**SA WG2 Meeting #137E (e-meeting) S2-2001820R1**

**Feb 24 - 27, 2020, Elbonia (revision of S2-2000860)**

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| *CR-Form-v12.0* |
| **CHANGE REQUEST** |
|  |
|  | **23.501** | **CR** | **2108** | **rev** | **1** | **Current version:** | **16.3.0** |  |
|  |
| *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 |  | Radio Access Network |  | Core Network | **X** |

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| ***Title:***  | Clarification on the CN tunnel info allocation and release |
|  |  |
| ***Source to WG:*** | Nokia, Nokia Shanghai Bell, DT, Ericsson, Huawei?, HiSilicon?, China Mobile? |
| ***Source to TSG:*** | SA2 |
|  |  |
| ***Work item code:*** | 5GS\_Ph1, TEI16 |  | ***Date:*** | 2020-02-07 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***Release:*** | Rel-16 |
|  | *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-12 (Release 12)**Rel-13 (Release 13)Rel-14 (Release 14)Rel-15 (Release 15)Rel-16 (Release 16)* |
|  |  |
| ***Reason for change:*** | CN tunnel info, i.e. F-TEID, allocation is supported by both SMF and UPF in rel-15. With the deployment of 5GC, vendors and operators now believe it is more efficient for the UPF to allocate the F-TEID than the SMF.Defining two options for the same functionality in standard increases burden on vendors and operators, therefore it is proposed to remove the option for SMF to support this feature. |
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| ***Summary of change:*** | Remove the option that SMF allocates the CN tunnel info. |
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| ***Consequences if not approved:*** | Two options of CN tunnel info allocation defined in standard is unnecessary. |
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| ***Clauses affected:*** | 5.8.2.3.1, 5.8.2.3.2, 5.8.2.3.3, 5.8.2.9.1, 5.8.2.11.3, 5.17.1.2 |
|  |  |
|  | **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:*** | R1:Update 5.8.2.3 per Tdoc 2242 + minor corrections |

\* \* \* \* First change \* \* \* \*

##### 5.8.2.3.1 General

CN Tunnel Info is the Core Network address of a N3/N9 tunnel corresponding to the PDU Session. It comprises the TEID and the IP address which is used by the UPF on the N3/N9 tunnel for the PDU Session.

The CN Tunnel Info allocation and release, is performed by the UPF. The SMF shall indicate to the UPF when the UPF is required to allocate/release CN Tunnel Info.

##### 5.8.2.3.2 void

##### 5.8.2.3.3 Management of CN Tunnel Info in the UPF

The UPF shall manage the CN Tunnel Info space. When a new CN Tunnel Info is needed, the SMF shall request over N4 the UPF to allocate CN Tunnel Info for the applicable N3/N9 reference point. In response, the UPF provides CN Tunnel Info to the SMF. In the case of PDU Session Release or a UPF is removed from the user plane path of an existing PDU Session, the SMF shall request UPF to release CN Tunnel Info for the PDU Session. If the corresponding N4 Session is released the UPF releases the associated CN Tunnel Info.

\* \* \* \* next changes \* \* \* \*

##### 5.8.2.9.1 UPF Constructing the "End marker" Packets

In the case of inter NG-RAN Handover procedure without UPF change, SMF shall indicate the UPF to switch the N3 path(s) by sending an N4 Session Modification Request message with the new AN Tunnel Info of NG RAN and in addition, provide an indication to the UPF to send the end marker packet(s) on the old N3 user plane path.

On receiving this indication, the UPF shall construct end marker packet(s) and send it for each N3 GTP-U tunnel towards the source NG RAN after sending the last PDU on the old path.

In the case of inter NG-RAN Handover procedure with UPF change, SMF shall indicate the UPF with N9 reference point to switch the N9 user plane path(s) by sending an N4 Session Modification Request message (N4 session ID, new CN Tunnel Info of remote UPF) and in addition, provide an indication to the UPF to send the end marker packet(s) on the old path.

