served by an MME.

**MO MMTEL voice call is started**: the MO-MMTEL-voice-started indication was received from upper layers (see 3GPP TS 24.173 [13E]) and after reception of the MO-MMTEL-voice-started indication, the MO-MMTEL-voice-ended indication has not been received.

**MO MMTEL video call is started**: the MO-MMTEL-video-started indication was received from upper layers (see 3GPP TS 24.173 [13E]) and after reception of the MO-MMTEL-video-started indication, the MO-MMTEL-video-ended indication has not been received.

**MT MMTEL voice call is started**: the MT-MMTEL-voice-started indication was received from upper layers (see 3GPP TS 24.173 [13E]) and after reception of the MT-MMTEL-voice-started indication, the MT-MMTEL-voice-ended indication has not been received.

**MT MMTEL video call is started**: the MT-MMTEL-video-started indication was received from upper layers (see 3GPP TS 24.173 [13E]) and after reception of the MT-MMTEL-video-started indication, the MT-MMTEL-video-ended indication has not been received.**MO SMSoIP is started**: the MO-SMSoIP-attempt-started indication was received from upper layers (see 3GPP TS 24.341 [15D]) and after reception of the MO-SMSoIP-attempt-started indication, the MO-SMSoIP-attempt-ended indication has not been received.

**MT SMSoIP is started**: the MT-SMSoIP-attempt-started indication was received from upper layers (see 3GPP TS 24.341 [15D]) and after reception of the MT-SMSoIP-attempt-started indication, the MT-SMSoIP-attempt-ended indication has not been received.

**MUSIM UE:** A UE with multiple valid USIMs, capable of initiating and maintaining simultaneous separate registration states with PLMN(s) using identities and credentials associated with those USIMs and supporting one or more of the NAS signalling connection release, the paging indication for voice services, the reject paging request, the paging restriction and the paging timing collision control.

**NAS level mobility management congestion control:** Congestion control mechanism in the network in mobility management. "NAS level mobility management congestion control" consists of "subscribed APN based congestion control" and "general NAS level mobility management congestion control".

**NAS signalling connection:** A peer to peer S1 mode connection between UE and MME. A NAS signalling connection consists of the concatenation of an RRC connection via the "LTE-Uu" interface and an S1AP connection via the S1 interface. Additionally, for the purpose of optimized handover or idle mode mobility from cdma2000® HRPD access to E‑UTRAN (see 3GPP TS 23.402 [11]), the NAS signalling connection can consist of a concatenation of an S101‑AP connection and a signalling tunnel over a cdma2000® HRPD access network.

NOTE 2: cdma2000® is a registered trademark of the Telecommunications Industry Association (TIA-USA).

**NAS signalling connection recovery**: A mechanism initiated by the NAS to restore the NAS signalling connection on indication of "RRC connection failure" by the lower layers.

**Native GUTI:** A GUTI previously allocated by an MME. Definition derived from 3GPP TS 23.401 [10].

**Non-access stratum protocols:** The protocols between UE and MSC or SGSN that are not terminated in the UTRAN, and the protocols between UE and MME that are not terminated in the E-UTRAN. Definition derived from 3GPP TR 21.905 [1].

**Non-emergency EPS bearer context:** Any EPS bearer context which is not an emergency EPS bearer context.

**Non-EPS services:** Services provided by CS domain. Within the context of this specification, non-EPS services is used as a synonym for non-GPRS services in 3GPP TS 24.008 [13]. A UE which camps on E-UTRAN can attach to both EPS services and non-EPS services.

**Non-GBR bearer:** An EPS bearer that uses network resources that are not related to a guaranteed bit rate (GBR) value. Definition derived from 3GPP TS 23.401 [10].

**PDN address:** An IP address assigned to the UE by the Packet Data Network Gateway (PDN GW).

**PDN connection for emergency bearer services:** A PDN connection with an emergency EPS bearer context or with a default PDP context activated with request type "emergency" or "handover of emergency bearer services".

**PDN connection for RLOS:** A PDN connection for which the default EPS bearer context was activated with request type "RLOS".

**Plain NAS message:** A NAS message with a header including neither a message authentication code nor a sequence number.

**Persistent EPS bearer context:** either a non-emergency EPS bearer context representing a GBR bearer with QoS equivalent to QoS of teleservice 11 and where there is a radio bearer associated with that context, or an emergency EPS bearer context where there is a radio bearer associated with that context.

NOTE 3: An example of a persistent EPS bearer context is a non-emergency EPS bearer context with QCI = 1 where there is a radio bearer associated with that context.

**Procedure Transaction Identity:** An identity which is dynamically allocated by the UE for the UE requested ESM procedures. The procedure transaction identity is released when the procedure is completed.

