3GPP TSG-RAN WG2 #129bis R2-250xxxx

**Wuhan, China, April 7 – April 11, 2025**

**Agenda item:**8.7.1 (NR\_XR\_Ph3-Core)

**Source:** LG Electronics

**Title:** Discussion of [POST129][511][XR] PDCP running CR (LGE)

**Document for:** Report

# 1. Introduction

This document summarizes the discussion of the following offline discussion.

* [POST129][511][XR] PDCP running CR (LGE)

Scope: Update and review the CR

Intended outcome: Running CR for endorsement in the next meeting

Deadline: Long

# 2. Contact information

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# 3. Comments to the PDCP running CR v01

Companies are invited to list their comments on v01, using comment identifier (company ID and number), e.g. LGE001. The rapporteur will provide update based on the comments in proper time.

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| Comment identifier | Section | Comments and/or change suggestions | Rapporteur resolution |
| FW01 | 3.1 | About the last sentence in the définition of Delay-reporting PDCP SDU, we are not sure whether we need this sentence in the definition section. However, we definitely need to capture this in the RRC spec (in the description of this parameter in the *MAC-CellGroupConfig*). | Agree with the comment, but until the RRC captures it clearly, let’s keep it in PDCP for now. |
| HW001 | 3.1 | We think that there is no need to separately define this since it is only used in definition and can merge into delay reporting PDCP SDU definition. The wording can be merged into the definition of “Delay-reporting PDCP SDU” as follow  **Delay-reporting PDCP SDU**: if *pdu-SetDiscard* is not configured, a delay-reporting PDCP SDU associated with the i:th *dsr-ReportingThreshold* is a PDCP SDU for which the remaining time till *discardTimer* expiry is less than the i:th *dsr-ReportingThreshold* and larger than or equal to the i-1:th *dsr-ReportingThreshold* (if i>1) or larger than zero (if i=1). If *pdu-SetDiscard* is configured, a delay-reporting DCP SDU associated with the i:th *dsr-ReportingThreshold* is a PDCP SDU belonging to a PDU Set of which at least one PDU SDU has the remaining time till *discardTimer* expiry ~~the PDU Set remaining time is~~ less than the i:th *dsr-ReportingThreshold* and larger than or equal to the i-1:th *dsr-ReportingThreshold* (if i>1) or larger than zero (if i=1) and is the shortest remaining time till *discardTimer* expiry among the PDCP SDUs belonging to the PDU Set. The *dsr-ReportingThreshold*s configured for the PDCP entity are ordered in ascending order.  With the above, the following definition can be removed:  **~~PDU Set remaining time~~**~~: the shortest remaining time till~~ *~~discardTimer~~* ~~expiry among the PDCP SDUs belonging to the PDU Set.~~ | Actually, I tried various ways to describe the delay-reporting PDCP SDU, and your suggestion was one way of doing it. However, it is still unclear and difficult to understand.  For example, in your last sentence, it is unclear what the subject of “is”.  [Huawei0319] The ‘is’ in the sentence ‘and is the shortest…’ refers to the object ‘a PDU SDU’. Agree that the use of ‘is’ is not correct here and should be ‘being’. With this we do not see any confusión.  Therefore, I decided to introduce a new terminology of “PDU Set remainging time”. If other way of describing it is simple and clear, I’m happy to remove the new terminology, but your suggestion is more difficult to understand. |