On receiving this indication, the UPF shall construct end marker packet(s) and send it for each N9 GTP-U tunnel towards the source UPF after sending the last PDU on the old path.

On receiving the end marker packet(s) on N9 GTP-U tunnel, source UPF shall forward the end marker packet(s) and send it for each N3 GTP-U tunnel towards the source NG RAN.

\* \* \* \* Next changes \* \* \* \*

##### 5.8.2.11.3 Packet Detection Rule

The following table describes the Packet Detection Rule (PDR) containing information required to classify a packet arriving at the UPF. Every PDR is used to detect packets in a certain transmission direction, e.g. UL direction or DL direction.

Table 5.8.2.11.3-1: Attributes within Packet Detection Rule

|  |  |  |
| --- | --- | --- |
| Attribute | Description | Comment |
| N4 Session ID | Identifies the N4 session associated to this PDR. NOTE 5. |  |
| Rule ID | Unique identifier to identify this rule. |  |
| Precedence | Determines the order, in which the detection information of all rules is applied. |  |
| Packet  | Source interface | Contains the values "access side", "core side", "SMF", "N6-LAN" , "5G VN internal". | Combination of UE IP address (together with Network instance, if necessary), CN tunnel info, |
| Detection | UE IP address  | One IPv4 address and/or one IPv6 prefix with prefix length (NOTE 3). | packet filter set, application ID, Ethernet PDU Session |
| Information.NOTE 4. | Network instance (NOTE 1) | Identifies the Network instance associated with the incoming packet. | Information, QoS Monitoring Packet indicator and QFI are used for traffic detection.Source interface identifies the |
|  | CN tunnel info | CN tunnel info on N3, N9 interfaces, i.e. F-TEID. | interface for incoming packets |
|  | Packet Filter Set | Details see clause 5.7.6. | where the PDR applies, e.g. from access side (i.e. up-link), |
|  | Application ID |  | from core side (i.e. down-link), |
|  | QoS Flow ID | Contains the value of 5QI or non-standardized QFI. | from SMF, from N6-LAN (i.e. the |
|  | Ethernet PDU Session Information | Refers to all the (DL) Ethernet packets matching an Ethernet PDU session, as further described in clause 5.6.10.2 and in TS 29.244 [65]. | DN or the local DN), or from "5G VN internal" (i.e. local switch). |
|  | Framed Route Information | Refers to Framed Routes defined in clause 5.6.14. | Details like all the combination possibilities on N3, N9 interfaces are left for stage 3 decision. |
|  | QoS Monitoring Packet indicator (NOTE 8) | Identifies the packet is used for QoS Monitoring as defined in clause 5.33.3. |  |
| Packet replication and detection carry on information | Packet replication skip information NOTE 7 | Contains UE address indication or N19/N6 indication. If the packet matches the packet replication skip information, i.e., source address of the packet is the UE address or the packet has been received on the interface in the packet replication skip information, the UP function neither creates a copy of the packet nor applies the corresponding processing (i.e., FAR, QER, URR). Otherwise the UPF performs a copy and applies the corresponding processing (i.e., FAR, QER, URR). |  |
| NOTE 6 | Carry on indication | Instructs the UP function to continue the packet detection process, i.e., lookup of the other PDRs without higher precedence. |  |
| Outer header removal | Instructs the UP function to remove one or more outer header(s) (e.g. IP+UDP+GTP, IP + possibly UDP, VLAN tag), from the incoming packet. | Any extension header shall be stored for this packet.  |
| Forwarding Action Rule ID (NOTE 2) | The Forwarding Action Rule ID identifies a forwarding action that has to be applied. |  |
| Multi-Access Rule ID (NOTE 2) | The Multi-Access Rule ID identifies an action to be applied for handling forwarding for a MA PDU Session. |  |
| List of Usage Reporting Rule ID(s) | Every Usage Reporting Rule ID identifies a measurement action that has to be applied. |  |
| List of QoS Enforcement Rule ID(s) | Every QoS Enforcement Rule ID identifies a QoS enforcement action that has to be applied. |  |
| NOTE 1: Needed e.g. in case: - UPF supports multiple DNN with overlapping IP addresses; - UPF is connected to other UPF or AN node in different IP domains. - UPF "local switch", N6-based forwarding and N19 forwarding is used for different 5G LAN groups.NOTE 2: Either a FAR ID or a MAR ID is included, not both.NOTE 3: The SMF may provide an indication asking the UPF to allocate one IPv4 address and/or IPv6 prefix. When asking to provide an IPv6 Prefix the SMF provides also an IPv6 prefix length.NOTE 4: When in the architecture defined in clause 5.34, a PDR is sent over N16a from SMF to I-SMF, the Packet Detection Information may indicate that CN tunnel info is to be locally determined. This is further defined in clause 5.34.6.NOTE 5: In the architecture defined in clause 5.34, the rules exchanged between I-SMF and SMF are not associated with a N4 Session ID but are associated with a N16a association.NOTE 6: Needed in case of support for broadcast/multicast traffic forwarding using packet replication with SMF-provided PDRs and FARs as described in clause 5.8.2.13.3.2.NOTE 7: Needed in the case of packet replication with SMF-provided PDRs and FARs as described in clause 5.8.2.13.3.2, to prevent UPF from sending the broadcast/multicast packets back to the source UE or source N19/N6.NOTE 8: The UPF identifies the UL packet or dummy packet to be the QoS Monitoring packet based on the QoS Monitoring Packet indicator encapsulated in the GTP-U header by NG-RAN as defined in clause 5.33.3. |

