**3GPP TSG-RAN WG2 Meeting #109bis-e *R2-200xxxx***

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

**Agenda item: 6.7.4.2**

**Source: Intel Corporation**

**Title: Report of email discussion [AT109bis-e][030][IIOT] Ethernet Header Compression (Intel)**

**Document for: Discussion and Decision**

# Introduction

The contribution is the report of following email discussion.

* [AT109bis-e][030][IIOT] Ethernet Header Compression (Intel)

Scope: Treat topics in 6.7.4.2, based on [R2-2003782](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_109bis-e%5CDocs%5CR2-2003782.zip) and comments.

Part 1: Determine which issues that need resolution, find agreeable proposals, can consider attempt to agree TP. Deadline: April 24 0700 UTC. Result to be merged to PDCP CRs.

# Discussion

## Whether to have reserved bit in EHC header

Terminology: to avoid confusion regarding reserved bit discussion, we’d like to emphasize that *EHC header* denotes the header in EHC full header format and/or EHC compressed header format in clause A.2.1.1 of TS 38.323 v16.0.0 [1], and *EHC* *feedback packet* is specified in clause A.2.1.2 of TS 38.323 v16.0.0 [1].

In RAN2#109-e meeting, following was agreed: “*EHC header only contains Context ID field, format indication bit, and reserved bit(s) if needed. The number of reserved bit(s) are FFS*”. Contributions R2-2002718 [4], R2-2002773 [6], and R2-2002973 [9] propose to have reserved bit/codepoint for future extensibility, e.g. when introducing profiles for EHC in future releases. On the other hand, contributions R2-2002712 [3], R2-2002758 [5], R2-2002936 [8], R2-2003171 [10], , R2-2003321 [13], and R2-2003755 [14] propose not to have reserved bit in EHC header, with the following reasons: 1) there is very little possibility to introduce a new packet format in future releases, because Ethernet header is long-existing format and difficult to be changed; 2) if there is a need to introduce new EHC profile in future releases, a new EHC header format can be introduced with RRC configuration; 3) the drawback of having reserved bit in EHC header is that the maximum number of EHC contexts is reduced to half; 4) potential future support for non-standard-Ethernet based protocols requires probably further changes in the EHC than using 1-2 bits.

One thing to note is that there are different options for companies proposing to have reserved bit/code point. R2-2002718 [4] proposes to have 1 reserved bit in EHC header, R2-2002773 [6] proposes to have 1 reserved code point, while R2-2002973 [9] proposes to have 1 and 3 reserved bits for 1 byte and 2 byte EHC header, respectively.

Given that there are majority views (6 out of 9 companies) to not have reserved bit/codepoint in EHC header, and agreeing on having reserved bits will take further discussion regarding reserved bit vs. reserved code point, and the number of reserved bits for 2 byte EHC header, following is proposed.

**Proposal 1**: There is no reserved bit/codepoint in EHC header.

**Question 1**: please provide your feedback on Proposal 1.

|  |  |  |
| --- | --- | --- |
| **Company** | **Support Proposal 1 (Yes/No)** | **Comments** |
| LG | Yes |  |
| Ericsson | Yes |  |
| Futurewei | No | We are not sure there’d be need of a large number of CID in the first release of EHC application, and we see having a reserve bit would provide more flexibility for future extension, not only for possible new profiles, but also for new EHC header format in general.We can, however, go with the majority, as this is not a critical issue. |
| Qualcomm | Yes |  |
| OPPO | No | We are also not sure whether we really need a larger number of CID in EHC than RoHC. In RoHC, the bit size of CID is 14 if large CID applies, whereas the bit size of CID is 4 if short CID applies. Thus, it is sufficient to set 14-bit CID for 2-byte header and 4-bit CID for 1-byte header.However, we can accept the proposal since it is not a critical issue. |
| vivo | No |  |
| Samsung | Yes |  |
| Huawei | No | We share the view that there shall be possibility for future extension as RAN2 develop this first EHC version within a relatively short time. Using one reserve bit in 1 octet EHC header would not limit the available CID number as 2 octets EHC header can always be used where 14 bits would allow sufficiently large CID number. CID overwriting mechanism and “all-zeros” CID can be used if, however rarely, CID number is run out.  |
| Nokia | Yes | This is not required for future extensibility while it limits the number of available contexts unnecessarily, especially the number of contexts in 1-byte header would be limited to 64 which may not be sufficient for IIOT. It is true that 2-byte header can be used, but in this case the compression efficiency deteriorates.  |
| ZTE | No | We share the above comments for supporting to have spare bits. |
| CATT | Yes | If we think a large number of CIDs is not necessary, why we introduce two types of header size: 1byte and 2 bytes? At least 7 bits CID field is important to avoid unnecessary 1 more byte overhead. |
| Intel | Yes | There can be large number of CIDs since CID represents a unique combination of all compressed fields: DESTINATION ADDRESS, SOURCE ADDRESS, 802.1Q TAG, and LENGTH/TYPE.  |
| DOCOMO | Partly Yes | According to 9 Annex A.1: Traffic model applied to example use cases in a White Paper "A 5G Traffic Model for Industrial Use Cases", some use cases are described. In the paper, the number of Ether devices is maximum 4 and it means that currently 7bits length is sufficient for the number of CIDs. Therefore, I think we can introduce R bit in the 2OCT format. https://www.5g-acia.org/fileadmin/5G-ACIA/Publikationen/5G-ACIA\_White\_Paper\_Traffic\_Model/WP\_5G\_5G\_Traffic\_Model\_for\_Industrial\_Use\_Cases\_22.10.19.pdf |
| MediaTek | Yes |  |
| Sony | Yes |  |
| III | No | A reserve bit would provide possibility for future extension. However, we can accept the proposal or go with the majority since it is not a critical issue. |

**Summary:** among 16 companies, 9 companies support Proposal 1, 1 company partially supports (no reserved bit for 1 byte EHC header, and reserved bit for 2 byte EHC header), and 6 companies do not support Proposal 1. Among 6 companies who do not support Proposal 1, 3 companies can go with the majority / accept the proposal as this is not a critical issue. Given that there is majority support of Proposal 1, it is proposed to agree on Proposal 1.

If there is no reserved bit in EHC header, contributions R2-2002712 [3], R2-2002758 [5], R2-2002936 [8], R2-2003171 [10], and R2-2003321 [13] propose that CID length is 7 or 15 bits, for 1 byte and 2 bytes EHC header, respectively. Note that this also applies to the case that there is one reserved code point in EHC header. On the other hand, with the assumption of have reserved bit, according to R2-2002718 [4], CID length is 6 or 14 bits, for 1 byte and 2 byte EHC header, respectively. According to R2-2002973 [9], CID length is 4 or 14 bits, for 1 byte and 2 bytes EHC header, respectively.

For consistency with Proposal 1, following is proposed:

**Proposal 2**: CID length is 7 or 15 bits, for 1 byte and 2 byte EHC header, respectively.

If Proposal 2 is agreed, then following Editor’s notes in TS 38.323 v16.0.0 can be removed:

* Clause A.2.1.1: *It is FFS whether and how many reserved bits are included in the EHC header*
* Clause A.2.2: *It is decided that 1 or 2 bytes are allocated for CID field. However, exact length of the CID field is not decided yet.*

**Question 2:** please provide your feedback on Proposal 2. Companies do not support the proposal are invited to provide their preference on CID length for 1 byte and 2 byte EHC header.

