**3GPP TSG-RAN2 Meeting #109bis-eR2-2004139**

**Electronic, 20 April – 30 April 2020**

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| *CR-Form-v12.0* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **38.300** | **CR** | **0222** | **rev** |  | **Current version:** | **16.1.0** |  |
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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 | **X** | Core Network |  |

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| ***Title:*** | Clarification on *pdcp-Duplication* at RRC Reconfiguration | | | | | | | | | |
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| ***Source to WG:*** | Samsung | | | | | | | | | |
| ***Source to TSG:*** | R2 | | | | | | | | | |
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| ***Work item code:*** | NR\_newRAT-Core | | | | |  | ***Date:*** | | | 2020-04-24 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **A** |  | | | | | ***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 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-12 (Release 12)* *Rel-13 (Release 13) Rel-14 (Release 14) Rel-15 (Release 15) Rel-16 (Release 16)* | |
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| ***Reason for change:*** | | This CR is a Category A CR for Rel-15: R2-2004138, CR#0221.  In the current specification, it is not clearly described if the “initial” state of duplication configured by RRC is the initial state 1) at the (very first) initial configuration of bearer conifgured with PDCP duplication or 2) at the reception of the reconfiguration, i.e. *pdcp-Duplication* IE. Those two interpretations could be equivalent to 1) the initial state is not changed during the lifetime of the radio bearer or 2) the initial state can be changed.  The correct interpretation is 2) the state at the reception of (re-)configuration, i.e. *pdcp-Duplication* IE and 2) the state can be changed by RRC signaling.  The source of this confusion comes from “initial” which needs to be deleted. Also, the clarification is necessary to avoid the further confusion. | | | | | | | | |
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| ***Summary of change:*** | | It is clarified that the initial state is “state of duplication at the time of (re-)configuration”.  **Impact Analysis**  Architecture options  Standalone and all MR-DC options  Impacted functionality  PDCP duplication  Inter-operability   1. If the network is implemented according to the CR and the UE is not, the UE may not configure the changed duplication status. UE may consider it as a reconfiguration failure. 2. If the UE is implemented according to the CR but the network is not, it is not clear if UE applies original configuration of duplication or ignore it. Since UE behavior is not clear, there could be an inefficiency that the network does not change the state of duplication and sends MAC CE after the reconifiguration. | | | | | | | | |
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| ***Consequences if not approved:*** | | How to configure and apply the (initial) state of duplication indicated by RRC remains unclear. | | | | | | | | |
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| ***Clauses affected:*** | | 16.1.3 | | | | | | | | |
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|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | | **X** |  | Other core specifications | | | | TS 38.331 CR1587 | | |
| ***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 changes

### 16.1.3 Packet Duplication

When duplication is configured for a radio bearer by RRC, at least one secondary RLC entity is added to the radio bearer to handle the duplicated PDCP PDUs as depicted on Figure 16.1.3-1, where the logical channel corresponding to the primary RLC entity is referred to as *the primary logical channel*, and the logical channel corresponding to the secondary RLC entity(ies), the *secondary logical channel(s)*. All RLC entities have the same RLC mode. Duplication at PDCP therefore consists in submitting the same PDCP PDUs multiple times: once to each activated RLC entity for the radio bearer. With multiple independent transmission paths, packet duplication therefore increases reliability and reduces latency and is especially beneficial for URLLC services.



Figure 16.1.3-1: Packet Duplication

NOTE: PDCP control PDUs are not duplicated and always submitted to the primary RLC entity.

When configuring duplication for a DRB, RRC also sets the state of PDCP duplication (either activated or deactivated) at the time of (re-)configuration. After the configuration, the PDCP duplication state can then be dynamically controlled by means of a MAC control element and in DC, the UE applies the MAC CE commands regardless of their origin (MCG or SCG). When duplication is configured for an SRB the state is always active and cannot be dynamically controlled. When configuring duplication for a DRB with more than one secondary RLC entity, RRC also sets the initial state of each of them (i.e. either activated or deactivated). Subsequently, a MAC CE can be used to dynamically control whether each of the configured secondary RLC entities for a DRB should be activated or deactivated, i.e. which of the RLC entities shall be used for duplicate transmission. Primary RLC entity cannot be deactivated. When duplication is deactivated for a DRB, all secondary RLC entities associated to this DRB are deactivated. When a secondary RLC entity is deactivated, it is not re-established, the HARQ buffers are not flushed, and the transmitting PDCP entity should indicate to the secondary RLC entity to discard all duplicated PDCP PDUs.

Editor’s note: For NR-DC, it is FFS how the nodes can coordinate RLC entities activation/deactivation between each other (pending RAN3 discussions)

When activating duplication for a DRB, NG-RAN should ensure that at least one serving cell is activated for each logical channel of the DRB; and when the deactivation of SCells leaves no serving cells activated for a logical channel of the DRB, NG-RAN should ensure that duplication is also deactivated.

When duplication is activated, the original PDCP PDU and the corresponding duplicate(s) shall not be transmitted on the same carrier. The primary and secondary logical channels can either belong to the same MAC entity (referred to as CA duplication) or to different ones (referred to as DC or DC+CA duplication). CA duplication can be configured together with DC duplication when duplication over more than two legs is configured in the UE. In CA duplication, logical channel mapping restrictions are used in MAC to ensure that the primary and secondary logical channels are not sent on the same carrier. When CA duplication is configured for an SRB, one of the logical channels associated to the SRB is mapped to SpCell.

When CA duplication is deactivated for a DRB, the logical channel mapping restrictions of the primary and secondary logical channels are lifted for as long as duplication remains deactivated.

When an RLC entity acknowledges the transmission of a PDCP PDU, the PDCP entity shall indicate to the other RLC entity(ies) to discard it. In addition, in case of CA duplication, when an RLC entity restricted to only SCell(s) reaches the maximum number of retransmissions for a PDCP PDU, the UE informs the gNB but does not trigger RLF.

End of changes