| HW002 | 3.1 | On the following:  **Non-delay-reporting PDCP SDU**: a non-delay-reporting PDCP SDU associated with the i:th *dsr-ReportingThreshold* is a PDCP SDU that is associated with a COUNT value smaller than the largest COUNT value of the delay-reporting PDCP SDU associated with the i:th *dsr-ReportingThreshold*.  RAN2 agreement is that it is for “non-delay critical data ahead of delay critical data”, which means that the “non-delay-reporting PDCP SDU” should only be reported for reporting thresholds overlapped with the DSR triggering threshold.  The UE may also support including non-delay critical data ahead of delay critical data in the buffer size calculation for DSR, which is a capability indicated to the NW.  The definition above is for all the reporting thresholds. Suggest to update as follow:  **Non-delay-reporting PDCP SDU**: a non-delay-reporting PDCP SDU associated with the i:th *dsr-ReportingThreshold* is a PDCP SDU that is associated with a COUNT value smaller than the largest COUNT value of the delay-reporting PDCP SDU associated with the i:th *dsr-ReportingThreshold*, where the i:th *dsr-ReportingThreshold* overlaps with the *remainingTimeThreshold*. | There are different understanding of “delay critical data” in the previous agreement. I thought that the intention of the agreement was to include all data ahead of delay-reporting data. There may be different understanding of this, and I wanted to clarify in my document Proposal 2 in R2-2501243. This issue needs to be discussed in the next meeting.  [Huawei0319] We are just literally taking the agreement that RAN2 only perform this for data in front of delay critical data. If it is to be extended to all delay reporting data, then we need to discuss.  By the way, I don’t understand your suggestion clearly. Let’s take an example of Figure 3 in R2-2501243.    Assuming the remainingTimeThreshold = 10ms, is your suggestion that 2nd delay reporting data volume is only SDU9, i.e. not include SDU8?  [Huawei0319] In the TH3 reporting, the buffer status will include SDU 6, 7 and 9. For the TH2 delay reporting, the buffer status will include SDU 3 and 4 and for the TH1 delay reporting Will include both SDU 1 and 2.  We think our suggested text captured that well, but we are fine to discuss the wording further.  [Rapporteur0320]  I don’t understand how you derive such conclusion.  For TH1, the delay-reporting data volume should include SDU1~SDU7, because SDU2, 4, 7 are in the same PDU Set, and SDU1, 3, 5, 6 are ahead of the last delay-reporting SDU. With the same reasoning, for TH2, SDU8, 9 are reported, and for TH3, nothing is reported. |
| HW003 | 5.15 | Similar issue as HW002 in the following statement:  If *dsr-ReportNonDelayCriticalData* is configured, the transmitting PDCP entity shall further consider the following as delay-reporting PDCP data volume associated with the i:th *dsr-ReportingThreshold*, where the i:th *dsr-ReportingThreshold* overlaps with the *remainingTimeThreshold*: | See the reply to HW002. By the way, I don’t think your suggestion is clear. |
| HW004 | 5.15 | The following should include the highlighted red part, since the indication is referring to the i:th *dsr-ReportingThreshold*  The transmitting PDCP entity provides a delay-reporting indication associated with the i:th *dsr-ReportingThreshold* for the PDCP Data PDU to lower layers when:  [OPPO] We share a similar view as HW, as R19 DSR introduces multiple portions thus the lower layer should know which portion this PDCP PDU is associated with.  [Xiaomi] It is not needed since the next sentences has captured that the data is for portion i:th.  The transmitting PDCP entity provides a delay-reporting indication for the PDCP Data PDU to lower layers when:  - the PDCP Data PDU has already been submitted to lower layers and the corresponding PDCP SDU becomes a delay-reporting PDCP SDU associated with the i:th *dsr-ReportingThreshold*; or  - the PDCP Data PDU is submitted to lower layers and the corresponding PDCP SDU is already a delay-reporting PDCP SDU associated with the i:th *dsr-ReportingThreshold*. | This sentence describes the general behaviour of delay-reporting indication, and the bullets below this sentence clearly specifies that it is associated with the i:th dsr-ReportingThreshold. So, I think this change is not essential.  However, as two companies support with this change, I add this text in v02. |