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| --- | --- | --- |
| **Company** | **Support Proposal 2 (Yes/No)** | **Comments** |
| LG | Yes |  |
| Ericsson | Yes |  |
| Futurewei | Yes if Proposal 1 is taken |  |
| Qualcomm | Yes |  |
| OPPO | Yes if Proposal 1 is taken | As we mentioned in Q1, in EHC, it is sufficient to set 14-bit CID for 2-byte header and 4-bit CID for 1-byte header. However, if it is majority view, we are also ok |
| vivo | Yes if Proposal 1 is agreed |  |
| Samsung | Yes if Proposal 1 is agreed |  |
| Huawei |  | This would be straightforward if proposal 1 is agreed, though our preference is 6 bits/14bits CID for 1 octet/2 octets EHC header. |
| Nokia | Yes | As mentioned above, there is no need for reserved bits or for any other purpose, so we can use all the available bits for CID |
| ZTE | Yes if Proposal 1 is taken |  |
| CATT | Yes |  |
| Intel | Yes |  |
| DOCOMO | Yes if Proposal 1 is taken |  |
| MediaTek | Yes |  |
| Sony | Yes |  |
| III | Yes if Proposal 1 is agreed |  |

**Summary:** all companies either support Proposal 2, or can support Proposal 2 if Proposal 1 is agreed. Given that there is majority support of Proposal 1, it is proposed to agree on Proposal 2.

EHC feedback packet contains only CID field, and there is a related Editor’s note in TS 38.323 v16.0.0 [1]: “*It is FFS how many reserved bits are included in the EHC feedback packet*”. The specification assumes 1 reserved bit in EHC feedback packet since only CID field is included. If there is no reserved bit in EHC header, contributions R2-2002758 [5], R2-2003171 [10], and R2-2003321 [13] propose to confirm the EHC feedback packet format in PDCP running CR, i.e. there is 1 reserved bit in EHC feedback packet. Note that this also applies to the case that there is one reserved code point in EHC header. On the other hand, with the assumption of having reserved bit in EHC header, according to R2-2002718 [4], there should be 2 reserved bits in EHC feedback packet format, while according to R2-2002973 [9], there are 4 and 2 reserved bits in EHC feedback packet format, for 1 byte and 2 byte EHC header, respectively.

For consistency with Proposal 1, following is proposed:

**Proposal 3**: EHC feedback packet format in TS 38.323 v16.0.0 clause A2.1.2 can be confirmed, i.e. there is 1 reserved bit in EHC feedback packet.

If Proposal 3 is agreed, editor’s note “*It is FFS how many reserved bits are included in the EHC feedback packet*” in TS 38.323 v16.0.0 clause A.2.1.2 can be removed.

**Question 3:** please provide your feedback on Proposal 3. Companies do not support the proposal are invited to provide their preference on the number of reserved bits in EHC feedback packet.

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| --- | --- | --- |
| **Company** | **Support Proposal 3 (Yes/No)** | **Comments** |
| LG | Yes |  |
| Ericsson  | Yes |  |
| Futurewei | Yes if Proposal 1 is taken |  |
| Qualcomm | Yes |  |
| OPPO | Yes if Proposal 1 is taken |  |
| vivo | Yes if Proposal 1 is agreed |  |
| Samsung | Yes if Proposal 1 is agreed |  |
| Huawei |  | This would be straightforward if proposal 1 is agreed, though our preference is 2 reserve bits for EHC feedback. |
| Nokia | Yes | There is currently no use for this bit, so we can have it as reserved. If we do not have reserved bits in EHC header, then feedback cannot have more than 1 reserved bit. |
| ZTE | Yes if Proposal 1 is taken |  |
| CATT | Yes |  |
| Intel | Yes |  |
| DOCOMO | Yes if Proposal 1 is taken |  |
| MediaTek | Yes |  |
| Sony | No | Compressor should be able to switch back to full header if decompressor is unable to decompress the compressed packets due to any reason |
| III | Yes if Proposal 1 is agreed |  |

**Summary:** among 16 companies, 15 companies either support Proposal 3, or can support Proposal 3 if Proposal 1 is agreed. There is one company do not support Proposal 3. Given that there is majority support of Proposal 1, and there is overwhelming support of Proposal 3, it is proposed to agree on Proposal 3.

## Decompressor behavior when receiving unknow context ID

The issue was discussed in RAN2#109e-meeting without conclusion and was postpone to this meeting. R2-2002669 [2] proposes that decompressor should indicate to the compressor when receiving unknown context ID, R2-2003296 [12] suggest not to address this issue since this is an error case, and R2-2003758 [15] proposes to confirm that EHC feedback contains only CID, and further proposes to define compressor’s behavior when overwriting a CID so that decompressor cannot receive unknow context IDs. In TS 38.323 v16.0.0 Annex A.1, it is specified that “*The EHC compressor keeps transmitting the FH packets until the EHC feedback is received from the EHC decompressor*…*After receiving the EHC feedback, the EHC compressor starts to transmit the CH packets to the EHC decompressor including the associated CID.*” It is understood that above specification text also applies to the case that compressor selects the CID which had already established (i.e. CID overwriting case), therefore there is no need to have further clarification.

Given that there is only 1 company proposing to specify decompressor behavior if it receives a compressed packet with an unknow context ID, and current feedback mechanism specified in TS 38.323 v16.0.0 prevents the problem of unknown context ID (compressor only sends compressed packet after receiving the feedback), it is proposed to not specify decompressor behavior when receiving unknown context ID.

**Proposal 4**: There is no need to specify decompressor behavior if it receives a compressed packet with an unknown context ID.

**Question 4:** please provide your feedback on Proposal 4.

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| --- | --- | --- |
| **Company** | **Support Proposal 4 (Yes/No)** | **Comments** |
| LG | Yes |  |
| Ericssson | Yes |  |
| Futurewei | Yes |  |
| Qualcomm | Yes |  |
| OPPO | Yes |  |
| vivo | Yes |  |
| Samsung | Yes |  |
| Huawei | Yes |  |
| Nokia | Not entirely | It might be worth clarifying that decompressor discards such packets.  |
| ZTE | Yes |  |
| CATT | Yes |  |
| Intel | Yes |  |
| DOCOMO | Yes but | I also think there is no need to specify decompressor behavior. However, I would like to confirm that the expression of the “ *keeps transmitting*” above means that the compressor shall not cancel to transmit the EHC header ( i.e. the CID OCT and the Ethernet full header) until the context is established even if it would like to use the CID in order to perform the overwrite procedure. |
| MediaTek |  | Agree with Nokia |
| Sony | No | This is related to P3 that any error in decompressor should be handled in the EHC design and there is an option of signalling it back to the compressor.  |
| III | Yes |  |

**Summary:** among 16 companies, 13 companies support Proposal 4, 2 companies propose to clarify that decompressor discards such packets, 1 company do not support Proposal 4 and proposes to consider that decompressor should indicate to the compressor when receiving unknown context ID. One company wants to confirm that compressor behavior (keep transmitting FH until feedback is received) is applicable to overwriting case. Given that there is majority support of Proposal 4, it is proposed to agree on Proposal 4. Further clarification (if needed) can be discussed in next meeting.

## RRC parameter

Contribution R2-2002758 [5] and R2-2002936 [8] propose to replace parameter *ehc-HeaderSize*with *ehc-CIDLength*, to align between PDCP and RRC specification. R2-2002712 [3] proposes to keep *ehc-HeaderSize* and PDCP specification describes corresponding EHC header formats and therein clarifies to which CID the headers sizes belong to. R2-2003171 [10] proposes to introduce parameter *maxCID-EHC* and removes both *ehc-HeaderSize* and *ehc-CIDLength*, and R2-2003758 [15] also proposes to introduce MAX\_CID for EHC.

