3GPP TSG-RAN WG2 Meeting #118-e R2- 220xxxx

Online, May, 2022

Agenda: 6.7.1

Source: ZTE

Title: Summary of [AT118-e][619][Relay] LS on SDU type in PDCP (ZTE)

Document for: Discussion, Decision

# 1 Introduction

This document captures the following email discussion:

 **[AT118-e][619][Relay] LS on SDU type in PDCP (ZTE)**

      Scope: Discuss the LS in R2-2204447 and related contributions (R2-2204633, R2-2204771, R2-2204772, R2-2204798, R2-2204799).  Phase 1 should determine a way forward and a recommendation to be taken into account in the PDCP rapporteur CR; Phase 2 is to draft and approve the LS.

      Intended outcome: Approved LS (without CB)

      Deadline:  Phase 1 Friday 2022-05-13 1800 UTC,

Phase 2 Wednesday 2022-05-18 0400 UTC

# Discussion

CT1 sent an LS (R2-220447) to RAN2 on the SDU type used over user plane for NR PC5 reference point, which checks with RAN2 whether “Ethernet PDCP SDU type” and “Unstructured PDCP SDUtype” are supported by AS layer.

|  |
| --- |
| In clause 6.1.2.2 of TS 23.304 v17.1.0, it specifies that "IP, *Ethernet and Unstructured PDCP SDU types* are supported. For IP PDCP SDU type, both IPv4 and IPv6 are supported." Hence, the "Ethernet PDCP SDU type" and "Unstructured PDCP SDU type" are required over the user plane for NR PC5 reference point.  In order to implement the requirement above, CT1 would like to check with RAN2 whether "*Ethernet PDCP SDU type*" and "*Unstructured PDCP SDU type*" are supported by AS layer.  **To RAN WG2 group.**  **ACTION:** CT1 kindly asks RAN2 to provide the answer to the question above. |

According to the latest TS 23.304, IP, Ethernet and Unstructured PDCP SDU types are supported. For IP PDCP SDU type, both IPv4 and IPv6 are supported. As we can see from the user plane protocol stack in Figure 1, the packets from ProSe application layer may be IP, Ethernet and Unstructured packets.



Figure 1 User plane protocol stack for NR PC5 reference point (TS 23.304)

To be specific, the Ethernet, unstructured and IP traffic are supported for both 5G ProSe Direc Communication and U2N relay according to TS 23.304. The detailes are listed as follows:

* 5G ProSe Direc Communication
* For broadcast and groupcast mode: the data unit types of IPv4, IPv6, Ethernet, Unstructured, and Address Resolution Protocol should be supported.
* For unicast mode: the data unit types of IPv4, IPv6, Ethernet, and Unstructured should be supported.
* U2N relay
* For both L2 and L3 U2N relay: unicast traffic (uplink and downlink) between the 5G ProSe Remote UE and the network supports IP, Ethernet or Unstructured traffic type.

In addition, during RAN2#115 meeting, RAN2 sent the reply LS (R2-2109124) to SA2, which confirmed that the new data unit type of ARP for broadcast and groupcast mode ProSe Direct Communication can be supported by AS layer with some update in TS 38.323 specification. However, it is not yet captured in TS 38.323 yet.

According to [4] (CATT, R2-2204771) and [6] (ZTE, R2-2204798), it is suggested to introduce new code point for PDCP SDU types of “Ethernet”, “Unstructured” and “ARP”. On the other hand, it is mentioned in [3](OPPO, R2-2204633) that TS 38.323 include a Non-IP SDU type, which may be used to carry the "Ethernet" and "Unstructured" SDU type without differentiation of the two using separate code-points. And [3] suggest to further clarify this with CT1 and SA2 on whether there is a need to introduce separate code-points for “Ethernet”, “Unstructured” and “ARP” PDCP SDU Type.

