3GPP TSG-RAN WG2 #116e R2-21xxxxx

Electronic Meeting, 1 – 12 November 2021

Agenda Item: 5.3.2 / 6.1.3.3

Source: Samsung

Title: [AT116-e][007][NR1516] PDCP (Samsung)

Release: Rel-15/16

Document for: Discussion and Decision

# 1 Introduction

This document is to handle the following email discussion:

* [AT116-e][007][NR1516] PDCP (Samsung)

Scope: Determine agreeable parts in a first phase, for agreeable parts agree on CRs. Treat [R2-2111027](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116-e/Docs/R2-2111027.zip) (AI 5.3.2), [R2-2109945](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116-e/Docs/R2-2109945.zip), [R2-2109946](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116-e/Docs/R2-2109946.zip), [R2-2109947](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116-e/Docs/R2-2109947.zip), [R2-2110757](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116-e/Docs/R2-2110757.zip), [R2-2110758](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116-e/Docs/R2-2110758.zip)

Intended outcome: Report, Agreed CRs if applicable

Deadline: Schedule 1

The following documents are to be treated in this email discussion:

## 5.3.2 RLC PDCP SDAP

[R2-2111027](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116-e/Docs/R2-2111027.zip) On association between RLC entities and PDCP entity Huawei, HiSilicon discussion Rel-15 NR\_newRAT-Core

## 6.1.3.3 PDCP

[R2-2109945](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116-e/Docs/R2-2109945.zip) Clarification on the ciphering of LTE EHC header Samsung discussion Rel-16 NR\_IIOT-Core

[R2-2109946](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116-e/Docs/R2-2109946.zip) CR for the ciphering of LTE EHC header (Rel-15) Samsung CR Rel-15 36.323 15.6.0 0297 - F NR\_IIOT-Core

[R2-2109947](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116-e/Docs/R2-2109947.zip) CR for the ciphering of LTE EHC header (Rel-16) Samsung CR Rel-16 36.323 16.4.0 0298 - A NR\_IIOT-Core

[R2-2110757](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116-e/Docs/R2-2110757.zip) Clarification on joint EHC and RoHC operation MediaTek Inc. CR Rel-16 38.323 16.5.0 0083 - F NR\_IIOT-Core

[R2-2110758](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116-e/Docs/R2-2110758.zip) Clarification on joint EHC and RoHC operation MediaTek Inc. CR Rel-16 36.323 16.4.0 0299 - F NR\_IIOT-Core

2 Contact Information

The rapporteur encourages the delegates who provide input to provide their contact information in the below table:

|  |  |
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# 3 Discussion

## [R2-2111027](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116-e/Docs/R2-2111027.zip) On association between RLC entities and PDCP entity Huawei, HiSilicon discussion Rel-15 NR\_newRAT-Core

**Proposal 1: RAN2 to discuss whether it is possible to lift the restriction about the symmetric association between RLC entities and PDCP entity in PDCP spec, to allow building asymmetric UM RLC entities for a radio bearer with marginal spec impact but offer much more flexibility.**

**Q1. Do you agree to lift the restriction about the symmetric association between RLC entities and PDCP entity specified in 38.323 to allow building asymmetric UM RLC entities for a radio bearer?**

|  |  |  |
| --- | --- | --- |
| Company | Agree/Disagree | Comments |
| Huawei, HiSilicon | Agree | Proponent, we don’t see much value to set this limitation in spec. |
| LGE | Comments | We have some sympathy for proposal. But, this change should not be considered for Rel-15/16. It could be discussed for TEI17. |
| ZTE | Not for R15 | It can only be discussed in TEI 17 |
| Nokia | Disagree | A more practical correction would be to not count RLC UM entities but regardless of the change, this should be TEI17. |
| MediaTek | Not for Rel15 | We do not see a reason to change Rel-15 specs for this. This can be discussed as part of TEI17 |
| OPPO | Not for R15 | We think such change should not be considered for R15/16, to avoid the potential backward compatibility issue. Can be discussed in TEI 17. |
| Futurewei | - | We generally agree with the concept, which seems to be beneficial for some use cases. |
| QCOM | Agree | I would like to suggest to use the existing clause as upper limit and allow to configure fewer RLC entities than the current specification to avoid abuse. |
| Samsung | Disagree | It should be discussed in TEI17. |
| Xiaomi | Not for R15 | This can be discussed in TEI17. |
| Apple | See comment | We are not totally against a clarification in the PDCP spec. At the same time, we do not see this change as very essential. It’s probably a bit late to introduce to Rel-15 and Rel-16 now. |
| Intel | Not for Rel-15/16 | The benefits of removing restrictions on logical channels is not obvious - for example, it should not have any impact on UL power limitation. We don’t think this is an essential correction, but we’re OK to discuss it in Rel-17. |
| vivo | See comment | We do not see this change is very essential, as the description of the association between RLC entities and PDCP entity in PDCP spec is captured in the general chapter. From our view, this will not restrict implementation. |
| CATT | Not for Rel15/16 | May consider in TEI17 |