**Question 5:** please provide your preference on following options:

Option a: replace parameter *ehc-HeaderSize*with *ehc-CIDLength*

Option b: keep *ehc-HeaderSize*

Option c: introduce parameter *maxCID-EHC* and remove both *ehc-HeaderSize* and *ehc-CIDLength*

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| --- | --- | --- |
| **Company** | **Preference (a/b/c)** | **Comments** |
| LG | a | Option b is not correct because; for the FH packet, the EHC header comprises bytes for CID field and Ethernet header, which would be much larger than 1 or 2 bytes.Option c is used in ROHC to indicate three kinds of CID fields, i.e. small CID, 1 byte large CID and 2 bytes large CID. However, in EHC, there are only two kinds of CID fields, and there is no reason to introduce such parameter. |
| Ericsson | a | Option a is the most correct option. However also b would be acceptable when clearly described.  |
| Futurewei | a | CID length is a DRB parameter, and it’d be better to clearly separate it from the max number of CID a UE can support.Header size can be different between FH packet and compressed packet for the same length of CID. |
| Qualcomm | a |  |
| OPPO | a | Much explanation is needed for option b. |
| vivo | a |  |
| Samsung | a |  |
| Huawei | a | If in option b, “ehc-HeaderSize” means the size of EHC header, that could work as well. Anyway this is not critical issue.  |
| Nokia | a | This should not be confused with maxCID though, which we think is needed anyway by the gNB to limit the number of contexts the UE may establishe in UL (as in ROHC). |
| ZTE | a | We assume *ehc-CIDLength* can indicate same thing as *maxCID-EHC*, e.g., maximum available CID, but needs much less bits.The *maxCID-EHC* can be additionally used to limit the actually used CID number, especially when CID length is long. As we assume long CID length would only be allocated when it’s necessary, the *maxCID-EHC* may be not so useful and we are fine not to introduce *maxCID-EHC* in this release. If proposal 1 is agreed, *ehc-HeaderSize* may be also fine as it may have less bits than *ehc-CIDLength* for indicating same thing. |
| CATT | a | It is a direct way and makes PDCP and RRC specifications aligned. |
| Intel | a | Using *ehc-CIDLength* is simple and straightforward compared with other options.  |
| DOCOMO | a | I agree with Nokia. The maxCID is used for other purposes |
| MediaTek | a |  |
| Sony | a |  |
| III | a | The option a is more clear. |

**Summary:** all companies support Option a. It is proposed to agree Proposal 7 below.

**Proposal 7**: In RRC specifications, replace parameter *ehc-HeaderSize*with *ehc-CID-Length*.

A related discussion is on how to handle clause “5.12.3 Protocol parameters” and its Editor’s Note: “*The need for configuration parameters is FFS.*” Contribution R2-2002758 [5] proposes to remove the clause since it is a copy of corresponding ROHC clause. R2-2002712 [3] proposes that RRC parameters can be described in this section. R2-2003171 [10] proposed to clarify that EHC header size and CID field length in EHC header are derived based on *maxCID-EHC*.

**Question 6:** please provide your preference on how to handle clause “5.12.3 Protocol parameters”.

Option a: Remove clause “5.12.3 Protocol parameters”.

Option b: Update clause “5.12.3 Protocol parameters” to document EHC parameters.

|  |  |  |
| --- | --- | --- |
| **Company** | **Preference (a/b)** | **Comments (including e.g. proposed text for clause “5.12.3 Protocol parameters”)** |
| LG | a | But we have to make VOID for this section instead of removing. |
| Ericsson | a |  |
| Futurewei | a | This section can be VOID’ed, as EHC is fully specified in PDCP. |
| Qualcomm | a | Agree with Futurewei explanation |
| OPPO | a |  |
| vivo | a |  |
| Samsung | a |  |
| Huawei | a |  |
| Nokia | b | It can be in another section, but we need to describe somewhere that RRC configures CID length (which then translates into the header structure the UE uses), and maxCID which denotes the maximum number of contexts the UE may establish in UL.  |
| ZTE | a |  |
| CATT | a |  |
| Intel | a | The clause can be VOID’ed if Option a in Question 5 is agreed.  |
| DOCOMO | b | Same as Nokia |
| MediaTek | b | Agree with Nokia |
| Sony | a |  |
| III | a |  |

**Summary:** among 16 companies, 13 companies prefer option a while 3 companies prefer option b. Given the overwhelming support of option a, it is proposed to agree Proposal 8 below.

**Proposal 8**: The clause “5.12.3 Protocol parameters” in TS 38.323 and clause “5.14.3 Protocol parameters” in TS 36.323 are VOID’ed.

## Configuration

Reconfiguration involving PDCP re-establishment

R2-2002718 [4] and R2-2003171 [10] propose that network reconfigures *ethernetHeaderCompression* only upon reconfiguration involving PDCP re-establishment, similar to ROHC. In the email discussion in RAN2#109-e meeting, some companies indicated that this can be handled by the implementation and that such restriction is not required. From contributions submitted to this meeting, both companies prefer to capture the restriction.

**Proposal 5**: Network reconfigures *ethernetHeaderCompression* only upon reconfiguration involving PDCP re-establishment.

**Question 7:** please provide your feedback on Proposal 5.

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| --- | --- | --- |
| **Company** | **Support Proposal 5 (Yes/No)** | **Comments** |
| LG | Yes |  |
| Ericsson | No | Can be handled by network implementation. |
| Futurewei | Yes | This avoid the context confusion (e.g., the CID length) when the reconfiguration message is received. |
| Qualcomm | Yes | We are open to discuss if there is any constraint placed on the network due to the “yes” answer. |
| OPPO | Yes |  |
| vivo | Yes |  |
| Samsung | Yes |  |
| Huawei | Yes |  |
| Nokia | Yes | If we do not agree this, there might be issues with proper handling of PDUs at PDCP layer. We are not sure how the UE side could be solved by network implementation. |
| ZTE | Yes | Agree with Futurewei. |
| CATT | Yes | It is consistent with the configuration of *headerCompression* for ROHC. It is a safe way for EHC configuration |
| Intel | Yes | This follows the principle in ROHC. |
| DOCOMO | Yes |  |
| MediaTek | Yes |  |
| Sony | Yes |  |
| III | Yes |  |

**Summary:** among 16 companies, 15 companies support Proposal 5 while 1 company prefer to leave it to network implementation. Given the overwhelming support of Proposal 5, it is proposed to agree Proposal 5.

LTE EHC configuration

Contribution R2-2002908 [7] proposes that for LTE, EHC cannot be configured with UDC, following the same principle of not configuring ROHC and UDC together. Although it is only proposed by one company, the proposal is expected to be easily agreeable.

**Proposal 6**: For LTE, EHC cannot be configured together with UDC.

**Question 8:** please provide your feedback on Proposal 6.

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| --- | --- | --- |
| **Company** | **Support Proposal 6 (Yes/No)** | **Comments** |
| LG | Yes |  |
| Ericsson | Yes |  |
| Futurewei | Yes |  |
| Qualcomm | Yes |  |
| OPPO | Yes |  |
| vivo | Yes |  |
| Huawei | Yes |  |
| Nokia | Yes |  |
| ZTE | Yes |  |
| CATT | Yes |  |
| Intel | Yes |  |
| DOCOMO | Yes |  |
| MediaTek | Yes |  |
| Sony | Yes |  |
| III | Yes |  |

**Summary:** all companies support Proposal 6. It is proposed to agree Proposal 6.

## Other potential open issues

Differentiation between SDAP control and data PDUs

Contribution R2-2002908 [7] proposes to distinguish SDAP control PDU from SDAP Data PDU if both SDAP header and EHC are configured, since PDCP entity should generate EHC header for SDAP Data PDU while it should not generate EHC header for SDAP control PDU.

**Question 9:** please provide your preference on following options if both SDAP header and EHC are configured:

Option a: add clarification in PDCP specification to distinguish SDAP control PDU from SDAP Data PDU.