\* \* \* \* Next changes \* \* \* \*

#### 5.17.1.2 User Plane management to support interworking with EPS

In order to support the interworking with EPC, the SMF+PGW-C provides information over N4 to the UPF+PGW-U related to the handling of traffic over S5-U. Functionality defined in TS 23.503 [45] for traffic steering control on SGi-LAN/N6 can be activated in UPF+PGW-U under consideration of whether the UE is connected to EPC or 5GC.

When the UE is connected to EPC and establishes/releases PDN connections, the following differences apply to N4 compared to when the UE is connected to 5GC:

- The CN Tunnel Info is allocated for each EPS Bearer.

- In addition to the Service Data Flow related information, the SMF+PGW-C shall be able to provide the GBR and MBR values for each GBR bearer of the PDN connection to the UPF+PGW-U.

If the UE does not have preconfigured rules for associating an application to a PDN connection (i.e. the UE does not have rules in UE local configuration and is not provisioned with ANDSF rules), the UE should use a matching URSP rule as defined in TS 23.503 [45], if available, to derive the parameters, e.g. APN, for the PDN connection establishment and associating an application to the PDN connection.

NOTE: The mapping between the parameters in the URSP rules and the parameters used for PDN connection establishment is defined in TS 24.526 [110].

\* \* \* \* Next changes \* \* \* \*

#### 5.34.6.1 General

This clause applies only in case of non-roaming or LBO roaming as control of UL CL/Branching Point in VPLMN is not supported in HR case. It applies for the architectures described in clauses 5.34.4 and 5.34.5

When the I-SMF is inserted into a PDU Session, e.g. during PDU Session establishment or due to UE mobility, the I-SMF may provide the DNAI list it supports to the SMF. Based on the DNAI list information received from I-SMF, the SMF may provide the DNAI(s) of interest for this PDU Session for local traffic steering to the I-SMF e.g. immediately or when a new or updated or removed PCC rule(s) is/are received. The DNAI(s) of interest is derived from PCC rules.

The I-SMF is responsible for the insertion, modification and removal of UPF(s) to ensure local traffic steering. The SMF does not need to have access to local configuration or NRF output related with UPF(s) controlled by I-SMF. Based on the DNAI(s) of interest for this PDU Session for local traffic steering and UE location the I-SMF determines which DNAI(s) are to be selected, selects UPF(s) acting as UL CL/BP and/or PDU Session Anchor based on selected DNAI, and insert these UPF(s) into the data path of the PDU Session.

