**3GPP TSG-RAN WG3 Meeting #110-e *R3-20xxxx***

**E-meeting, 2 – 12 Nov 2020**

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| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **37.340** | **CR** | **draftCR** | **rev** | **-** | **Current version:** | **15.10.0** |  |
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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 |  | Radio Access Network | **X** | Core Network | **X** |

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| ***Title:*** | End marker handling in case of MR-DC NG-RAN initiated QoS Flow offloading | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Huawei, Deutsche Telekom, Nokia, Nokia Shanghai Bell | | | | | | | | | |
| ***Source to TSG:*** | R3 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_NewRAT-Core | | | | |  | ***Date:*** | | | 2020-11-03 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **F** |  | | | | | ***Release:*** | | | Rel-15 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-15 (Release 15) Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18)* | |
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| ***Reason for change:*** | | Currently End marker handling is defined per GTP-U tunnel, works on all the QoS Flows in the same tunnel, and a G-PDU that arrives after an End Marker message on this tunnel may be silently discarded.  In case of MR-DC NG-RAN initiated QoS Flow offloading, only the G-PDU of the switched QoS flow could be discarded after End marker, the G-PDUs of other QoS flows shall not be discarded. | | | | | | | | |
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| ***Summary of change:*** | | Clarify the end marker handling at NG-RAN node in case of MR-DC NG-RAN initiated QoS Flow offloading.  Impact Analysis:  Impact assessment towards the previous version of the specification (same release):  This CR has isolated impact with the previous version of the specification (same release) because it only clarify the handling of end marker in case of MR-DC NG-RAN initiated QoS Flow offloading.  This CR has an impact under functional point of view.  The impact can be considered isolated because the change affects the handling of end marker in case of MR-DC NG-RAN initiated QoS Flow offloading. | | | | | | | | |
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| ***Consequences if not approved:*** | | The G-PDUs of the not offloaded QoS flow may be wrongly discarded. | | | | | | | | |
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| ***Clauses affected:*** | | 8.4, 10.14.3, 10.14.4 | | | | | | | | |
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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:*** | |  | | | | | | | | |

***--------Start of the first Change------***

## 8.4 User data forwarding

Upon EN-DC specific activities, user data forwarding may be performed for E-RABs for which the bearer type change from/to MN terminated bearer to/from SN terminated bearer is performed. The behaviour of the node from which data is forwarded is the same as specified for the "source eNB" for handover, the behaviour of the node to which data is forwarded is the same as specified for the "target eNB" for handover.

For MR-DC with 5GC, user data forwarding may be performed between NG-RAN nodes whenever the logical node hosting the PDCP entity changes. The behaviour of the node from which data is forwarded is the same as specified for the "source NG-RAN node" for handover, the behaviour of the node to which data is forwarded is the same as specified for the "target NG-RAN node" for handover.

For mobility scenarios which involve more than two RAN nodes, either direct or indirect data forwarding may be applied. Two transport layer addresses of different versions may be provided to enable that the source RAN node can select either IPv4 or IPv6.

For MR-DC with 5GC, offloading of QoS flows within one PDU session may be performed between NG-RAN nodes. The handling of End Marker packets in case of NG-RAN initiated PDU session split is described in clause 10.14.3 and 10.14.4.

***--------Start of the next Change------***

### 10.14.3 PDU Session Split at UPF (RAN initiated QoS flows offloading from MN to SN)

When some QoS flows are offloaded from the MN to the SN, the MN may decide to split the PDU session served by the MN into more than one NG-U tunnels. The MN sends the *SN Addition/Modification Request* message including UPF UL TEID address used at the MN. Later on, if the MN receives a new UL TEID in the *PDU Session Resource Modify Confirm* message, the MN may provide the new UL TEID to the SN.



Figure 10.14.3-1: PDU Session Split at UPF during RAN initiated PDU session resource modify (QoS flows offloading from MN to SN)

1-2. If the MN decides to split a PDU session, it uses the SN Addition procedure or the MN-initiated SN Modification procedure, including current UPF UL NG-U tunnel used at the MN. If in-order delivery is required for some QoS flows, an UL forwarding tunnel may be setup for the PDU session at this stage.