**RAT-related TMSI:** When the UE is camping on an E-UTRAN cell, the RAT-related TMSI is the GUTI; when it is camping on a GERAN or UTRAN cell, the RAT-related TMSI is the P-TMSI.

**Registered PLMN**: The PLMN on which the UE is registered. The identity of the registered PLMN is provided to the UE within the GUTI.

**Relay node:** A network element in the E-UTRAN, wirelessly connected to an eNode B and providing relaying function to UEs served by the E-UTRAN. Definition derived from 3GPP TS 23.401 [10].

**Removal of eCall only mode restriction:** All the limitations as described in 3GPP TS 22.101 [46] for the eCall only mode do not apply any more.

**RLOS EPS bearer context:** A default RLOS EPS bearer context which was activated with request type "RLOS", or any dedicated EPS bearer context associated to this default EPS bearer context.

The label **(S1 mode only)** indicates that this clause or paragraph applies only to a system which operates in S1 mode, i.e. with a functional division that is in accordance with the use of an S1 interface between the radio access network and the core network. The S1 mode includes WB-S1 mode and NB-S1 mode. In a multi-access system this case is determined by the current serving radio access network or the current serving satellite access network.

**Satellite E-UTRAN RAT type:** In case of satellite E-UTRAN access, RAT types are used to distinguish different types of satellite E-UTRAN access, as defined in 3GPP TS 38.413 [31]. In this version of the specification, the defined satellite E-UTRAN RAT types are "WB-E-UTRAN(LEO)", "WB-E-UTRAN(MEO)", " WB-E-UTRAN(GEO)", "NB-IoT(LEO)", "NB-IoT(MEO)", "NB-IoT(GEO)", "LTE-M(LEO)", "LTE-M(MEO)" and "LTE-M(GEO)".

**SCEF PDN Connection:** A PDN connection established between the UE and the Service Capability Exposure Function (SCEF) for transmitting the UE's non-IP data related to a specific application.

**SGi PDN Connection:** A PDN connection established between the UE and the Packet Gateway (P-GW) for transmitting the UE's IP, non-IP or Ethernet data related to a specific application.

**S101 mode:** Applies to a system that operates with a functional division that is in accordance with the use of an S101 interface. For the definition of the S101 reference point, see 3GPP TS 23.402 [11].

**SIPTO at the local network PDN connection:** A PDN connection, for which the default EPS bearer context or default PDP context was activated with an APN authorized to use SIPTO at the local network and it was activated such that the traffic of the PDN connection will be using an L-GW. The network authorizes an APN for using SIPTO at the local network based on the subscription profile (see 3GPP TS 29.272 [16C]) and subsequently the network considers this PDN connection a SIPTO at the local network PDN connection. SIPTO at the local network PDN connection can be of IP, non-IP or Ethernet PDN type.

**SIPTO at the local network PDN connection with a collocated L-GW:** A SIPTO at the local network PDN connection which is established to a L-GW function collocated with the (H)(e)NodeB. The core-network entity (i.e. the MME or the SGSN) can be aware of whether the SIPTO at the local network PDN connection with a collocated L-GW is used when the PDN connection is established.

**SIPTO at the local network PDN connection with a stand-alone GW:** A SIPTO at the local network PDN connection which is established to a stand-alone GW (with collocated L-GW and S-GW). The core-network entity (i.e. the MME or the SGSN) can be aware of whether the SIPTO at the local network PDN connection with a stand-alone GW is used when the PDN connection is established.

**"SMS only":** A subset of services which includes only Short Message Service. A UE camping on E-UTRAN can attach to both EPS services and "SMS only".

**SMS over NAS**: refers to SMS in MME or SMS over SGs.

**SMS over S102**: refers to SMS which uses 1xCS procedures in EPS as defined in 3GPP TS 23.272 [9].

**Subscribed APN based congestion control:** Congestion control in mobility management where the network can reject attach requests from UEs with a certain APN in the subscription.

**TAI list:** A list of TAIs that identify the tracking areas that the UE can enter without performing a tracking area updating procedure. The TAIs in a TAI list assigned by an MME to a UE pertain to the same MME area.

**Traffic flow aggregate:** A temporary aggregate of packet filters that are included in a UE requested bearer resource allocation procedure or a UE requested bearer resource modification procedure and that is inserted into a traffic flow template (TFT) for an EPS bearer context by the network once the UE requested bearer resource allocation procedure or UE requested bearer resource modification procedure is completed.

**UE configured for dual priority:** A UE which provides dual priority support is configured for NAS signalling low priority and also configured to override the NAS signalling low priority indicator (see 3GPP TS 24.368 [15A], 3GPP TS 31.102 [17]).

**UE configured to use AC11 – 15 in selected PLMN:** A UE configured with at least one access class in the range 11-15 on the USIM, and the access class is applicable in the selected PLMN according to 3GPP TS 22.011 [1A].