Table 6.3.12-1: SDU Type (TS 38.323)

|  |  |
| --- | --- |
| Bit | Description |
| 000 | IP |
| 001 | Non-IP |
| 010-111 | Reserved |

Furthermore, [8] (Samsung, R2-2205611) presents that CT1 specifies Ethernet, ARP, Unstructured data as non-IP PDU type in TS 24.554[9]. The “Non-IP” code point in current PDCP SDU type can be used to support the Ethernet, Unstructured and ARP packet. RAN2 can add a text to specify that non-IP in PDCP SDU type includes Ethernet, Unstructured data or ARP in PDCP specification.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 11.5 Non-IP PDU format The non-IP PDU is coded according to figure 11.5.1 and table 11.5.1.   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Bits | | | | | | | |  | | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | Octets | | Non-IP type | | | | | | | | 1 | | Non-IP payload | | | | | | | | 2 | |  | |  | | n |   Figure 11.5.1: Non-IP PDU format  Table 11.5.1: Non-IP PDU values   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Non-IP type (octet 1)  Bits | | | | | | | | | | | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |  |  | | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |  | Ethernet | | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |  | Address Resolution Protocol (see RFC 826 [32]) | | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |  | Unstructured | | All other values are reserved. | | | | | | | | | | |  | | | | | | | | | | | Octets 2 to n contain the non-IP payload field containing the data provided by the upper layer as indicated in Non-IP type. | | | | | | | | | | |  | | | | | | | | | | |

Rapporteur’s comment: Based on the above analysis, it seems that the new PDCP SDU type defined in TS 23.304 and the non-IP PDU format in TS 24.554 are both available for the support of “Ethernet”, “Unstructured” and “ARP” data packet. One is the AS layer solution, the other one is the NAS layer solution. Actually, only one of the two solutions need to be adopted.

Rapp double checked with CT1 colleagues, they said that they also noticed this inconsistency in TS 23.304 and TS 24.554. So they sent out this LS on SDU type to confirm with RAN2 whether RAN2 could support the PDCP SDU type such as “Ethernet” and “Unstructured” in AS layer as defined in SA2’s TS 23.304. If RAN2 confirms that the new PDCP SDU types in AS layer can be supported, they are ready to remove the non-IP type in CT1’s TS 24.554. On the other hand, if RAN2 think that the PDCP SDU type such as “Ethernet”, “Unstructured” can not be supported in AS layer, SA2 should be involved to delete the PDCP SDU type relevant description in TS 23.304. As a matter of fact, CT1 are not sure which option to choose, they hope RAN2 could make the decision. To move forward, Rapp would like to encourage our RAN2 experts to discuss with your CT1 colleagues and present aligned comments.

**Q1) Which option do you prefer for the support of “Ethernet”, “Unstructured” and “ARP” packet? Provide your comments.**

**Option 1: introduce three new code points of PDCP SDU type to support “Ethernet”, “Unstructured” and “ARP” packet;**

**Option 2: reuse the legacy “Non-IP” code point;**

**Option 3: introduce two new code points of PDCP SDU type to support “Ethernet” and “ARP”. Meanwhile, use non IP type for “unstructured PDCP SDU type”**