Option b: leave the handling to UE implementation.

|  |  |  |
| --- | --- | --- |
| **Company** | **Preference (a/b)** | **Comments** |
| LG | b | For ROHC, there is no special handling on distinguishing SDAP header. Thus, it should be also left up to UE implementation for EHC. |
| Ericsson | b |  |
| Futurewei | b | The compressor and decompressor can already distinguish SDAP data PDU and control PDU, and know that there is no thernet header in SDAP control PDU. |
| Qualcomm | b |  |
| OPPO | b |  |
| vivo | b |  |
| Samsung | a | Even for ROHC, it is not clear how to distinguish SDAP Control PDU from SDAP Data PDU even though implementation can distinguish one from the other. ROHC is a implementation-specific solution and thus it was left as it was.However, EHC is a standardized solution and has different handling for SDAP Control PDU and SDAP Data PDU, which requires further clarification unlike ROHC. |
| Huawei | b | We do not see any problem that SDAP control PDUs are distinguished from SDAP data PDUs by UE implementation. Nothing needs to be specified. |
| Nokia | b | We also do not see why anything would have to be specified here. |
| ZTE | b | Agree with LG. |
| CATT | b |  |
| Intel | b |  |
| DOCOMO | b | This is about the compressor’s internal behavior, so there is no problem even if it is handled by the implementation.  |
| MediaTek | b |  |
| Sony | b |  |
| III | b | There is no need to specify this. |

**Summary:** among 16 companies, 15 companies prefer option b, while 1 company prefer option a. Given the overwhelming support of option b, it is proposed to agree Proposal 9 below.

**Proposal 9**: If both SDAP header and EHC are configured, how to distinguish SDAP control PDU from SDAP Data PDU is left to UE implementation.

Ethernet frame handling by EHC

R2-2003172 [11] proposes to adopt a TP regarding detailed example of operation on different Ethernet header structures as informative text.

**Question 10:** please provide your preference on whether to capture example of operation on different Ethernet header structures as informative text.

|  |  |  |
| --- | --- | --- |
| **Company** | **Whether to capture an informative text (Yes/No)** | **Comments (including proposed changes to the TP if any)** |
| LG | No | We don’t see any clear reason to include such informative example. |
| Ericsson | No |  |
| Futurewei | Yes | An informative section (e.g., an annex) can be helpful.  |
| Qualcomm | Yes | Not a strong view though |
| OPPO | No |  |
| vivo |  | No strong view. The informative text could be helpful for the readers. |
| Samsung | No |  |
| Huawei | No | Agree with LG |
| Nokia | Yes | We can of course discuss the exact form of the TP and we think it is OK to have this as informative Annex. The reason is simple – we believe the way EHC is currently described will not be sufficiently clear to people implementing the feature even if it is clear to us at the moment. For example, the level of detail as compared to how RoHC is described by IETF is much much lower, even when we consider that EHC is simpler in general. |
| ZTE | Yes | Such example would be helpful for understanding EHC. |
| CATT | - | No strong view |
| Intel | No | We don’t think Ethernet frame handling details should be captured in PDCP specification. If the example is captured, RAN2 needs to maintain it if any update of Ethernet specifications results in updated operation on Ethernet header handling in EHC. |
| DOCOMO | No | Agree with Intel. We need to maintain it once we introduce it.  |
| MediaTek | Yes | Agree with Nokia |
| Sony |  | No strong view |
| III | - | No strong view |

**Summary:** among 16 companies, 5 companies prefer to capture the informative text (including 1 company do not have strong view), 7 companies prefer not to capture, and 4 companies do not have strong view. Given that there is no clear majority support of capturing the informative text, it is proposed to postpone the discussion to next meeting.

**Proposal 10**: RAN2 to postpone the discussion to next meeting regarding whether to capture example of operation on different Ethernet header structures as informative text.

# Conclusion

Following proposals have overwhelming support and are easy agreements:

**Proposal 4**: There is no need to specify decompressor behavior if it receives a compressed packet with an unknown context ID.

**Proposal 5**: Network reconfigures *ethernetHeaderCompression* only upon reconfiguration involving PDCP re-establishment.

**Proposal 6**: For LTE, EHC cannot be configured together with UDC.

**Proposal 7**: In RRC specifications, replace parameter *ehc-HeaderSize*with *ehc-CID-Length*.

**Proposal 8**: The clause “5.12.3 Protocol parameters” in TS 38.323 and clause “5.14.3 Protocol parameters” in TS 36.323 are VOID’ed.

**Proposal 9**: If both SDAP header and EHC are configured, how to distinguish SDAP control PDU from SDAP Data PDU is left to UE implementation.

Following proposals have majority support:

**Proposal 1**: There is no reserved bit/codepoint in EHC header.

**Proposal 2**: CID length is 7 or 15 bits, for 1 byte and 2 byte EHC header, respectively.

**Proposal 3**: EHC feedback packet format in TS 38.323 v16.0.0 clause A2.1.2 can be confirmed, i.e. there is 1 reserved bit in EHC feedback packet.

TP to TS 38.323 implementing Proposal 1, 2, 3 and 8 is in Annex A. TP to TS 36.323 implementing Proposal 8 is in Annex B. TP to TS 38.331 implementing Proposal 5 and 7 are in Annex C. TP to TS 36.331 implementing Proposal 5, 6 and 7 are in Annex D.

Following issue is postponed to next meeting:

**Proposal 10**: RAN2 to postpone the discussion to next meeting regarding whether to capture example of operation on different Ethernet header structures as informative text.

# References

[1] 3GPP TS 38.323 v16.0.0, "NR; Packet Data Convergence Protocol (PDCP) specification"

[2] R2-2002669, Sony, “EHC absence of Q-Tags and NACK feedback”

[3] R2-2002712, Ericsson, “Remaining EHC issues”

[4] R2-2002718, Huawei, HiSilicon “Discussion about remaining issues of EHC”

[5] R2-2002758, CATT, “The Remaining Issues on EHC”

[6] R2-2002773, vivo, “Reserved value in the EHC header”

[7] R2-2002908, Samsung, “Leftover issues for EHC”

[8] R2-2002936, LG Electronics Inc., “Length of CID field in EHC header”

[9] R2-2002973, OPPO, “Discussion on EHC format ”

[10] R2-2003171, Nokia, Nokia Shanghai Bell, “EHC remaining issues”

[11] R2-2003172, Nokia, Nokia Shanghai Bell, “Clarification on Ethernet frame handling by EHC”

[12] R2-2003296, ZTE Corporation, Sanechips, “Remaining issues for EHC in TSC”

[13] R2-2003321, Intel Corporation, “Remaining issues in Ethernet header compression”

[14] R2-2003755, Qualcomm Inc, “On reserved bit in EHC header”

[15] R2-2003758, NTT DOCOMO INC., “Remaining issue for EHC”

# Annex A Text proposal for TS 38.323

The text proposal below implements Proposal 1, 2, 3, and 8.

*Start of the TP to TS 38.323*

### 5.12.3 Void

*Next change*

#### A.2.1.1 EHC Full Header packet and EHC Compressed Header packet

Figure A.2.1.1-1 and Figure A.2.1.1-2 show the formats of EHC FH packet and EHC CH packet, respectively.

 

Figure A.2.1.1-1: EHC Full Header packet format

 

Figure A.2.1.1-2: EHC Compressed Header packet format

#### A.2.1.2 EHC feedback packet

Figure A.2.1.2-1 shows the format of the EHC feedback packet.

 

Figure A.2.1.2-1: EHC feedback packet format

### A.2.2 Parameters

#### A.2.2.1 F/C

Length: 1 bit

This field indicates whether the corresponding EHC packet is a FH packet or a CH packet.

Table A.2.2.1-1: F/C field

|  |  |
| --- | --- |
| Bit | Description |
| 0 | FH packet |
| 1 | CH packet |

#### A.2.2.2 CID

Length: 7, or 15 bits. The length of the CID is configured by upper layers (*ehc-CID-Length* in TS 38.331 [3]).

The CID = "all zeros" indicates that the corresponding Ethernet header is "uncompressed". The EHC decompressor does not establish the EHC context identified by the CID = "all zeros".

*End of the TP to TS 38.323*

# Annex B Text proposal for TS 36.323

The text proposal below implements Proposal 8.

*Start of the TP to TS 36.323*

### 5.14.3 Void

*End of the TP to TS 36.323*

# Annex C Text proposal for TS 38.331

The text proposal below implements Proposal 5 and 7.

*Start of the TP to TS 38.331*

#### – *PDCP-Config*

The IE *PDCP-Config* is used to set the configurable PDCP parameters for signalling and data radio bearers.