**UE's availability for voice calls in the IMS:** The indication of this availability or non-availability is provided by the upper layers of the UE as specified in 3GPP TS 24.229 [13D] in the annex relevant to the IP-Connectivity Access Network in use or determined in the NAS layer, as specified in clause 4.3.1. If availability is indicated, the UE uses the IM CN Subsystem and can terminate or originate requests for SIP sessions including an audio component with codecs suited for voice.

**UE's usage setting:** This is a UE setting that indicates whether the UE has preference for voice services over data services or vice-versa. If a UE has preference for voice services, then the UE's usage setting is "voice centric". If a UE has preference for data services, then the UE's usage setting is "data centric". A UE whose setting is "data centric" may still require access to voice services. A UE whose setting is "voice centric" may still require access to data services. This definition is derived from 3GPP TS 23.221 [8A] and it applies to voice capable UEs. If the UE is capable of both S1 mode and N1 mode, there is a single UE's usage setting which applies to both 5GS and EPS (see 3GPP TS 24.501 [54]).

**UE supporting CIoT EPS optimizations:** A UE that supports control plane CIoT EPS optimization or user plane CIoT EPS optimization and one or more other CIoT EPS optimizations when the UE is in S1 mode.

**UE using EPS services with control plane CIoT EPS optimization:** AUE that is attached for EPS services with the control plane CIOT EPS optimization accepted by the network.

**User plane CIoT EPS optimization:** Signalling optimizations to enable efficient transport of user data (IP, non-IP or Ethernet) over the user plane.

For the purposes of the present document, the following terms and definitions given in 3GPP TS 23.221 [8A] apply:

**Restricted local operator services**

For the purposes of the present document, the following terms and definitions given in 3GPP TS 23.401 [10] apply:

**APN rate control status**

**Cellular IoT (CIoT)**

**DCN-ID**

**eCall only mode**

**NarrowBand-IoT**

**Dedicated core network**

**PDN connection**

**Service Gap Control**

**UE paging probability information**

For the purposes of the present document, the following terms and definitions given in 3GPP TS 23.272 [9] apply:

**CS fallback**

**SMS in MME**

**SMS over SGs**

For the purposes of the present document, the following terms and definitions given in 3GPP TS 23.682 [11A] apply:

**SCEF**

For the purposes of the present document, the following terms and definitions given in 3GPP TS 24.008 [13] apply:

**A/Gb mode**

**Access domain selection**

**Default PDP context**

**Extended idle-mode DRX cycle**

**Iu mode**

**Native P-TMSI**

**Power saving mode**

**PS signalling connection**

**RR connection**

**TFT**

For the purposes of the present document, the following terms and definitions given in 3GPP TS 33.102 [18] apply:

**UMTS security context**

For the purposes of the present document, the following terms and definitions given in 3GPP TS 33.401 [19] apply:

**Current EPS security context**

**Full native EPS security context**

**KASME**

**K'ASME**

**Mapped security context**

**Native EPS security context**

**Non-current EPS security context**

**Partial native EPS security context**

**Data via MME**

For the purposes of the present document, the following terms and definitions given in 3GPP TS 23.122 [6] apply:

**Country**

**EHPLMN**

**HPLMN**

**Shared Network**

**Suitable Cell**

**VPLMN**

**Limited Service State**

For the purposes of the present document, the following terms and definitions given in 3GPP TS 23.216 [8] apply:

**SRVCC**

**vSRVCC**

For the purposes of the present document, the following terms and definitions given in 3GPP TS 22.011 [1A] apply:

**Extended Access Barring**

**Application specific Congestion control for Data Communication (ACDC)**

For the purposes of the present document, the following terms and definitions given in 3GPP TS 23.003 [10] apply:

**Local Home Network Identifier**

For the purposes of the present document, the following terms and definitions given in 3GPP TS 23.303 [31] apply:

**ProSe direct communication**

**ProSe direct discovery**

**ProSe UE-to-Network Relay**

For the purposes of the present document, the following terms and definitions given in 3GPP TS 24.161 [36] apply:

**Multi-access PDN connection**

**NBIFOM**

For the purposes of the present document, the following terms and definitions given in 3GPP TS 23.167 [45] apply:

**eCall over IMS**

For the purposes of the present document, the following terms and definitions given in 3GPP TS 24.501 [54] apply:

**5G-EA**

**5G-IA**

**5GMM-CONNECTED mode**

**5GMM-DEREGISTERED**

**5GMM-DEREGISTERED-INITIATED**

**5GMM-IDLE mode**

**5GMM-NULL**

**5GMM-REGISTERED**

**5GMM-REGISTERED-INITIATED**

**5GMM-SERVICE-REQUEST-INITIATED**

**Applicable UE radio capability ID for the current UE radio configuration in the selected network**

**Control plane CIoT 5GS optimization**

**N1 mode**

**NB-N1 mode**

**Native 5G-GUTI**

**Service-level-AA**

**UE operating in single-registration mode in a network supporting N26 interface**

**UE supporting UAS services**

**User plane CIoT 5GS optimization**

For the purposes of the present document, the following terms and definitions given in 3GPP TS 36.413 [23] apply:

**User Location Information**

For the purposes of the present document, the following terms and its definitions given in 3GPP TS 23.256 [60] apply:

**3GPP UAV ID**

**CAA (Civil Aviation Administration)-Level UAV Identity**

**Command and Control (C2) Communication**

**UAV controller (UAV-C)**

**UAS Services**

**UAS Service Supplier (USS)**

**Uncrewed Aerial System (UAS)**

**USS communication**

**UUAA**

**UUAA-SM**

**Direct C2 communication**

\*\*\*\*\* Next change \*\*\*\*\*

#### 6.3.13.3 Authorization of C2 communication

The network supports C2 communication authorization for pairing of UAV and UAV-C. The pairing of UAV and UAV-C needs to be authorized by USS successfully before the user plane connectivity for C2 communication (over Uu or over NR-PC5) is enabled. The UE supporting UAS services may provide the network with an identification information of UAV-C to pair with, if available, via the protocol configuration options as follows:

- If the UE uses a common PDN connectivity for both USS communication and C2 communication with a UAV-C, the C2 communication with the UAV-C can be authorized using UUAA-SM procedure during the PDN connectivity procedure or during the bearer resource modification procedure. If the pairing of UAV and UAV-C is revoked, the network shall disable C2 communication for the PDN connection.

NOTE 1: The network can disable C2 communication for the PDN connection e.g., by removing the packet filter(s) allocated for C2 communication during EPS bearer context modification procedure as specified in clause 6.4.3 or by deactivating the EPS bearer context for C2 communication during EPS bearer context deactivation procedure as specified in clause 6.4.4.

- If the UE uses separate PDN connectivity for, respectively, USS communication and C2 communication with a UAV-C, the C2 communication with the UAV-C is authorized using UUAA-SM during the PDN connectivity procedure. If the pairing of UAV and UAV-C is revoked, the PDN connectivity or C2 communication shall be released by the network.

The authorization of direct C2 communication can be performed during the C2 communication authorization procedure.

NOTE 2: The C2 authorization payload in the service-level-AA payload, sent to the network via the protocol configuration options, can include an indication of the request for direct C2 communication and pairing information for direct C2 communication (see subclauses 6.4.3.3 and 6.5.1.2).

The authorization of UAV flight can also be performed during the C2 communication authorization procedure. The UE supporting UAS services provides flight authorization information to the network via the protocol configuration options if the flight authorization information is already available in the UE.

\*\*\*\*\* Next change \*\*\*\*\*

#### 6.4.3.3 EPS bearer context modification accepted by the UE

Upon receipt of the MODIFY EPS BEARER CONTEXT REQUEST message, if the UE provided an APN for the establishment of the PDN connection, the UE shall stop timer T3396, if it is running for the APN provided by the UE. If the UE did not provide an APN for the establishment of the PDN connection and the request type was different from "emergency" and from "handover of emergency bearer services", the UE shall stop the timer T3396 associated with no APN if it is running. If the MODIFY EPS BEARER CONTEXT REQUEST message was received for an emergency PDN connection, the UE shall not stop the timer T3396 associated with no APN if it is running. For any case, the UE shall then check the received TFT before taking it into use and send a MODIFY EPS BEARER CONTEXT ACCEPT message to the MME.

If the MODIFY EPS BEARER CONTEXT REQUEST message contains a PTI value other than "no procedure transaction identity assigned" and "reserved" (see 3GPP TS 24.007 [12]), the UE uses the PTI to identify the UE requested bearer resource allocation procedure or the UE requested bearer resource modification procedure to which the EPS bearer context modification is related (see clause 6.5.3 and clause 6.5.4).

If the MODIFY EPS BEARER CONTEXT REQUEST message contains a PTI value other than "no procedure transaction identity assigned" and "reserved" (see 3GPP TS 24.007 [12]) and the PTI is associated to a UE requested bearer resource allocation procedure or a UE requested bearer resource modification procedure, the UE shall release the traffic flow aggregate description associated to the PTI value provided.

If the EPS bearer context that is modified is a GBR bearer and the MODIFY EPS BEARER CONTEXT REQUEST message does not contain the Guaranteed Bit Rate (GBR) and the Maximum Bit Rate (MBR) values for uplink and downlink, the UE shall continue to use the previously received values for the Guaranteed Bit Rate (GBR) and the Maximum Bit Rate (MBR) for the corresponding bearer.