## [R2-2109945](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116-e/Docs/R2-2109945.zip) Clarification on the ciphering of LTE EHC header Samsung discussion Rel-16 NR\_IIOT-Core

[R2-2109946](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116-e/Docs/R2-2109946.zip) CR for the ciphering of LTE EHC header (Rel-15) Samsung CR Rel-15 36.323 15.6.0 0297 - F NR\_IIOT-Core

[R2-2109947](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116-e/Docs/R2-2109947.zip) CR for the ciphering of LTE EHC header (Rel-16) Samsung CR Rel-16 36.323 16.4.0 0298 - A NR\_IIOT-Core

**Reason for change:**

In RAN2#107bis, RAN2 made the following agreements:

* The EHC function is in PDCP
* The EHC header is located after the SDAP header, and it is ciphered

However, it is not clear whether to cipher the EHC header in the current PDCP specification.

**Q2. Do you agree to clarify the ciphering of LTE EHC header in 36.323 given that RAN2 already clarified the ciphering of NR EHC header in 38.323 in the last meeting?**

|  |  |  |
| --- | --- | --- |
| Company | Agree/Disagree | Comments |
| Huawei, HiSilicon | Agree, but | We still don’t think it is essential. But we can follow the majority view. |
| LGE | Agree |  |
| ZTE | Follow the majorities | No strong view. |
| Nokia | agree |  |
| MediaTek | Agree |  |
| OPPO | No strong view. | Can follow the majority view. |
| Futurewei | - | We don’t think the clarification is critically needed, because from Figure 5.14.7.1, we know that at least the EHC header is not a part of the PDCP header. And we know that for a LTE user plane PDCP PDU associated with a PDCP SDU, ciphering applies to everything except the PDCP PDU header. So, we would not characterize the issue as being completely unclear whether to cipher the EHC header or not.  However, if companies feel strongly that clarification is needed, Option 1 would be better, because Option 2 would create a new problem for the UDC header, as explained in our response to the next question. |
| QCOM | Agree | It’s a good to have a generic statement/note |
| Samsung | Agree | The justification was discussed sufficiently in the last meeting. |
| Xiaomi | Agree |  |
| Apple | Agree | OK to align LTE with NR. |
| Intel | Agree |  |
| vivo | Agree |  |
| CATT | Agree |  |

**Q3. Which option do you prefer if you agree to clarify the ciphering of LTE EHC header in 36.323? or do you have any other suggestion?**

|  |
| --- |
| **Option 1 (LTE style)** 6.3.3 Data Length: Variable  The Data field may include either one of the following:  - Uncompressed PDCP SDU (user plane data, or control plane data); or  - Compressed PDCP SDU (user plane data only); or  - UDC header and UDC Data Block if UDC is configured.  - EHC header and compressed PDCP SDU if EHC is configured. |

If we go for Option 1, then one Rel-16 CR would be needed.

|  |
| --- |
| **Option 2 (NR style)** 6.3.3 Data Length: Variable  The Data field may include either one of the following:  - Uncompressed PDCP SDU (user plane data, or control plane data); or  - Compressed PDCP SDU (user plane data only); or  NOTE: All fields other than PDCP PDU header and MAC-I belong to Data field.‎ |

If we go for Option 2, then one Rel-15 CR and one Rel-16 CR would be needed.