| APP01 | 5.15 | For the following:  A delay-reporting PDCP SDU changes its associated *dsr-ReportingThreshold* as its remaining time decreases. The transmitting PDCP entity provides a delay-reporting indication for the PDCP Data PDU to lower layers each time the delay-reporting PDCP SDU changes its associated *dsr-ReportingThreshold*.  We tend to think whether/when PDCP update the delay-reporting indication to lower layer is an UE implementation issue. Some discussions in RAN2 may be needed to confirm if this has to be captured in the specification.  [Xiaomi] Similar view with Apple. This is not needed.  “The transmitting PDCP entity provides a delay-reporting indication for the PDCP Data PDU to lower layers” has already captured the rapporteur’s intention. | I agree that is an UE implementation issue. However, as the delay-critical indicaiton is already specified in the PDCP spec, having the similar text for delay-reporting indication would avoid any potential misunderstanding.  The transmitting PDCP entity provides a delay-critical indication for the PDCP Data PDU to lower layers when:  - the PDCP Data PDU has already been submitted to lower layers and the corresponding PDCP SDU becomes a delay-critical PDCP SDU; or  - the PDCP Data PDU is submitted to lower layers and the corresponding PDCP SDU is already a delay-critical PDCP SDU. |
| Sharp01 | 3.1 | The configuration of dsr-ReportingThresholds is done in RRC field description. It would be better to capture the following sentence in TS 38.331:  The *dsr-ReportingThreshold*s configured for the PDCP entity are ordered in ascending order | See my reply to FW01. |
| Sharp02 | 5.15 | We don’t think the following paragraph is needed. This is an internal UE behaviour which can be implemented in different ways. For example, the MAC entity decides the contents of the DSR MAC CE when it is triggered and about to send.  A delay-reporting PDCP SDU changes its associated *dsr-ReportingThreshold* as its remaining time decreases. The transmitting PDCP entity provides a delay-reporting indication for the PDCP Data PDU to lower layers each time the delay-reporting PDCP SDU changes its associated *dsr-ReportingThreshold*. | It is related to APP01.  If delay-reporting indication is kept, I think this text also needs to be kept.  Moreover, the RLC layer uses this indication to decide delay-reporting data volume. |
| OPPO001 | 5.15 | When time elapses, the portion that a PDCP SDU is associated with will be changed. If the delay-reporting indication has not yet been delivered, the PDCP layer only needs to provide the information based on the latest status. If the delay-reporting indication has already been provided to the lower layer, the PDCP layer can deliver a new indication for updating. However, we doubt the necessity of delay-reporting indication for a PDCP PDU each time its associated portion changes. This restricts the UE behaviour. We suggest leaving it to the UE implementation when/whether to update the delay-reporting indication to the lower layer.  A delay-reporting PDCP SDU changes its associated *dsr-ReportingThreshold* as its remaining time decreases. The transmitting PDCP entity provides a delay-reporting indication for the PDCP Data PDU to lower layers each time the delay-reporting PDCP SDU changes its associated *dsr-ReportingThreshold*. | See my reply to Sharp 02. |
| Xiaomi001 | 3.1 | Agree with HW001 that “**PDU Set remaining time**” is not needed since we have agreed that remaining timer is maintained per packet not per packet set.  Since as in legacy, if PDU set discard is configured, all the data of a packet set will be sorted into one portion associated with the shortest remaining time among PDCP SDUs in the packet set, we can say:  **Delay-reporting PDCP SDU**: if *pdu-SetDiscard* is not configured, a delay-reporting PDCP SDU associated with the i:th *dsr-ReportingThreshold* is a PDCP SDU for which the remaining time till *discardTimer* expiry is less than the i:th *dsr-ReportingThreshold* and larger than or equal to the i-1:th *dsr-ReportingThreshold* (if i>1) or larger than zero (if i=1). If *pdu-SetDiscard* is configured, a delay-reporting PDCP SDU associated with the i:th *dsr-ReportingThreshold* is a PDCP SDU belonging to a PDU Set of which the shortest remaining time till *discardTimer* expiry among the PDCP SDUs is less than the i:th *dsr-ReportingThreshold* and larger than or equal to the i-1:th *dsr-ReportingThreshold* (if i>1) or larger than zero (if i=1). The *dsr-ReportingThreshold*s configured for the PDCP entity are ordered in ascending order. | Actually, your suggestion was my first attempt. Note that your suggested text is exactly same as the definition of “PDU Set remaining time”.  **PDU Set remaining time**: the shortest remaining time till *discardTimer* expiry among the PDCP SDUs belonging to the PDU Set.  After I put it like that, I decided to introduce a definition of PDU Set remaining time, because it was too wordy and difficult to understand.  I still think using the PDU Set remaining time is clean and simple, but if more companies want to remove the new terminology, I’ll update the text. |
| Xiaomi002 | 3.1 | Agree with Sharp01 that “The *dsr-ReportingThreshold*s configured for the PDCP entity are ordered in ascending order. ” should be captured in 331. | See my reply to FW01. |
| Xiaomi003 | 3.1 | **Non-delay-reporting PDCP SDU**: a non-delay-reporting PDCP SDU associated with the i:th *dsr-ReportingThreshold* is a PDCP SDU that is associated with a COUNT value smaller than the largest COUNT value of the delay-reporting PDCP SDU associated with the i:th *dsr-ReportingThreshold*.  According to the agreement:   * The UE may also support including non-delay critical data ahead of delay critical data in the buffer size calculation for DSR, which is a capability indicated to the NW.   If we take the same definition of delay-reporting data as the delay critical data, then non-delay-reporting data should be defined similarly as non-delay critical data which is data whose remaining timer is above a threshold or data of low importance.  Do not need to specify the COUNT. Anyway, a packet with smaller COUNT does not mean it is put ahead in the buffer queue.  We first need to define what is non-delay-reporting data. And when it comes to the sorting, for a portion, PDCP adds the non-delay-reporting data buffered ahead delay-reporting data into this portion. | First, there is no definition of “non-delay-critical data” in the PDCP spec.  Secondly, the delay-critical data volume does not include non-delay-critical PDCP SDU ahead of delay-critical PDCP SDU.  Thus, there is no reference to follow when defining non-delay-reporting PDCP SDU.  Regarding COUNT, I don’t agree with what you are saying, “a packet with smaller COUNT does not mean it is put ahead in the buffer queue”. Placing a SDU in the buffer may be in arbitrary order, but from the specification point of view, SDU with lower COUNT should be regarded as ahead of SDU with higher COUNT. |
| Xiaomi 004 | 5.14 | For the purpose of MAC delay status reporting, the transmitting PDCP entity shall consider the following as delay-reporting PDCP data volume associated with the i:th *dsr-ReportingThreshold*:  - the delay-reporting PDCP SDUs associated with the i:th *dsr-ReportingThreshold* for which no PDCP Data PDUs have been constructed, and are not considered as delay-reporting PDCP data volume associated with any of the k:th *dsr-ReportingThreshold* where k < i;  The intention here is for PDCP to indicate the delay-reporting data for portion i which is defined as:  **Delay-reporting PDCP SDU**: if *pdu-SetDiscard* is not configured, a delay-reporting PDCP SDU associated with the i:th *dsr-ReportingThreshold* is a PDCP SDU for which the remaining time till *discardTimer* expiry is less than the i:th *dsr-ReportingThreshold* and larger than or equal to the i-1:th *dsr-ReportingThreshold* (if i>1) or larger than zero (if i=1).  Why this part of data is calculated in “ any of the k:th *dsr-ReportingThreshold* where k < I”? | Without the highlighted part, one SDU can be calculated multiple times in different dsr-ReportingThresholds.  The intention is to calculate a SDU only in one dsr-ReportingThreshold. |
| **Put your comments in the next section** | | | |