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| --- | --- | --- |
| Company | Option | Comments |
| Qualcomm | Option 1 | To not overload the legacy “Non-IP” code point and not incur additional non-IP header overhead for each packet |
| Apple | Option 2 for now, wait CT1/SA2 input | In CT1 LS, CT1 just asked RAN2 question, but not requested RAN2 to implement this change. Obviously, whether to reflect "Ethernet PDCP SDU type" and "Unstructured PDCP SDU type" in SDU type should be decided by CT1 and SA2. At least, we are not sure why reflecting "ARP" is needed for Prose. So, we suggest RAN2 to wait further input of SA2/CT1. |
| Samsung | Option 2 with comment | We are open for any option. Since there is no specific request on the new code point from CT1/SA2 we prefer to wait for the further input from CT1/SA2. |
| CATT | Option 1 | We share the same view as Rapp that RAN2 should take the responsibility to make this decision and finish this work as soon as possible.  For Option2, we beg to differ that Non-IP code-point can be used to carry the "Ethernet PDCP SDU type" and "Unstructured PDCP SDU type". Because there should be no Non-IP in 5G system, for upper layer, the concept of Non-IP is related to LTE but not 5G. Hence, we should not further continue this chaos. But considering of forward compatibility, we suggest leaving the definition of Non-IP as it is. |
| Ericsson | Option 3 | As stated in TS 23.304,  *5.3.1               General*  *5G ProSe Direct Communication over PC5 reference point is supported when the UE is "served by NG-RAN" or when the UE is "not served by NG-RAN". A UE is authorized to perform 5G ProSe Direct Communication when it has valid authorization and configuration as specified in clause 5.1.3. 5G ProSe Direct Communication supports both the cases of public safety and commercial service.*  *5G ProSe Direct Communication over NR based PC5 reference point supports broadcast mode, groupcast mode, and unicast mode.*  *For broadcast and groupcast mode 5G ProSe Direc Communication, the following data unit types are supported: IPv4, IPv6, Ethernet, Unstructured, and Address Resolution Protocol (see RFC 826 [19]).*  *For unicast mode 5G ProSe Direct Communication, the following data unit types are supported: IPv4, IPv6, Ethernet, and Unstructured.*  *The identifiers used in the 5G ProSe Direct Communication over PC5 reference point are described in clause 5.8.2.*  *The QoS handling and procedures for the 5G ProSe Direct Communication over PC5 reference point are defined in clauses 5.6 and 6.4.*  *The UEs may use the PC5 DRX mechanism to perform 5G ProSe Direct Communication over PC5 reference point as specified in clause 5.13.*  *5.4.1      5G ProSe Layer-3 UE-to-Network Relay*  5.4.1.1   General  *The 5G ProSe Layer-3 UE-to-Network Relay shall provide generic function that can relay any IP, Ethernet or Unstructured traffic:*  *-    For IP traffic over PC5 reference point, the 5G ProSe Layer-3 UE-to-Network Relay uses IP type PDU Session towards 5GC.*  *-    For Ethernet traffic over PC5 reference point, the 5G ProSe Layer-3 UE-to-Network Relay can use Ethernet type PDU Session or IP type PDU Session towards 5GC.*  *-    For Unstructured traffic over PC5 reference point, the 5G ProSe Layer-3 UE-to-Network Relay can use Unstructured type PDU Session or IP type PDU Session (i.e. IP encapsulation/de-capsulation by 5G ProSe Layer-3 UE-to-Network Relay) towards 5GC.*  *The type of traffic supported over PC5 reference point is indicated by the 5G ProSe Layer-3 UE-to-Network Relay e.g. using the corresponding RSC. The 5G ProSe Layer-3 UE-to-Network Relay determines the PDU Session Type based on configuration of the mapping between PDU Session parameters and RSC, as specified in clause 5.1.4.1.*  *IP type PDU Session and Ethernet type PDU Session can be used to support more than one 5G ProSe Layer-3 Remote UEs while Unstructured type PDU Session can be used to support only one 5G ProSe Layer-3 Remote UE.*  *NOTE:      The maximum number of PDU Sessions can affect the maximum number of 5G ProSe Layer-3 Remote UEs that the 5G ProSe UE-to-Network Relay can support.*  *The 5G ProSe Layer-3 Remote UE and 5G ProSe Layer-3 UE-to-Network Relay may use the PC5 DRX mechanism to perform 5G ProSe UE-to-Network Relay Communications over PC5 reference point as specified in clause 5.13.*  ========================================================  For L3 U2N relay, relay UE may need to map  Ethernet PDCP SDU to Ethernet session or IP session.  Therefore, it would be good to introduce new code point for Ethernet PDCP SDU, also ARP.  Meanwhile, it is sufficient to use non IP type for “unstructured PDCP SDU type”.  There is non IP SDU in EPS, therefore, it is better to keep non IP SDU.  In addition, we may also need to add a note  **Non IP SDU type in EPS corresponds to unstructured PDCP SDU type in 5G core.**  [ZTE] According to the latest 38.323, the non-IP may be associated with Ethernet packet. I am wondering if it is problematic to reuse the non-IP to indicate the unstructured PDCP SDU type.  “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.” |
| ZTE | Option 1 | SA2 has decided to adopt the new PDCP SDU type for “Ethernet”, “Unstructured”. It is better to follow their decision and make updates in TS 38.323.  With regard to “ARP”, SA2 has sent LS on the introduction of new data unit type of ARP (i.e. Address Resolution Protocol) for broadcast and groupcast mode ProSe Direct Communication and would like to check with RAN2 whether it is supported by AS layer. RAN2 has confirmed that the new data unit type of ARP can be supported by AS layer with some update in TS38.323 specification. So it should also be considered in the PDCP SDU type. |
| LG | wait for input from CT1/SA2 | We open any option. But we prefer to wait further input from CT1/SA2. |
| vivo | Option 1 | If non-IP code point is reused to indicate multiple SDU types, additional indicator may be needed for upper layer to differentiate the packet types. Meanwhile, the rest code point space are large enough. |
| MediaTek | Option 3 | Agree with Ericsson, new code points are required to distinguish different types of PDCP SDUs. |
| Nokia | Option 3 | However, would suggest using 001 for ethernet, and introduce new code points for ARP and Unstructured  [ZTE] This is slightly different from option 3, i.e. reuse non-IP for ethernet and design new code point for ARP and unstructured. The common part is that two new code point needs to be designed. |
| Xiaomi | Option 1 | The cleanest way is to introduce new code points to support “Ethernet”, “Unstructured” and “ARP” packet types. |
| Intel | Option 1 | Same view as Xiaomi |