|  |  |  |
| --- | --- | --- |
| Company | Preferred option | Comments |
| Huawei, HiSilicon | Option 2 with revisions | If we have to have a CR, we can compromise to Option 2 with revisions in order to align with NR spec, but we don’t think the last bullet of “UDC header and UDC Data Block if UDC is configured” should be removed. We see no issue with this bullet for the proposed NOTE. It is worthy noting that we should minimize the CR maintenance burden for developers especially it is just to beautify the LTE text. |
| LGE | Option 2 | We don’t understand Huawei’s concern. The NOTE covers UDC, and leaving the UDC bullet makes more confusion.  [LC]: Sorry I should be clearer when making the comment. Our concern is to remove the legacy text will cause more confusion for the developers to trace the CR history for internal implementation check. Given that Option 2 doesn’t affect the UDC bullet but to address EHC case, we don’t see a strong reason to remove LTE text and we can only compromise to add a generic NOTE. |
| Nokia | Option 2 with revisions | UDC header and UDC data block" line should not be removed since "UDC data block" is used instead of "Data" in PDU formats from section 6.2.14 till 6.2.16. |
| MediaTek | Option 2 with revisions | Agree with Nokia’s reasoning above |
| OPPO | Option 2 with revisions |  |
| Futurewei | Option 1 | In 38.323, the EHC header is added inside the SDAP header and therefore is impossible to be mistaken as a part of the PDCP PDU header. Hence, the simple Note in 38.323 leaves no room for ambiguity.  However, in 36.323, there is no SDAP header sandwiched between the PDCP PDU header and the EHC or UDC header. Therefore, it is better to make it clear that the EHC header and the UDC header are a part of the Data field. Actually, the EHC header is in a better situation than the UDC header. At least, in Figure 5.14.7.1, it is clear that the EHC header is not a part of the PDCP header. On the other hand, the UDC bullet being deleted in Option 2 is the only place currently in 36.323 that clearly indicates that the UDC header is a part of the Data field. The color code used on the UDC header in Figure 6.2.14.1, Figure 6.2.15.1, and Figure 6.2.16.1 doesn’t help at all. (It would have been better, had they all been painted with the same color as the UDC Data Block field.)  If Option 2 is adopted, i.e., if the UDC bullet is deleted, it may become ambiguous whether the UDC header is a part of the PDCP PDU header (hence not ciphered) or a part of the Data field (hence ciphered).  If we have to go with Option 2, then we would agree with Huawei and Nokia that the UDC bullet should not be removed. |
| Samsung | Option 2 with revisions | Nokia’s comment is reasonable to us. |
| Xiaomi | Option 2 with revisions | Agree with Nokia’s comment. |
| Apple | Option 2 with revisions | A generic note (option 2) is clean and covers all cases. We are fine to keep the legacy text for the reasons mentioned by Nokia. |
| Intel | Option 2 with revisions | Agree with Nokia’s comment. |
| vivo | Option 2 with revisions | Agree with Nokia’s comment. |
| CATT | Option 2 with revisions | Agree with Nokia’s comment. |

**Q4. Do you agree to both** [**R2-2109946**](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116-e/Docs/R2-2109946.zip) **(Rel-15 CR) and** [**R2-2109947**](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116-e/Docs/R2-2109947.zip) **(Rel-16 CR) if you prefer Option 2?**

|  |  |  |
| --- | --- | --- |
| Company | Agree/Disagree | Comments |
| Huawei, HiSilicon | Agree with revisions | As above |
| LGE | Agree |  |
| Nokia | Agree with changes | See above |
| MediaTek | Agree with changes | See above |
| OPPO | Agree with changes | See above |
| Futurewei | Disagree | As explained in our response to the previous question, if the UDC bullet is deleted, it may become ambiguous whether the UDC header is a part of the PDCP PDU header (hence not ciphered) or a part of the Data field (hence ciphered). |
| Samsung | Agree with changes | See above |
| Xiaomi | Agree with changes | See above |
| Apple | Agree with changes | See above |
| Intel | Agree with changes | See above. |
| vivo | Agree with changes | See above |
| CATT | Agree with changes | See above. |

## [R2-2110757](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116-e/Docs/R2-2110757.zip) Clarification on joint EHC and RoHC operation MediaTek Inc. CR Rel-16 38.323 16.5.0 0083 - F NR\_IIOT-Core

[R2-2110758](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116-e/Docs/R2-2110758.zip) Clarification on joint EHC and RoHC operation MediaTek Inc. CR Rel-16 36.323 16.4.0 0299 - F NR\_IIOT-Core

**Reason for change:**

When ROHC and EHC are jointly configured for a DRB, the current specifications require the EHC decompressor to bypass the ROHC decompressor for non-IP packets. When this operation was discussed in R2-109e, the understanding was that the EHC decompressor could detect the presence or absence of an IP header from the Ether type field in the Ethernet header (post decompression). Hence the following agreement was reached:

*When a DRB is configured with RoHC and EHC, the receiver/decompressor behaviour* ***for a packet that has non-IP Ethertype (after EHC decompression) is to bypass RoHC*** *and deliver the packet directly to higher layers.*

This agreement is currently captured in the PDCP specification as below:

*If a PDCP Data PDU including non-IP Ethernet packet is received from lower layers, the EHC decompressor shall bypass the ROHC decompressor and deliver the EHC decompressed non-IP Ethernet packet to upper layers*