When a UL CL/BP has been inserted, changed or removed, the I-SMF indicates to the SMF that traffic offload have been inserted, updated or removed for a DNAI, providing also the IPv6 prefix that has been allocated in case a new IPv6 prefix has been allocated for the PDU Session.

From now on the SMF and I-SMF interactions entail:

- Notifying the SMF with the new Prefix (multi-Homing case): the SMF is responsible of issuing Router Advertisement message. The SMF constructs a link-local address as the source IP address. The Router Advertisement message includes the IPv6 multi-homed routing rules provided to the UE to select the source IPv6 prefix among the prefixes related with the PDU Session according to RFC 4191 [8]. The SMF sends the Router Advertisement message to the UE via the PSA UPF controlled by the SMF.

- N4 interactions related with traffic offloading. The SMF provide N4 information to the I-SMF for how the traffic shall be detected, enforced, monitored in UPF(s) controlled by the I-SMF: the SMF issues requests to the I-SMF containing N4 information to be used for creating / updating /removing PDR, FAR, QER, URR, etc. The N4 information for local traffic offload provided by the SMF to the I-SMF are described in clause 5.34.6.2.

- Receiving N4 notifications related with traffic usage reporting: the I-SMF forwards to the SMF N4 information corresponding to UPF notifications related with traffic usage reporting; the SMF aggregates and constructs usage reports towards PCF/CHF.

NOTE: How the SMF decides what traffic steering and enforcement actions are enforced in UPF(s) controlled by I-SMF is left for implementation.

The I-SMF is responsible of the N4 interface towards the local UPF(s) including:

- the usage of AN Tunnel Info received from the 5G AN via the AMF in order to build PDR and FAR;

- requesting the allocation of the CN Tunnel Info between local UPFs (if needed);

- to control UPF actions when the UP of the PDU Session becomes INACTIVE.

- provide Trace Requirements on the N4 interface towards the UPF(s) it is controlling, using Trace Requirements received from AMF.

\* \* \* \* Next changes \* \* \* \*

#### 5.34.6.2 N4 information sent from SMF to I-SMF for local traffic offload

The SMF generates N4 information for local traffic offload based on the available DNAI(s) indicated by the I-SMF, PCC rules associated with these DNAI(s) and charging requirement. This N4 information is sent from the SMF to the I-SMF after UL CL/Branching Point insertion/update/removal, and the I-SMF uses this N4 information to derive rules installed in the UPFs controlled by the I-SMF.

The N4 information for local traffic offload corresponds to rules and parameters defined in clause 5.8.2.11, i.e. PDR, FAR, URR and QER. It contains identifiers allowing the SMF to later modify or delete these rules.

N4 information for local traffic offload is generated by the SMF without knowledge of how many local UPF(s) are actually used by the I-SMF. The SMF indicates whether a rule within N4 information is enforced in UL CL/ Branching Point or local PSA. If the rule is applied to the local PSA, the N4 information includes the associated DNAI. The I-SMF generates suitable rules for the UPF(s) based on the N4 information received from SMF.

NOTE: The SMF is not aware of whether there is a single PSA or multiple PSA controlled by I-SMF.

The following parameters are managed by the I-SMF:

- The 5G AN Tunnel Info.

- CN tunnel info between local UPFs.

- Network instance (if needed).

The N4 information exchanged between I-SMF and SMF are not associated with a N4 Session ID but are associated with an N16a association allowing the SMF to modify or delete the N4 information at a later stage.

The I-SMF generates an N4 Session ID and for each rule a Rule ID (unless the ones received from the SMF can be used) and maintains a mapping between the locally generated identifiers and the ones received from the SMF. The I-SMF replaces those IDs in the PDR(s), QER(s), URR(s) and FAR(s) received from the SMF. When the I-SMF receives the N4 information, the Network instance (if needed) included in the rules sent to the UPF is generated by I-SMF.

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