# 4. Comments to the PDCP running CR v02

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| Comment identifier | Section | Comments and/or change suggestions | Rapporteur resolution |
| Len001 | 3.1 | For the definition of Non-delay-reporting PDCP SDU, the wording is a bit unclear. We prefer to not define it based on COUNT value since the discardTimer is already started for a PDCP SDU before it is associated with a COUNT value. By the given definition, only those PDCP SDUs associated with a COUNT value will be considered whereas any PDCP SDUs whose discardTimer is running but yet to be associated with a COUNT value will not be considered.  We have similar view as HW002. RAN2 did not have any separate discussion/ agreement for defining a “PDU Set remaining time”, and so we prefer to merge that with the definition of Non-delay-reporting PDCP SDU. | For COUNT, it is strange to me that PDCP SDU not associated with COUNT is considered in delay-reporting data volume calculation.  For PDU Set remaining time, see my reply to Xiaomi001. |
| E001 | 3.1 | We agree with rapporteurs description of what data will be included in the delay-reporting data volume in answer to HW002 and for this rapporteurs current description seems to work. We are as perplexed as rapporteur of the opposite proposed counting.  For the ones questioning using COUNT in the description it is unclear what should be used instead. We had a proposal in R2-2500982 to simply refer to the order packets will be transmitted, but using COUNT may be more precise. | Thanks. I have same understanding. |
| E002 | 5.15 | Wonder what is the reason that the mention of "for which no PDCP Data PDUs have been constructed” is not included for the non-delay-reporting PDCP SDUs as is done for all the other similar cases. | Yes, you are correct. It is just a mistake. I’ll add the sentence in the v03. |
| N001 | 3.1 | We share the rapporteur’s understanding on the delay-reporting data volume calculation. While it’s unclear how HW arrived at such calculation, they may have calculated the data volume from the highest threshold. It might be beneficial to specify that the data volume is calculated from the lowest threshold (Note that it is not about whether the threshold itself is in ascending order). | Thanks. I have same understanding. |
| N002 | 3.1 | On COUNT – Since start of *discardTimer* and association of the COUNT are specified separately, it is theoretically possible for an SDU to exist without an assigned COUNT. However, because COUNT must be assigned before e.g. ciphering and integrity protection, we consider this to be a marginal issue. In addition, we see no better alternative for using COUNT to describe what’s ahead in the queue. | Thanks. I have same understanding. |
| N003 | 5.15 | For the purpose of MAC delay status reporting, the transmitting PDCP entity shall consider the following as delay-reporting PDCP data volume associated with the i:th *dsr-ReportingThreshold*:  - the delay-reporting PDCP SDUs associated with the i:th *dsr-ReportingThreshold* for which no PDCP Data PDUs have been constructed, and are not considered as delay-reporting PDCP data volume associated with any of the k:th *dsr-ReportingThreshold* where k < i;  Shouldn’t also the non-delay-reporting PDCP SDUs part below include the highlighted text? Otherwise, it seems that the 1st bullet will also report the SDUs of the 2nd bullet, which may result in double reporting?  If *dsr-ReportNonDelayCriticalData* is configured, the transmitting PDCP entity shall further consider the following as delay-reporting PDCP data volume associated with the i:th *dsr-ReportingThreshold*:  - the non-delay-reporting PDCP SDUs associated with the i:th *dsr-ReportingThreshold*, and are not considered as delay-reporting PDCP data volume associated with any of the k:th *dsr-ReportingThreshold* where k < i;  - the PDCP Data PDUs that contain the non-delay-reporting PDCP SDUs associated with the i:th *dsr-ReportingThreshold* and have not been submitted to lower layers, and are not considered as delay-reporting PDCP data volume associated with any of the k:th *dsr-ReportingThreshold* where k < i. | I don’t clearly understand your question.  As commented in E002, I add the sentence ‘for which no PDCP Data PDUs have been constructed’ after the green text in v03. Can this solve your concern ? |