However, the above requirement does not consider the case where the Ethernet header uses the Length field in place of the Ether type field. If the length field is used, there **is no way** for the EHC decompressor to know if the PDCP data PDU contains an IP packet or a non-IP packet, and the decompressor cannot meet the requirement above. Therefore, the specification needs to be updated to clarify that a mix of IP and non-IP packets can only be expected by the EHC decompressor, if the Ether type field is present in the Ethernet header.

|  |
| --- |
| **Proposed change**  5.12.7 Simultaneous configuration of ROHC and EHC  If both ROHC and EHC are configured for a DRB, the ROHC header shall be located after the EHC header. Figure 5.12.7-1 shows the location of the ROHC header and the EHC header in a PDCP Data PDU.      **Figure 5.12.7-1: Location of ROHC header and EHC header in a PDCP Data PDU**  If a PDCP SDU including non-IP Ethernet packet is received from upper layers, the EHC compressor shall bypass the ROHC compressor and submit the EHC compressed non-IP Ethernet packet to lower layers according to clause 5.2.1.  If a PDCP Data PDU including non-IP Ethernet packet is received from lower layers, the EHC decompressor shall bypass the ROHC decompressor and deliver the EHC decompressed non-IP Ethernet packet to upper layers according to clause 5.2.2.  If both ROHC and EHC are configured for a DRB, the DRB is only expected to have a mix of IP and non-IP packets if the Ethernet header contains the TYPE field. |

**Q5. Do you agree to** [**R2-2110757**](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116-e/Docs/R2-2110757.zip) **(38.323) and** [**R2-2110758**](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116-e/Docs/R2-2110758.zip) **(36.323)?**