The UE shall use the received TFT to apply mapping of uplink traffic flows to the radio bearer if the TFT contains packet filters for the uplink direction.

If a WLAN offload indication information element is included in the MODIFY EPS BEARER CONTEXT REQUEST message, the UE shall store the WLAN offload acceptability values for this PDN connection and use the E-UTRAN offload acceptability value to determine whether this PDN connection is offloadable to WLAN or not.

If the UE receives an APN rate control parameters container in the Protocol configuration options IE or Extended protocol configuration options IE in the MODIFY EPS BEARER CONTEXT REQUEST message, the UE shall store the APN rate control parameters value and use the stored APN rate control parameters value as the maximum allowed limit of uplink user data related to the corresponding APN in accordance with 3GPP TS 23.401 [10]. If the UE has a previously stored APN rate control parameters value for this APN, the UE shall replace the stored APN rate control parameters value for this APN with the received APN rate control parameters value.

If the UE receives an additional APN rate control parameters for exception data container in the Protocol configuration options IE or Extended protocol configuration options IE in the MODIFY EPS BEARER CONTEXT REQUEST message, the UE shall store the additional APN rate control parameters for exception data value and use the stored additional APN rate control parameters for exception data value as the maximum allowed limit of uplink exception data related to the corresponding APN in accordance with 3GPP TS 23.401 [10]. If the UE has a previously stored additional APN rate control parameters for exception data value for this APN, the UE shall replace the stored additional APN rate control parameters for exception data value for this APN with the received additional APN rate control parameters for exception data value.

If the UE receives a small data rate control parameters container in the Protocol configuration options IE or the Extended protocol configuration options IE in the MODIFY EPS BEARER CONTEXT REQUEST 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 corresponding PDU session that becomes transferred after inter-system change from S1 mode to N1 mode in accordance with 3GPP TS 23.501 [58]. If the UE has a previously stored small data rate control parameters value for this PDU session, the UE shall replace the stored small data rate control parameters value for this PDU Session with the received small data rate control parameters value.

If the UE receives an additional small data rate control parameters for exception data container in the Protocol configuration options IE or the Extended protocol configuration options IE in the MODIFY EPS BEARER CONTEXT REQUEST 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 corresponding PDU session that becomes transferred after inter-system change from S1 mode to N1 mode in accordance with 3GPP TS 23.501 [58]. If the UE has a previously stored additional small data rate control parameters for exception data value for this PDU session, the UE shall replace the stored additional small data rate control parameters for exception data value for this PDU session with the received additional small data rate control parameters for exception data value.

Upon receipt of the MODIFY EPS BEARER CONTEXT REQUEST message with a session-AMBR and QoS rule(s) 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 receives the MODIFY EPS BEARER CONTEXT REQUEST message containing the Uplink data allowed parameter in the Extended protocol configuration options IE, then the UE may start transmitting uplink user data over EPS bearer context(s) of the corresponding PDN connection.

The MODIFY EPS BEARER CONTEXT REQUEST message as a part of authorization procedure for the C2 communication, can include an Extended protocol configuration options IE containing the service-level-AA container with the length of two octets. The service-level-AA container with the length of two octets:

a) contains the service-level-AA response with the C2AR field set to the C2 authorization result informed by the UAS NF;

b) can contain the service-level-AA payload parameter set to the C2 authorization payload and the service-level-AA payload type parameter set to "C2 authorization payload"; and

c) can contain the service-level device ID with the value set to a new CAA-level UAV ID.

NOTE 1: The C2 authorization payload in the service-level-AA payload can include one, some or all of the C2 pairing information, the C2 session security information, and the direct C2 pairing information.

If the EPS bearer context being modified is associated with a PDN connection for UAS services and the MODIFY EPS BEARER CONTEXT REQUEST message includes the service-level-AA container with the length of two octets in the Extended protocol configuration options IE, the UE supporting UAS services shall forward the contents of the service-level-AA container with the length of two octets to the upper layers.

If the EPS bearer context being modified is associated with a PDN connection for UAS services, the MODIFY EPS BEARER CONTEXT REQUEST message includes the Extended protocol configuration options IE containing the service-level-AA container with the length of two octets containing the service-level-AA response parameter with the SLAR field set to "Service level authentication and authorization was successful", the UE supporting UAS services:

a) shall consider the UUAA procedure as successfully completed and provide the service-level-AA response to the upper layers;

b) if the service-level-AA container with the length of two octets contains the service-level device ID parameter carrying a CAA-level UAV ID, shall provide the CAA-level UAV ID to the upper layers; and

c) if the service-level-AA container with the length of two octets contains the service-level-AA payload type parameter with the value "UUAA payload" and the service-level-AA payload parameter carrying the UUAA payload, shall provide the UUAA payload to the upper layers.