*PDCP-Config* information element

-- ASN1START

-- TAG-PDCP-CONFIG-START

PDCP-Config ::= SEQUENCE {

 drb SEQUENCE {

 discardTimer ENUMERATED {ms10, ms20, ms30, ms40, ms50, ms60, ms75, ms100, ms150, ms200,

 ms250, ms300, ms500, ms750, ms1500, infinity} OPTIONAL, -- Cond Setup

 pdcp-SN-SizeUL ENUMERATED {len12bits, len18bits} OPTIONAL, -- Cond Setup2

 pdcp-SN-SizeDL ENUMERATED {len12bits, len18bits} OPTIONAL, -- Cond Setup2

 headerCompression CHOICE {

 notUsed NULL,

 rohc SEQUENCE {

 maxCID INTEGER (1..16383) DEFAULT 15,

 profiles SEQUENCE {

 profile0x0001 BOOLEAN,

 profile0x0002 BOOLEAN,

 profile0x0003 BOOLEAN,

 profile0x0004 BOOLEAN,

 profile0x0006 BOOLEAN,

 profile0x0101 BOOLEAN,

 profile0x0102 BOOLEAN,

 profile0x0103 BOOLEAN,

 profile0x0104 BOOLEAN

 },

 drb-ContinueROHC ENUMERATED { true } OPTIONAL -- Need N

 },

 uplinkOnlyROHC SEQUENCE {

 maxCID INTEGER (1..16383) DEFAULT 15,

 profiles SEQUENCE {

 profile0x0006 BOOLEAN

 },

 drb-ContinueROHC ENUMERATED { true } OPTIONAL -- Need N

 },

 ...

 },

 integrityProtection ENUMERATED { enabled } OPTIONAL, -- Cond ConnectedTo5GC1

 statusReportRequired ENUMERATED { true } OPTIONAL, -- Cond Rlc-AM

 outOfOrderDelivery ENUMERATED { true } OPTIONAL -- Need R

 } OPTIONAL, -- Cond DRB

 moreThanOneRLC SEQUENCE {

 primaryPath SEQUENCE {

 cellGroup CellGroupId OPTIONAL, -- Need R

 logicalChannel LogicalChannelIdentity OPTIONAL -- Need R

 },

 ul-DataSplitThreshold UL-DataSplitThreshold OPTIONAL, -- Cond SplitBearer

 pdcp-Duplication BOOLEAN OPTIONAL -- Need R

 } OPTIONAL, -- Cond MoreThanOneRLC

 t-Reordering ENUMERATED {

 ms0, ms1, ms2, ms4, ms5, ms8, ms10, ms15, ms20, ms30, ms40,

 ms50, ms60, ms80, ms100, ms120, ms140, ms160, ms180, ms200, ms220,

 ms240, ms260, ms280, ms300, ms500, ms750, ms1000, ms1250,

 ms1500, ms1750, ms2000, ms2250, ms2500, ms2750,

 ms3000, spare28, spare27, spare26, spare25, spare24,

 spare23, spare22, spare21, spare20,

 spare19, spare18, spare17, spare16, spare15, spare14,

 spare13, spare12, spare11, spare10, spare09,

 spare08, spare07, spare06, spare05, spare04, spare03,

 spare02, spare01 } OPTIONAL, -- Need S

 ...,

 [[

 cipheringDisabled ENUMERATED {true} OPTIONAL -- Cond ConnectedTo5GC

 ]],

 [[

 discardTimerExt-r16 ENUMERATED {ms0dot5, ms1, ms2, ms4, ms6, ms8, spare3, spare2, spare1} OPTIONAL, -- Cond DRB-Only

 moreThanTwoRLC-r16 SEQUENCE {

 splitSecondaryPath LogicalChannelIdentity OPTIONAL, -- Cond SplitBearer2

 duplicationState SEQUENCE (SIZE (3)) OF BOOLEAN OPTIONAL -- Need M

 } OPTIONAL, -- Cond MoreThanTwoRLC

 ethernetHeaderCompression-r16 CHOICE {

 notUsed NULL,

 ehc SEQUENCE {

 ehc-Common SEQUENCE {

 ehc-CID-Length ENUMERATED { bits7, bits15 },

 ...

 },

 ehc-Downlink SEQUENCE {

 drb-ContinueEHC-DL ENUMERATED { true } OPTIONAL, -- Need N

 ...

 } OPTIONAL, -- Need N

 ehc-Uplink SEQUENCE {

 drb-ContinueEHC-UL ENUMERATED { true } OPTIONAL, -- Need N

 ...

 } OPTIONAL, -- Need N

 ...

 },

 ...

 } OPTIONAL -- Cond DRB

 ]]

}

UL-DataSplitThreshold ::= ENUMERATED {

 b0, b100, b200, b400, b800, b1600, b3200, b6400, b12800, b25600, b51200, b102400, b204800,

 b409600, b819200, b1228800, b1638400, b2457600, b3276800, b4096000, b4915200, b5734400,

 b6553600, infinity, spare8, spare7, spare6, spare5, spare4, spare3, spare2, spare1}

-- TAG-PDCP-CONFIG-STOP

-- ASN1STOP

Editor's note: FFS on moreThanonRLC in pdcp-Config.