|  |  |  |
| --- | --- | --- |
| Company | Agree/Disagree | Comments |
| Huawei, HiSilicon |  | We think it is an internal UE implementation issue. Not sure if any spec update is needed on top of the previous agreement on “bypass ROHC/EHC for a non-IP packet”. Nevertheless, we understand the most critical issue is how to align the understanding on both transmitter and receiver. We need more time to check and tend to believe it is not a sensible/feasible approach to limit the network configuration.  *[MTK]: This isn’t a UE implementation issue. The same issue exists at the NW decompressor side when UL EHC is used. However, it’s a valid point that a better approach would be to align compressor and decompressor rather than limit NW configuration. A solution could be to specify that the RoHC compression is skipped if the Ethertype field is absent or if Ethertype field indicates that the packet is non-IP.* |
| LGE | Comments | We want to clarify first whether a mix of IP packet and non-IP packet is possible for one DRB. If mix is not allowed, the EHC decompressor can bypass the ROHC decompressor by configuration. Otherwise, internal check should be done by the EHC decompressor. But for internal check, we are wondering whether it is possible for the EHC decompressor to know whether the included field is LENGTH or TYPE field. We need more time to check whether the addressed problem is a real problem, and whether the proposed solution can solve the addressed problem.  *[MTK]: A mix of IP and non-IP packets are possible for an Ethernet PDU session as discussed in Rel-16. This is the reason why RoHC bypass behaviour was specified when EHC and RoHC are jointly configured. The EHC decompressor will know whether the included field is LENGTH or TYPE by the value indicated in the header.* |
| Nokia | Disagree | It is understood that EHC compressor and decompressor can identify if the PDCP SDU is an IP or non-IP Ethernet packet only if "Type" field is present in Ethernet header. If "Length" field is present in Ethernet header, EHC compressor cannot identify if it is an IP or non-IP Ethernet packet, hence EHC compressor should never bypass ROHC compressor. Similar logic applies for decompressor as well.  The proposed text should not be added in PDCP spec for the following reasons:  1) For the reason mentioned above  2) The text is not related to PDCP protocol and it is just additional information about the type of data expected for the DRB, hence not relevant to this spec.  *[MTK]: The logic stated above (EHC compressor bypasses RoHC if length field is present) isn’t present in the specification and therefore cannot be assumed to be always true. A solution for the issue raised could be to specify that the compressor follows the logic stated above.* |
| MediaTek | Agree; open to solutions (proponent) | The issue here is that when there’s a mix of IP and non-IP traffic along with an Ethernet header which uses the length field (instead of Ethertype), there is no way for the decompressor to know if an IP packet follows the Ethernet header or not. Therefore the decompressor does not know whether RoHC decompression should take place or not.  We are open to solutions for this issue. As indicated by Huawei and Nokia above, one option could be to specify the compressor behaviour so that it aligns with the decompressor. This would require compressor behaviour to be specified in PDCP as below:   1. Ethernet Frame with Ethertype indicating IP packet: perform RoHC compression. 2. Ethernet Frame with Ethertype indicating non-IP packet: bypass RoHC compression. 3. Ethernet Frame with Length: bypass RoHC compression.   Please see replies inline above as well. |
| OPPO | Disagree | The value range for "Type" field and "Length" field is different, thus the EHC compressor and decompressor can identify it is "Type" field or "Length" field. If it is "Type" field, they can know the packet type, otherwise, they can know the packet type by further checking e.g. LLC field (SSAP and DSAP). According to this text “If a PDCP SDU including non-IP Ethernet packet is received from upper layers”, it implicitly indicates it is the case that the packet type can be identified. There is no restriction on how the entity identifies the packet type. |
| Futurewei | Disagree | The proposed text is a wish list, not a specification. Instead of specifying what we wish to happen, we should specify what the EHC compressor’s and EHC decompressor’s behaviors should be when an Ethernet packet with the Ethernet header containing the Length field, instead of the Type field, is received, for example, always bypassing (or not bypassing) the RoHC compressor/decompressor. If always bypassing, a TP can be the following:  If a PDCP SDU including non-IP Ethernet packet or including an Ethernet packet with the Ethernet header containing the Length field is received from upper layers, the EHC compressor shall bypass the ROHC compressor and submit the EHC compressed ~~non-IP~~ Ethernet packet to lower layers according to clause 5.2.1.  If a PDCP Data PDU including non-IP Ethernet packet or including an Ethernet packet with the Ethernet header containing the Length field is received from lower layers, the EHC decompressor shall bypass the ROHC decompressor and deliver the EHC decompressed ~~non-IP~~ Ethernet packet to upper layers according to clause 5.2.2. |
| QCOM | Agree | The EHC+ROHC on the same frame is possible, when the ETH frame containing a IP pkt. The compressor compresses the ETH payload (IP pkt) using ROHC, and compresses the ETH header using EHC. However, this requires the compressor to identify whether the ETH payload is IP pkt or not, which is possible only if the “length/type” field is ethertype. The “length/type” field is overloaded with 2 meanings below, length or type. If “length/type” field means “length”, there is no way for the compressor to tell if the ETH payload is IP or not |
| Samsung | Agree, but | We have some sympathy with the intention. However, we don’t think the proposed change fully resolves the issue.  As Rapporteur, How to resolve the issue could be discussed in the second phase together with whether to postpone it to the next meeting. It would be better that the opponent can clarify how the decompressor can identify if PDCP SDU is IP or non-IP packet when Length field is used in Ethernet header in the second phase. If the majority prefer to have time to check, then we can postpone it to the next meeting. |
| Xiaomi | Agree with the intention | We agree with comments provided by both QCOM and Samsung. |
| Apple | Disagree | A restriction as to what application layer content can be transferred over a DRB is not so desirable. In fact, what is captured in the current PDCP specification already covers the case in a generic manner. The PDCP spec should be agnostic to details (such as the TYPE field in the Ethernet header) from other layers.  Current wording in the PDCP spec:  If a PDCP SDU including non-IP Ethernet packet is received from upper layers, the EHC compressor shall bypass the ROHC compressor and submit the EHC compressed non-IP Ethernet packet to lower layers according to clause 5.2.1.  If a PDCP Data PDU including non-IP Ethernet packet is received from lower layers, the EHC decompressor shall bypass the ROHC decompressor and deliver the EHC decompressed non-IP Ethernet packet to upper layers according to clause 5.2.2. |
| Intel | Comments | Agree with the intention, but as in TS 24.501 clause 6.2.2, for Ethernet type PDU session, only “EtherType as defined in IEEE 802.3” is supported. So we think the proposed restriction is already in CT1 specification, and there might be no need to add the same restriction in RAN2 spec. |
| vivo | Disagree | We do not see this issue really exists. When the Length/Type field is interpreted as Length, it corresponds to 802.3 Ethernet format. For 802.3 Ethernet format, there is a Type field which is part of SNAP field in Ethernet packet. Thus, compressor and decompressor can detect whether IP packet or non-IP is carried by deeply parsing the Ethernet frame. |
| CATT | Disagree | Same view as Intel. The frame with Length field instead of Ethertype is very old and very unlikely to be seen in a “factory of the future”, thus was ruled out by CT1. Even if it would happen, we would agree with Nokia that given there is no guaranty to identify the IP, it should be considered by default as a non-IP frame. As for vivo’s comment, we are not sure the SNAP field (following LLC header) is always there with Ethernet frames with Length field. And here again, it is our understanding that such frames (802.2 LLC/SNAP) are very marginal today. |

# Conclusion

**TBD**