NOTE 1: In case the MN offloads some QoS flows to the SN within a PDU session already split between the MN and the SN, the MN initiated SN Modification procedure is used.

3-6d. If in-order delivery is required, the SN buffers the first packets received from the UE for a certain QoS flow until it receives an GTP-U end marker packet over the UL forwarding tunnel indicating that the MN has delivered all UL packets from the source side to UPF for that QoS flow. Then the SN starts delivering UL packets to UPF for that QoS flow using the UPF UL TEID address used at the MN received at step 1.

7-8. The MN uses the *PDU Session Resource Modify Indication* message to inform 5GC that the PDU session is split into two tunnels and indicate which QoS flows are associated with which DL tunnel. The 5GC triggers the sending of DL End Marker packets without QFI tag and confirms with the *PDU Session Resource Modify Confirm* message and allocates corresponding uplink tunnels.

After receiving the End Marker packet(s) from UPF, the MN determines that the End Marker packets only work on the offloaded QoS flows, and may stop delivering and discard DL packets of the offloaded QoS flows, and the MN shall continue transmiting DL packets for the not offloaded QoS flows, if any.9-10. If the MN receives a new UL TEID in the *PDU Session Resource Modify Confirm* message for itself, the MN will use it to deliver UL packets to UPF. If the MN receives a new UL TEID for the SN, then the MN-initiated SN Modification procedure (i.e., step 9 and step 10) is used to provide the new UL TEID to the SN and then the SN switches to use the new UL TEID to deliver UL packets.

10.14.4 PDU Session Split at UPF (RAN initiates QoS flows offloading from SN to MN)

When some QoS flows are offloaded from the SN to the MN, the MN may decide to split the PDU session served by the SN into more than one NG-U tunnels. If the MN requests to offload, the MN sends the *SN Modification Request* message to the SN. In case the SN requests to offload, the SN sends the *SN Modification Required* message to the MN.



Figure 10.14.4-1: PDU Session Split at UPF during RAN initiated PDU session resource modify (QoS flows offloading from SN to MN)

1a-1c. When the MN requests to offload some QoS flows from the SN to the MN for a PDU session, it sends the *SN Modification Request* message. If in-order delivery is required for some of the QoS flows, an UL forwarding tunnel may be setup for the PDU session at this stage and the MN provides the UL forwarding tunnel address information in the *Xn-U Address Indication* message.

2a-2b. When the SN requests to offload some QoS flows to the MN for a PDU session, the SN sends the *SN Modification Required* message. If in-order delivery is required for some of the QoS flows, an UL forwarding tunnel may be setup for the PDU session at this stage and the MN provides the UL forwarding tunnel address information in the *SN Modification Confirm* message.

3-6d. If in-order delivery is required, the MN buffers the first packets received from the UE for a certain QoS flow until it receives an GTP-U end marker packet over the UL forwarding tunnel indicating that the SN has delivered all UL packets from the source side to UPF for that QoS flow.

7-8. The MN uses the *PDU Session Resource Modify Indication* message to inform 5GC that the PDU session is split into two tunnels and indicate which QoS flows are associated with which DL tunnel. The 5GC triggers the sending of DL End Marker packets without QFI tag and confirms with the *PDU Session Resource Modify Confirm* message and allocates corresponding uplink tunnels.

After receiving the End Marker packet(s) from UPF, the SN determines that the End Marker packets only work on the offloaded QoS flows, and may stop delivering and discard DL packets of the offloaded QoS flows, and the SN shall continue transmiting DL packets for the not offloaded QoS flows, if any.

9-10. If the MN receives a new UL TEID in the *PDU Session Resource Modify Confirm* message for itself, the MN will use it to deliver UL packets to UPF. If the MN receives a new UL TEID for the SN, then the MN-initiated SN Modification procedure (i.e., the step 9 and step 10) is used to provide the new UL TEID to the SN and then the SN switches to use the new UL TEID to deliver UL packets.

***--------End of the Changes------***