| *PDCP-Config* field descriptions |
| --- |
| ***cipheringDisabled***If included, ciphering is disabled for this DRB regardless of which ciphering algorithm is configured for the SRB/DRBs. The field may only be included if the UE is connected to 5GC. Otherwise the field is absent. The network configures all DRBs with the same PDU-session ID with same value for this field. The value for this field cannot be changed after the DRB is set up. |
| ***discardTimer***Value in ms of *discardTimer* specified in TS 38.323 [5]. Value *ms10* corresponds to 10 ms, value *ms20* corresponds to 20 ms and so on. The value for this field cannot be changed in case of reconfiguration with sync, if *dapsConfig* is configured for this bearer. |
| ***discardTimerExt***Value in ms of *discardTimer* specified in TS 38.323 [5]. Value *ms0dot5* corresponds to 0.5 ms, value *ms1* corresponds to 1ms and so on. If this field is present, the field *discardTimer* is ignored and *discardTimerExt* is used instead. |
| ***drb-ContinueEHC-DL, drb-ContinueEHC-UL***The fieldsindicate whether the PDCP entity continues or resets the EHC header compression protocol during PDCP re-establishment, as specified in TS 38.323 [5]. The field *drb-ContinueEHC-DL* indicates whether the PDCP entity continues or resets for downlink and the field *drb-ContinueEHC-UL* indicates whether the PDCP entity continues or resets for uplink. These fields are configured only in case of resuming an RRC connection or reconfiguration with sync, where the PDCP termination point is not changed and the *fullConfig* is not indicated.  |
| ***drb-ContinueROHC***Indicates whether the PDCP entity continues or resets the ROHC header compression protocol during PDCP re-establishment, as specified in TS 38.323 [5]. This field is configured only in case of resuming an RRC connection or reconfiguration with sync, where the PDCP termination point is not changed and the *fullConfig* is not indicated. |
| ***duplicationState***This field indicates the initial uplink PDCP duplication state for the associated RLC entities. If set to *true,* the initial PDCP duplication state is activated for the associated RLC entity. The index for the indication is determined by ascending order of logical channel ID of all RLC entities other than the primary RLC entityindicated by *primaryPath* in the order of MCG and SCG, as in clause 6.1.3.Y of TS 38.321 [3]. If the number of associated RLC entities other than the primary RLC entity is two, UE ignores the value in the largest index of this field. The initial PDCP duplication state of the associated RLC entity is always activated for SRB.  |
| ***ehc-CID-Length***Indicates the length of the CID field for EHC packet. |
| ***ethernetHeaderCompression***If *ehc-Downlink* is configured, then Ethernet header compression is configured for downlink. Otherwise, it is not configured for downlink.If *ehc-Uplink* is configured, then Ethernet header compression is configured for uplink. Otherwise, it is not configured for uplink.The fields in *ehc-Common* applies for both downlink and uplink once configured. Ethernet Header compression can only be configured for DRB.The network reconfigures *ethernetHeaderCompression* only upon reconfiguration involving PDCP re-establishment. |
| ***headerCompression***If rohc is configured, the UE shall apply the configured ROHC profile(s) in both uplink and downlink. If *uplinkOnlyROHC* is configured, the UE shall apply the configured ROHC profile(s) in uplink (there is no header compression in downlink). ROHC can be configured for any bearer type. ROHC and EHC can be both configured simultaneously for a DRB. The network reconfigures *headerCompression* only upon reconfiguration involving PDCP re-establishment. Network configures *headerCompression* to *notUsed* when *outOfOrderDelivery* is configured. |
| ***integrityProtection***Indicates whether or not integrity protection is configured for this radio bearer. The network configures all DRBs with the same PDU-session ID with same value for this field. The value for this field cannot be changed after the DRB is set up. |
| ***maxCID***Indicates the value of the MAX\_CID parameter as specified in TS 38.323 [5].The total value of MAX\_CIDs across all bearers for the UE should be less than or equal to the value of *maxNumberROHC-ContextSessions* parameter as indicated by the UE. |
| ***moreThanOneRLC***This field configures UL data transmission when more than one RLC entity is associated with the PDCP entity. |
| ***moreThanTwoRLC***This field configures UL data transmission when more than two RLC entities are associated with the PDCP entity. The presence of this field indicates that PDCP duplication is configured. PDCP duplication is not configured for CA packet duplication of LTE RLC bearer. |
| ***outOfOrderDelivery***Indicates whether or not *outOfOrderDelivery* specified in TS 38.323 [5] is configured. This field should be either always present or always absent, after the radio bearer is established. |
| ***pdcp-Duplication***Indicates whether or not uplink duplication status at the time of receiving this IE is configured and activated as specified in TS 38.323 [5]. The presence of this field indicates that duplication is configured. PDCP duplication is not configured for CA packet duplication of LTE RLC bearer. The value of this field, when the field is present, indicates the initial state of the duplication. If set to *true*, duplication is activated. The value of this field is always *true*, when configured for a SRB. This field is absent, if the field *moreThanTwoRLC* is present. |
| ***pdcp-SN-SizeDL***PDCP sequence number size for downlink, 12 or 18 bits, as specified in TS 38.323 [5]. For SRBs only the value *len12bits* is applicable. The value for this field cannot be changed in case of reconfiguration with sync, if *dapsConfig* is configured for this bearer. |
| ***pdcp-SN-SizeUL***PDCP sequence number size for uplink, 12 or 18 bits, as specified in TS 38.323 [5]. For SRBs only the value *len12bits* is applicable. The value for this field cannot be changed in case of reconfiguration with sync, if *dapsConfig* is configured for this bearer. |
| ***primaryPath***Indicates the cell group ID and LCID of the primary RLC entity as specified in TS 38.323 [5], clause 5.2.1 for UL data transmission when more than one RLC entity is associated with the PDCP entity. In this version of the specification, only cell group ID corresponding to MCG is supported for SRBs. The NW indicates *cellGroup* for split bearers using logical channels in different cell groups. The NW indicates *logicalChannel* for CA based PDCP duplication, i.e., if both logical channels terminate in the same cell group. |
| ***splitSecondaryPath***Indicates the LCID of the split secondary RLC entity as specified in TS 38.323 [5] for fallback to split bearer operation when UL data transmission with more than two RLC entities is associated with the PDCP entity. This RLC entity belongs to a cell group that is different from the cell group indicated by *cellGroup* in the field *primaryPath.* Editor's Note: The name *splitSecondaryPath* needs to be confirmed, and the impacts on the legacy split bearer operation (if any) may need to be considered. |
| ***statusReportRequired***For AM DRBs, indicates whether the DRB is configured to send a PDCP status report in the uplink, as specified in TS 38.323 [5]. |
| ***t-Reordering***Value in ms of t-Reordering specified in TS 38.323 [5]. Value *ms0* corresponds to 0 ms, value *ms20* corresponds to 20 ms, value *ms40* corresponds to 40 ms, and so on. When the field is absent the UE applies the value *infinity*. The value for this field cannot be changed in case of reconfiguration with sync, if *dapsConfig* is configured for this bearer. |
| ***ul-DataSplitThreshold***Parameter specified in TS 38.323 [5]. Value *b0* corresponds to 0 bytes, value *b100* corresponds to 100 bytes, value *b200* corresponds to 200 bytes, and so on. The network sets this field to *infinity* for UEs not supporting *splitDRB-withUL-Both-MCG-SCG*. If the field is absent when the split bearer is configured for the radio bearer first time, then the default value *infinity* is applied. |

| Conditional presence | Explanation |
| --- | --- |
| *DRB* | This field is mandatory present when the corresponding DRB is being set up, absent for SRBs. Otherwise this field is optionally present, need M. |
| *DRB-Only* | This field is optionally present in case of DRB, need M. Otherwise, it is absent for SRBs. |
| *MoreThanOneRLC* | This field is mandatory present upon RRC reconfiguration with setup of a PDCP entity for a radio bearer with more than one associated logical channel and upon RRC reconfiguration with the association of additional logical channels to the PDCP entity.The field is also mandatory present in case the field *moreThanTwoRLC* is included in *PDCP-Config*.Upon RRC reconfiguration when a PDCP entity is associated with multiple logical channels, this field is optionally present need M. Otherwise, this field is absent. Need R. |
| *MoreThanTwoRLC* | This field is mandatory present upon RRC reconfiguration with setup of a PDCP entity for a radio bearer with more than two associated logical channels and upon RRC reconfiguration with the association of more than one additional logical channel to the PDCP entity.Upon RRC reconfiguration when none of the RLC entities is re-established, this field is optionally present, Need M. Otherwise, the field is absent, Need R. |
| *Rlc-AM* | For RLC AM, the field is optionally present, need R. Otherwise, the field is absent. |
| *Setup* | The field is mandatory present in case of radio bearer setup. Otherwise the field is optionally present, need M. |
| *SplitBearer* | The field is absent for SRBs. Otherwise, the field is optional present, need M, in case of radio bearer with more than one associated RLC mapped to different cell groups. |
| *SplitBearer2* | The field is mandatory present, in case of a split radio bearer. Otherwise the field is absent. |
| *ConnectedTo5GC* | The field is optionally present, need R, if the UE is connected to 5GC. Otherwise the field is absent. |
| *ConnectedTo5GC1* | The field is optionally present, need R, if the UE is connected to NR/5GC. Otherwise the field is absent. |
| *Setup2* | This field is mandatory present in case for radio bearer setup for RLC-AM and RLC-UM. Otherwise, this field is absent, Need M. |

*End of the TP to TS 38.331*

# Annex D Text proposal for TS 36.331

The text proposal below implements Proposal 5, 6, and 7.

*Start of the TP to TS 36.331*

#### – *PDCP-Config*

The IE *PDCP-Config* is used to set the configurable PDCP parameters for data radio bearers.

*PDCP-Config* information element

-- ASN1START

PDCP-Config ::= SEQUENCE {

 discardTimer ENUMERATED {

 ms50, ms100, ms150, ms300, ms500,

 ms750, ms1500, infinity

 } OPTIONAL, -- Cond Setup

 rlc-AM SEQUENCE {

 statusReportRequired BOOLEAN

 } OPTIONAL, -- Cond Rlc-AM

 rlc-UM SEQUENCE {

 pdcp-SN-Size ENUMERATED {len7bits, len12bits}

 } OPTIONAL, -- Cond Rlc-UM

 headerCompression CHOICE {

 notUsed NULL,

 rohc SEQUENCE {

 maxCID INTEGER (1..16383) DEFAULT 15,

 profiles SEQUENCE {

 profile0x0001 BOOLEAN,

 profile0x0002 BOOLEAN,

 profile0x0003 BOOLEAN,

 profile0x0004 BOOLEAN,

 profile0x0006 BOOLEAN,

 profile0x0101 BOOLEAN,

 profile0x0102 BOOLEAN,

 profile0x0103 BOOLEAN,

 profile0x0104 BOOLEAN

 },

 ...