Upon reception of a service-level-AA payload from the upper layers, the UE supporting UAS services shall include the Extended protocol configuration options IE in the MODIFY EPS BEARER CONTEXT ACCEPT message. In the Extended protocol configuration options IE, the UE shall include the service-level-AA container with the length of two octets. In the service-level-AA container with the length of two octets, the UE shall:

a) include the service-level-AA payload parameter set to the service-level-AA payload received from the upper layers; and

b) set the service-level-AA payload type parameter to the type of the service-level-AA payload.

Upon receipt of the MODIFY EPS BEARER CONTEXT REQUEST message, if the SDNAEPC EAP message with the length of two octets is included in the Extended protocol configuration options IE, the UE supporting secondary DN authentication and authorization over EPC shall forward the SDNAEPC EAP message with the length of two octets to the upper layers.

Upon reception of an SDNAEPC EAP message with the length of two octets from the upper layers and if the UE has received an SDNAEPC EAP message with the length of two octets included in the Extended protocol configuration options IE of the MODIFY EPS BEARER CONTEXT REQUEST message from the network, the UE supporting secondary DN authentication and authorization over EPC shall include the Extended protocol configuration options IE in the MODIFY EPS BEARER CONTEXT ACCEPT message and include the SDNAEPC EAP message with the length of two octets in the Extended protocol configuration options IE.

The MODIFY EPS BEARER CONTEXT REQUEST message may include an Extended protocol configuration options IE containing the ATSSS response with the length of two octets PCO parameter. If the UE receives an ATSSS response with the length of two octets PCO parameter in the Extended protocol configuration options IE of the MODIFY EPS BEARER CONTEXT REQUEST message, the PDN connection associated with the EPS bearer context is established as a user-plane resource of an MA PDU session and the Measurement assistance information indicator is set to "Measurement assistance information length field and the measurement assistance information field included", the UE shall replace the stored Measurement assistance information with the received Measurement assistance information.

If the UE supports provisioning of ECS configuration information to the EEC in the UE, then upon receiving:

- at least one of ECS IPv4 address(es), ECS IPv6 address(es), ECS FQDN(s);

- at least one associated ECSP identifier; and

- optionally spatial validity conditions associated with the ECS address

in the Extended protocol configuration options IE of the MODIFY EPS BEARER CONTEXT REQUEST message, the UE shall pass them to the upper layers.

NOTE 2: The IP address(es) and/or FQDN(s) are associated with the ECSP identifier and replace previously provided ECS configuration information associated with the same ECSP identifier, if any.

Upon receipt of the MODIFY EPS BEARER CONTEXT ACCEPT message, the MME shall stop the timer T3486 and enter the state BEARER CONTEXT ACTIVE.

\*\*\*\*\* Next change \*\*\*\*\*

#### 6.5.1.2 UE requested PDN connectivity procedure initiation

In order to request connectivity to a PDN, the UE shall send a PDN CONNECTIVITY REQUEST message to the MME, start timer T3482 and enter the state PROCEDURE TRANSACTION PENDING (see example in figure 6.5.1.2.1).

When the PDN CONNECTIVITY REQUEST message is sent together with an ATTACH REQUEST message, the UE shall not start timer T3482 and shall not include the APN.

NOTE 1: If the UE needs to provide protocol configuration options which require ciphering or provide an APN, or both, during the attach procedure, the ESM information transfer flag is included in the PDN CONNECTIVITY REQUEST. The MME then at a later stage in the PDN connectivity procedure initiates the ESM information request procedure in which the UE can provide the MME with protocol configuration options or APN or both.

In order to request a PDN connection for emergency bearer services or for access to RLOS, the UE shall not include an APN in the PDN CONNECTIVITY REQUEST message or, when applicable, in the ESM INFORMATION RESPONSE message.

In order to request connectivity to a PDN using the default APN, the UE includes the access point name IE in the PDN CONNECTIVITY REQUEST message or, when applicable, in the ESM INFORMATION RESPONSE message, according to the following conditions:

- if use of a PDN using the default APN requires PAP/CHAP, then the UE should include the Access point name IE; and

- in all other conditions, the UE need not include the Access point name IE.

In order to request connectivity to an additional PDN using a specific APN, the UE shall include the requested APN in the PDN CONNECTIVITY REQUEST message or, when applicable, in the ESM INFORMATION RESPONSE message.

NOTE 2: The requested APN in the PDN CONNECTIVITY REQUEST or ESM INFORMATION RESPONSE message is for UAS services when the request to establish a PDN connection for UAS services is requested by the upper layers.

NOTE 3: By configuration provided by the operator, the UE supporting UAS services knows that an APN is for UAS services when the request to establish a PDN connection for UAS services is requested by the upper layers and how this UE configuration is achieved is implementation specific.