| FJ001 | 3.1 | For the definition of Non-delay-reporting PDCP SDU, we prefer not to use COUNT value to reflect the non-delay-critical data ahead of delay-critical data. Based on companies’ contributions and previous discussion, there may be several scenarios for non-delay-critical data ahead of delay-critical data:  1. Low importance data when *discardTimerForLowImportance* is configured and PSI based discard is activated;  2. non-delay-critical data ahead of queue for the same LCH;  3. non-delay-critical data in another LCH which has higher priority than the LCH which has delay-critical data.  To cover all the cases, one solution is to use a general definition like the following:  **Non-delay-reporting PDCP SDU**: a non-delay-reporting PDCP SDU associated with the i:th *dsr-ReportingThreshold* is a PDCP SDU that isnot a delay-reporting PDCP SDU associated with the k:th *dsr-ReportingThreshold* where k<i (if i>1), and is ahead of a delay-reporting PDCP SDU associated with the i:th *dsr-ReportingThreshold* but behind all delay-reporting PDCP SDU(s) associated with the i-1:th *dsr-ReportingThreshold* (if i >1) in the buffer. | From the specification point of view, ‘ahead’ and ‘behind’ are very vague terminologies, and should be avoided. What else can clearly describe than using COUNT? |
| FJ002 | 5.15 | Similar to Xiaomi004, we think the following two highlighted parts are redundant since the definition of delay-reporting PDCP SDU has already avoided the overlapping parts, i.e., a SDU only belongs to one portion:  For the purpose of MAC delay status reporting, the transmitting PDCP entity shall consider the following as delay-reporting PDCP data volume associated with the i:th *dsr-ReportingThreshold*:  - the delay-reporting PDCP SDUs associated with the i:th *dsr-ReportingThreshold* for which no PDCP Data PDUs have been constructed, and are not considered as delay-reporting PDCP data volume associated with any of the k:th *dsr-ReportingThreshold* where k < i;  - the PDCP Data PDUs that contain the delay-reporting PDCP SDUs associated with the i:th *dsr-ReportingThreshold* and have not been submitted to lower layers, and are not considered as delay-reporting PDCP data volume associated with any of the k:th *dsr-ReportingThreshold* where k < i; | As commented in Xiaomi004, without the highlighted part, one SDU can be calculated multiple times in different dsr-ReportingThresholds.  For example of Figure 3 in R2-2501243.    The SDU3, 6, 9 belong to PDU Set 2, and they are delay-reporting PDCP SDU #2. But the SDU3 and 6 are already included in the delay-reporting PDCP data volume #1, so they should not be included in the delay-reporting PDCP data volume #2. Without the highlighted part, the SDU3, 6 are included in both delay-reporting PDCP data volume #1 and #2. |
| FJ003 | 5.15 | We think the following two parts about “k<i” should be “k<=i” to avoid duplicate reporting, since a non-delay-reporting PDCP SDU may be counted as a delay-reporting PDCP SDU for the same i.  If *dsr-ReportNonDelayCriticalData* is configured, the transmitting PDCP entity shall further consider the following as delay-reporting PDCP data volume associated with the i:th *dsr-ReportingThreshold*:  - the non-delay-reporting PDCP SDUs associated with the i:th *dsr-ReportingThreshold*, and are not considered as delay-reporting PDCP data volume associated with any of the k:th *dsr-ReportingThreshold* where k < i;  - the PDCP Data PDUs that contain the non-delay-reporting PDCP SDUs associated with the i:th *dsr-ReportingThreshold* and have not been submitted to lower layers, and are not considered as delay-reporting PDCP data volume associated with any of the k:th *dsr-ReportingThreshold* where k < i. | I don’t think so. That part is to avoid double calculation of a same SDU in the i:th data volume if it was already included in the k(<i):th data volume. |
| **Put your comments in the next section** | | | |

# 5. Comments to the PDCP running CR v03

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| Comment identifier | Section | Comments and/or change suggestions | Rapporteur resolution |
| V001 | 3.1 | On the definition of “Non-delay-reporting PDCP SDU”,  We share the similar views above: the wording is a bit unclear and strange and prefer not to base on COUNT value. We are happy to start from the suggestion based on FJ001 |  |
| V002 | 5.15 | Suggest to update as below, as the current wording missed this part. In the definition of Delay-reporting PDCP SDU, it is also mentioned the configuration is ordered in ascending order.  For the purpose of MAC delay status reporting, the transmitting PDCP entity shall evaluate the delay-reporting PDCP data volume in ascending order of *dsr-ReportingThreshold* and consider the following as delay-reporting PDCP data volume associated with the i:th *dsr-ReportingThreshold*: |  |
| V003 | 5.15 | On “The transmitting PDCP entity provides a delay-reporting indication for the PDCP Data PDU to lower layers when:”  We think it is a bit vague to simply say “delay-reporting indication”.  Add “associated with the i:th dsr-ReportingThreshold” |  |