 }

 },

 ...,

 [[ rn-IntegrityProtection-r10 ENUMERATED {enabled} OPTIONAL -- Cond RN

 ]],

 [[ pdcp-SN-Size-v1130 ENUMERATED {len15bits} OPTIONAL -- Cond Rlc-AM2

 ]],

 [[ ul-DataSplitDRB-ViaSCG-r12 BOOLEAN OPTIONAL, -- Need ON

 t-Reordering-r12 ENUMERATED {

 ms0, ms20, ms40, ms60, ms80, ms100, ms120, ms140,

 ms160, ms180, ms200, ms220, ms240, ms260, ms280, ms300,

 ms500, ms750, spare14, spare13, spare12, spare11, spare10,

 spare9, spare8, spare7, spare6, spare5, spare4, spare3,

 spare2, spare1} OPTIONAL -- Cond SetupS

 ]],

 [[ ul-DataSplitThreshold-r13 CHOICE {

 release NULL,

 setup ENUMERATED {

 b0, b100, b200, b400, b800, b1600, b3200, b6400, b12800,

 b25600, b51200, b102400, b204800, b409600, b819200,

 spare1}

 } OPTIONAL, -- Need ON

 pdcp-SN-Size-v1310 ENUMERATED {len18bits} OPTIONAL, -- Cond Rlc-AM3

 statusFeedback-r13 CHOICE {

 release NULL,

 setup SEQUENCE {

 statusPDU-TypeForPolling-r13 ENUMERATED {type1, type2} OPTIONAL, -- Need ON

 statusPDU-Periodicity-Type1-r13 ENUMERATED {

 ms5, ms10, ms20, ms30, ms40, ms50, ms60, ms70, ms80, ms90,

 ms100, ms150, ms200, ms300, ms500, ms1000, ms2000, ms5000,

 ms10000, ms20000, ms50000} OPTIONAL, -- Need ON

 statusPDU-Periodicity-Type2-r13 ENUMERATED {

 ms5, ms10, ms20, ms30, ms40, ms50, ms60, ms70, ms80, ms90,

 ms100, ms150, ms200, ms300, ms500, ms1000, ms2000, ms5000,

 ms10000, ms20000, ms50000} OPTIONAL, -- Need ON

 statusPDU-Periodicity-Offset-r13 ENUMERATED {

 ms1, ms2, ms5, ms10, ms25, ms50, ms100, ms250, ms500,

 ms2500, ms5000, ms25000} OPTIONAL -- Need ON

 }

 } OPTIONAL -- Need ON

 ]],

 [[ ul-LWA-Config-r14 CHOICE {

 release NULL,

 setup SEQUENCE {

 ul-LWA-DRB-ViaWLAN-r14 BOOLEAN,

 ul-LWA-DataSplitThreshold-r14 ENUMERATED {

 b0, b100, b200, b400, b800, b1600, b3200, b6400,

 b12800, b25600, b51200, b102400, b204800, b409600,

 b819200 } OPTIONAL -- Need OR

 }

 } OPTIONAL, -- Need ON

 uplinkOnlyHeaderCompression-r14 CHOICE {

 notUsed-r14 NULL,

 rohc-r14 SEQUENCE {

 maxCID-r14 INTEGER (1..16383) DEFAULT 15,

 profiles-r14 SEQUENCE {

 profile0x0006-r14 BOOLEAN

 },

 ...

 }

 } OPTIONAL -- Need ON

 ]],

 [[ uplinkDataCompression-r15 SEQUENCE {

 bufferSize-r15 ENUMERATED {kbyte2, kbyte4, kbyte8, spare1},

 dictionary-r15 ENUMERATED {sip-SDP, operator} OPTIONAL, -- Need OR

 ...

 } OPTIONAL,-- Cond Rlc-AM4

 pdcp-DuplicationConfig-r15 CHOICE {

 release NULL,

 setup SEQUENCE {

 pdcp-Duplication-r15 ENUMERATED {configured, activated}

 }

 } OPTIONAL -- Need ON

 ]],

 [[

 ethernetHeaderCompression-r16 CHOICE {

 notUsed-r16 NULL,

 ehc-r16 SEQUENCE {

 ehc-Common-r16 SEQUENCE {

 ehc-CID-Length-r16 ENUMERATED {bits7, bits15},

 ...

 },

 ehc-Downlink-r16 SEQUENCE {

 drb-ContinueEHC-DL-r16 ENUMERATED {true} OPTIONAL, -- Need ON

 ...

 } OPTIONAL, -- Need ON

 ehc-Uplink-r16 SEQUENCE {

 drb-ContinueEHC-UL-r16 ENUMERATED {true} OPTIONAL, -- Need ON

 ...

 } OPTIONAL, -- Need ON

 ...

 },

 ...

 } OPTIONAL -- Cond DRB

 ]]