In the PDN type IE the UE shall either indicate the IP version capability of the IP stack associated with the UE or non IP or Ethernet as specified in clause 6.2.2.

If the PDN type value of the PDN type IE is set to IPv4 or IPv6 or IPv4v6 and the UE indicates "Control plane CIoT EPS optimization supported" in the UE network capability IE of the ATTACH REQUEST message, the UE may include the Header compression configuration IE in the PDN CONNECTIVITY REQUEST message.

When the connectivity to a PDN is to be transferred from a non-3GPP access network to the 3GPP access network, the UE shall set the PDN type value of the PDN type IE to:

- IPv4, if the previously allocated home address information consists of an IPv4 address only;

- IPv6, if the previously allocated home address information consists of an IPv6 prefix only; or

- IPv4v6, if the previously allocated home address information consists of both an IPv4 address and an IPv6 prefix.

The UE shall set the request type to "initial request" when the UE is establishing a new PDN connectivity to a PDN in an attach procedure or in a stand-alone PDN connectivity procedure or when the UE requests establishment of a PDN connection as a user-plane resource of an MA PDU session to be established. The UE shall set the request type to "emergency" when the UE is requesting a new PDN connectivity for emergency bearer services. The UE shall set the request type to "handover" when the connectivity to a PDN is to be transferred from a non-3GPP access network to the 3GPP access network, when the UE initiates the procedure to add 3GPP access to the PDN connection which is already established over WLAN, when the UE supporting N1 mode requests transfer of an existing non-emergency PDU session in 5GS or when the UE requests establishment of a PDN connection as a user-plane resource of an already established MA PDU session. The UE shall set the request type to "handover of emergency bearer services" when a PDN connection for emergency bearer services is to be transferred from a WLAN to the 3GPP access network or when the UE supporting N1 mode requests transfer of an existing emergency PDU session in 5GS. The UE shall set the request type to "RLOS" when the UE is requesting a new PDN connection for RLOS.

If the UE supports DSMIPv6, the UE may include a request for obtaining the IPv6 address and optionally the IPv4 address of the home agent in the Protocol configuration options IE in the PDN CONNECTIVITY REQUEST message. The UE may also include a request for obtaining the IPv6 Home Network Prefix. The UE shall request the IPv6 Home Network Prefix only if the UE has requested the home agent IPv6 address. The requested home agent address(es) and the Home Network Prefix are related to the APN the UE requested connectivity for.

The UE may set the ESM information transfer flag in the PDN CONNECTIVITY REQUEST message to indicate that it has ESM information, i.e. protocol configuration options, APN, or both, that needs to be sent after the NAS signalling security has been activated between the UE and the MME.

If the UE supports A/Gb mode or Iu mode or both, the UE shall indicate the support of the network requested bearer control procedures (see 3GPP TS 24.008 [13]) in A/Gb mode or Iu mode in the Protocol configuration options IE.

If the UE supports N1 mode and the request type is:

a) "initial request" or "emergency", the UE shall generate a PDU session ID, associate the PDU session ID with the PDN connection that is being established, and include the PDU session ID in the Protocol configuration options IE or the Extended protocol configuration options IE;

b) "handover" or "handover of emergency bearer services", and the UE requests:

1) transfer of an existing PDU session in 5GS or establishment of a PDN connection as a user-plane resource of an already established MA PDU session, the UE shall associate the PDU session ID of the PDU session with the PDN connection that is being established for the existing PDU session and include the PDU session ID in the Protocol configuration options IE or the Extended protocol configuration options IE; or

2) transfer of an existing PDN connection in a non-3GPP access connected to the EPC and a PDU session ID is associated with the existing PDN connection, the UE shall include the PDU session ID in the Protocol configuration options IE or the Extended protocol configuration options IE and associate the PDU session ID with the PDN connection that is being established. If the existing PDN connection is a non-emergency PDN connection and an S-NSSAI and a related PLMN ID are associated with the existing PDN connection, the UE shall in addition associate the S-NSSAI and the related PLMN ID with the PDN connection that is being established.

NOTE 4: The UE can also have an S-NSSAI and the related PLMN ID associated with the PDN connection, if the S-NSSAI and the related PLMN ID was associated with the existing PDN connection in a non-3GPP access connected to the EPC as specified in 3GPP TS 24.302 [48]. The UE stores this S-NSSAI and the related PLMN ID for later use during inter-system change from S1 mode to N1 mode.

If the N1 mode capability is disabled, the UE may apply a) and b.2) above for service continuity support at inter-system change from S1 mode to N1 mode once its N1 mode capability is enabled again.

If the UE supporting N1 mode supports receiving QoS rules with the length of two octets or QoS flow descriptions with the length of two octets via the Extended protocol configuration options IE, the UE shall include the QoS rules with the length of two octets support indicator or the QoS flow descriptions with the length of two octets support indicator, respectively, in the Protocol configuration options IE or the Extended protocol configuration options IE.

If the UE supports providing PDU session ID in the Protocol configuration options IE or the Extended protocol configuration options IE when its N1 mode capability is disabled, the UE shall include the QoS rules with the length of two octets support indicator or the QoS flow descriptions with the length of two octets support indicator, respectively, in the Protocol configuration options IE or the Extended protocol configuration options IE.

Protocol configuration options provided in the ESM INFORMATION RESPONSE message replace any protocol configuration options provided in the PDN CONNECTIVITY REQUEST message.

When the UE initiates the procedure to add 3GPP access to the PDN connection that is already established over WLAN, the UE shall provide the same APN as that of the PDN connection established over WLAN in the PDN connectivity procedure as specified in the clause 6.2.2 of 3GPP TS 23.161 [34].

If the UE supports APN rate control, the UE shall include an APN rate control support indicator and an additional APN rate control for exception data support indicator in the Protocol configuration options IE or Extended protocol configuration options IE.

If the UE supports DNS over (D)TLS (see 3GPP TS 33.501 [24]), the UE shall include the Protocol configuration options IE or the Extended protocol configuration options IE in the PDN CONNECTIVITY REQUEST or ESM INFORMATION RESPONSE message and include the DNS server security information indicator and optionally, if the UE wishes to indicate which security protocol type(s) are supported by the UE, it may include the DNS server security protocol support.

NOTE 5: Support of DNS over (D)TLS is based on the informative requirements as specified in 3GPP TS 33.501 [24].

When the UE supporting UAS services initiates a UE requested PDN connectivity procedure for UAS services during an attach procedure, the UE:

a) shall create the service-level-AA container with the length of two octets. In the service-level-AA container with the length of two octets, the UE:

1) shall include the service-level device ID parameter set to the UE's CAA-level UAV ID;

2) shall include the service-level-AA server address parameter set to the USS address, if it is provided by the upper layers;

3) shall include the service-level-AA payload parameter set to the UUAA payload and the service-level-AA payload type parameter set to "UUAA payload", if the UUAA payload is provided by the upper layer; and

4) shall include the service-level-AA payload parameter set to the C2 authorization payload and the service-level-AA payload type parameter set to "C2 authorization payload", if the C2 authorization procedure is requested; and

NOTE 6: The C2 authorization payload in the service-level-AA payload parameter can include one, some or all of the pairing information for C2 communication, an indication of the request for direct C2 communication, pairing information for direct C2 communication and the flight authorization information.

b) shall include the created service-level-AA container with the length of two octets in the Extended protocol configuration options IE of the PDN CONNECTIVITY REQUEST or ESM INFORMATION RESPONSE message.

When the UE supporting UAS services initiates a UE requested PDN connectivity procedure for C2 communication after the completion of the attach procedure, the UE:

a) shall create the service-level-AA container with the length of two octets. In the service-level-AA container with the length of two octets, the UE:

1) shall include the service-level device ID parameter set to the UE's CAA-level UAV ID; and

2) shall include the service-level-AA payload parameter set to the C2 authorization payload and the service-level-AA payload type parameter set to "C2 authorization payload"; and

NOTE 7: The C2 authorization payload in the service-level-AA payload parameter can include one, some or all of the pairing information for C2 communication, an indication of the request for direct C2 communication, pairing information for direct C2 communication and the flight authorization information.

b) shall include the created service-level-AA container with the length of two octets in the Extended protocol configuration options IE of the PDN CONNECTIVITY REQUEST message.

If the UE supports provisioning of ECS configuration information to the EEC in the UE, then the UE may include the ECS configuration information provisioning support indicator in the Protocol configuration options IE or the Extended protocol configuration options IE in the PDN CONNECTIVITY REQUEST message.

If the UE supports secondary DN authentication and authorization over EPC and has included the PDU session ID in the Protocol configuration options IE or the Extended protocol configuration options IE, the UE shall include the SDNAEPC support indicator in the Protocol configuration options IE or the Extended protocol configuration options IE in the PDN CONNECTIVITY REQUEST message, and if the UE requests to establish a new non-emergency PDN connection with a DN, the UE may include the SDNAEPC DN-specific identity set to DN-specific identity of the UE complying with network access identifier (NAI) format as specified in IETF RFC 7542 [62] in the PDN CONNECTIVITY REQUEST message.

NOTE 8: The UE can avoid including both the SDNAEPC DN-specific identity and the protocol configuration option parameters with PAP/CHAP protocol identifiers in the PDN CONNECTIVITY REQUEST message. The way to achieve this is implementation dependent.



Figure 6.5.1.2.1: UE requested PDN connectivity procedure

\*\*\*\*\* End of changes \*\*\*\*\*