}

-- ASN1STOP

| *PDCP-Config* field descriptions |
| --- |
| ***bufferSize***Indicates the buffer size applied for UDC specified in TS 36.323 [8]. Value *kbyte2* means 2048 bytes, *kbyte4* means 4096 bytes and so on. E-UTRAN does not reconfigure *bufferSize* for a DRB except for handover cases. |
| ***dictionary***Indicates which pre-defined dictionary is used for UDC as specified in TS 36.323 [8]. The value *sip-SDP* means that UE shall prefill the buffer with standard dictionary for SIP and SDP defined in TS 36.323 [8], and the value *operator* means that UE shall prefill the buffer with operator-defined dictionary. |
| ***discardTimer***Indicates the discard timer value specified in TS 36.323 [8]. Value in milliseconds. Value ms50 means 50 ms, ms100 means 100 ms and so on. |
| ***drb-ContinueEHC-DL, drb-ContinueEHC-UL***The fields indicate whether the PDCP entity continues or resets the EHC header compression protocol during PDCP re-establishment, as specified in TS 38.323 [5]. The field *drb-ContinueEHC-DL* indicates whether the PDCP entity continues or resets for downlink and the field *drb-ContinueEHC-UL* indicates whether the PDCP entity continues or resets for uplink. These fields are configured only in case of resuming an RRC connection or reconfiguration with sync, where the PDCP termination point is not changed and the *fullConfig* is not indicated. |
| ***ehc-CID-Length***Indicates the length of the CID field for EHC packet. |
| ***ethernetHeaderCompression***If *ehc-Downlink* is configured, then Ethernet header compression is configured for downlink. Otherwise, it is not configured for downlink. If *ehc-Uplink* is configured, then Ethernet header compression is configured for uplink. Otherwise, it is not configued for uplink.The fields in *ehc-Common* applies for both donwlink and uplink once configured. Ethernet Header compression can only be configured for DRB.E-UTRAN does not reconfigure *ethernetHeaderCompression* for an MCG DRB except for upon handover and upon the first reconfiguration after RRC connection re-establishment. E-UTRAN does not reconfigure *ethernetHeaderCompression* for a SCG DRB except for upon SCG change involving PDCP re-establishment. E-UTRAN only configures this field when *uplinkDataCompression* is not configured. |
| ***headerCompression***E-UTRAN does not reconfigure header compression for an MCG DRB except for upon handover and upon the first reconfiguration after RRC connection re-establishment. E-UTRAN does not reconfigure header compression for a SCG DRB except for upon SCG change involving PDCP re-establishment. For split and LWA DRBs E-UTRAN configures only *notUsed.* E-UTRAN only configures this field when neither *uplinkOnlyHeaderCompression* nor *uplinkDataCompression* is configured.If *headerCompression* is configured, the UE shall apply the configured ROHC profile(s) in both uplink and downlink. ROHC and EHC can be both configured simultaneously for a DRB. |
| ***maxCID***Indicates the value of the MAX\_CID parameter as specified in TS 36.323 [8]. The total value of MAX\_CIDs across all bearers for the UE should be less than or equal to the value of *maxNumberROHC-ContextSessions* parameter as indicated by the UE. |
| ***pdcp-Duplication***Parameter for configuring PDCP duplication as specified in TS 36.323 [8]. Value *configured* indicates that PDCP duplication is configured but initially deactivated and value *activated* indicates that PDCP duplication is configured and activated upon configuration. For EN-DC, E-UTRAN configures PDCP duplication for MCG DRB only if PDCP duplication is not configured for any split DRB. |
| ***pdcp-SN-Size***Indicates the PDCP Sequence Number length in bits. For RLC UM: value *len7bits* means that the 7-bit PDCP SN format is used and *len12bits* means that the 12-bit PDCP SN format is used. For RLC AM: value *len15bits* means that the 15-bit PDCP SN format is used, value *len18bits* means that the 18-bit PDCP SN format is used, otherwise if the field is not included upon setup of the PCDP entity 12-bit PDCP SN format is used, as specified in TS 36.323 [8]. |
| ***profiles***The profiles used by both compressor and decompressor in both UE and E-UTRAN. The field indicates which of the ROHC profiles specified in TS 36.323 [8] are supported, i.e. value *true* indicates that the profile is supported. Profile 0x0000 shall always be supported when the use of ROHC is configured. If support of two ROHC profile identifiers with the same 8 LSB's is signalled, only the profile corresponding to the highest value shall be applied. E-UTRAN does not configure ROHC while *t-Reordering* is configured (i.e. for split DRBs, for LWA bearers or upon reconfiguration from split or LWA to MCG DRB). |
| ***statusFeedback***Indicates whether the UE shall send PDCP Status Report periodically or by E-UTRAN polling as specified in TS 36.323 [8]. E-UTRAN configures this field only for LWA DRB. |
| ***statusPDU-TypeForPolling***Indicates the PDCP Control PDU option when it is triggered by E-UTRAN polling. Value *type1* indicates using the legacy PDCP Control PDU for PDCP status reporting and value *type2* indicates using the LWA specific PDCP Control PDU for LWA status reporting as specified in TS 36.323 [8]. |
| ***statusPDU-Periodicity-Type1***Indicates the value of the PDCP Status reporting periodicity for *type1* Status PDU, as specified in TS 36.323 [8]. Value in milliseconds. Value ms5 means 5 ms, ms10 means 10 ms and so on. |
| ***statusPDU-Periodicity-Type2***Indicates the value of the PDCP Status reporting periodicity for *type2* Status PDU, as specified in TS 36.323 [8]. Value in milliseconds. Value ms5 means 5 ms, ms10 means 10 ms and so on. |
| ***statusPDU-Periodicity-Offset***Indicates the value of the offset for *type2* Status PDU periodicity, as specified in TS 36.323 [8]. Value in milliseconds. Value ms1 means 1 ms, ms2 means 2 ms and so on. |
| ***t-Reordering***Indicates the value of the reordering timer, as specified in TS 36.323 [8]. Value in milliseconds. Value ms0 means 0 ms and behaviour as specified in 7.3.2 applies, ms20 means 20 ms and so on. |
| ***rn-IntegrityProtection***Indicates that integrity protection or verification shall be applied for all subsequent packets received and sent by the RN on the DRB. |
| ***statusReportRequired***Indicates whether or not the UE shall send a PDCP Status Report upon re-establishment of the PDCP entity and upon PDCP data recovery as specified in TS 36.323 [8]. |
| ***ul-DataSplitDRB-ViaSCG***Indicates whether the UE shall send PDCP PDUs via SCG as specified in TS 36.323 [8]. E-UTRAN only configures the field (i.e. indicates value *TRUE*) for split DRBs. For PDCP duplication, if this field is set to *TRUE*, the primary RLC entity is SCG RLC entity and the secondary RLC entity is MCG RLC entity. If this field is not configured or set to *FALSE*, the primary RLC entity is MCG RLC entity and the secondary RLC entity is SCG RLC entity. |
| ***ul-DataSplitThreshold***Indicates the threshold value for uplink data split operation specified in TS 36.323 [8]. Value b100 means 100 Bytes, b200 means 200 Bytes and so on. E-UTRAN only configures this field for split DRBs. |
| ***ul-LWA-DRB-ViaWLAN***Indicates whether the UE shall send PDCP PDUs via the LWAAP entity as specified in TS 36.323 [8]. E‑UTRAN only configures this field (i.e. indicates value *TRUE*) for LWA DRBs. |
| ***ul-LWA-DataSplitThreshold***Indicates the threshold value for uplink data split operation as specified in TS 36.323 [8]. Value b0 means 0 Bytes, b100 means 100 Bytes and so on. E-UTRAN only configures this field for LWA DRBs. |
| ***uplinkDataCompression***Indicates the UDCconfiguration that the UE shall apply**.** E-UTRAN does not configure *uplinkDataCompression* for a DRB, if *ethernetHeaderCompression*, *headerCompression* or *uplinkOnlyHeaderCompression* is already configured for the DRB. E-UTRAN does not configure *uplinkDataCompression* for the split and LWA DRBs*.*The maximum number of DRBs where *uplinkDataCompression* can be applied is two. In this version of the specification, for existing DRBs, E-UTRAN can configure *uplinkDataCompression* via handover procedure or the first *RRCConnectionReconfiguration* message after RRC connection re-establishment.. |
| ***uplinkOnlyHeaderCompression***Indicates the ROHC configuration that the UE shall apply uplink-only ROHC operations, see TS 36.323 [8]. E-UTRAN only configures this field when *headerCompression* is not configured.E-UTRAN does not reconfigure header compression for an MCG DRB except for upon handover and upon the first reconfiguration after RRC connection re-establishment. E-UTRAN does not reconfigure header compression for a SCG DRB except for upon SCG change involving PDCP re-establishment. For split and LWA DRBs E-UTRAN configures only *notUsed*. |

| Conditional presence | Explanation |
| --- | --- |
| *DRB* | This field is mandatory present when the corresponding DRB is being set up, absent for SRBs. Otherwise this field is optionally present, need ON. |
| *Rlc-AM* | The field is mandatory present upon setup of a PDCP entity for a radio bearer configured with RLC AM. The field is optional, need ON, in case of reconfiguration of a PDCP entity at handover, at the first reconfiguration after RRC re-establishment or at SCG change involving PDCP re-establishment or PDCP data recovery for a radio bearer configured with RLC AM. Otherwise the field is not present. |
| *Rlc-AM2* | The field is optionally present, need OP, upon setup of a PDCP entity for a radio bearer configured with RLC AM. Otherwise the field is not present. |
| *Rlc-AM3* | The field is optionally present, need OP, upon setup of a PDCP entity for a radio bearer configured with RLC AM, if *pdcp-SN-Size-v1130* is absent. Otherwise the field is not present. |
| *Rlc-AM4* | The field is optionally present, need ON, upon setup of a PDCP entity for a radio bearer configured with RLC AM. The field is optional, need OP, in case of reconfiguration of a PDCP entity at handover, or at the first reconfiguration after RRC re-establishment. Otherwise the field is not present and the UE shall continue to use the existing value. |
| *Rlc-UM* | The field is mandatory present upon setup of a PDCP entity for a radio bearer configured with RLC UM. It is optionally present, Need ON, upon handover within E-UTRA, upon the first reconfiguration after re-establishment and upon SCG change involving PDCP re-establishment. Otherwise the field is not present. |
| *RN* | The field is optionally present when signalled to the RN, need OR. Otherwise the field is not present. |
| *Setup* | The field is mandatory present in case of radio bearer setup. Otherwise the field is optionally present, need ON. |
| *SetupS* | The field is mandatory present in case of setup of or reconfiguration to a split DRB or LWA DRB. The field is optionally present upon reconfiguration of a split DRB or LWA DRB or upon DRB type change from split to MCG DRB or from LWA to LTE only, need ON. Otherwise the field is not present. |

*End of the TP to TS 36.331*