**Summary:**

Option 1 (introduce 3 new code points for Ethernet, unstructured and ARP respectively): 6

Option 2 (reuse legacy non-IP code point ) or wait for CT1/SA2 input: 3

Option 3 (introduce 2 new code points and meanwhile reuse the non-IP code point ): 3

Majority companies (9/12) think that the new code points of PDCP SDU type should be introduced to support the “Ethernet”, “Unstructured” and “ARP” data unit type. Among them, 6 companies prefer to introduce 3 code points while 3 companies think that legacy non-IP can be reused to indicate “Ethernet” or “Unstructured” type so only two new code points are needed. Two companies suggest that three code points is clearest. If reusing non-IP to indicate “Ethernet” or “Unstructured” type, we need to further double check if there is any backward compatibility issue. Considering a lot of spare code points for PDCP SDU type are available, the following proposal are given for the sake of progress:

**Proposal 1: Three new code points of PDCP SDU type are introduced to support “Ethernet”, “Unstructured” and “ARP” data unit type.**

**Q2) Is it necessary to further clarify with CT1 and SA2 on whether to reuse legacy “Non-IP” code point or to introduce three new code points of PDCP SDU type to support “Ethernet”, “Unstructured” and “ARP” packet?**

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| --- | --- | --- |
| Company | Response (Y/N) | Comments |
| Qualcomm | No | In SA2 TS 23.304, it is already assumed the PDCP SDU types are defined. So, we do not think it is necessary to clarify with SA2 further. As CT1 sent the LS, we think a reply with RAN2 decision is suitable approach. |
| Apple | Yes | In CT1 LS, CT1 just asked RAN2 question, but not requested RAN2 to implement this change. Obviously, whether to reflect “Ethernet PDCP SDU type” and “Unstructured PDCP SDU type” in SDU type should be decided by CT1 and SA2. At least, we are not sure why reflecting “ARP” is needed for Prose. So, we suggest RAN2 to wait further input of SA2/CT1. |
| Samsung | Yes | We are fine to wait for more clear input from SA2/CT1. |
| CATT | No | We share the same view as QC. |
| Ericsson | Yes | It is beneficial if we indicate reasons why we introduce new code points. |
| ZTE | No | To make progress, it is suggested not to further clairfy with SA2/CT1 via LS any more. Companies may negotiate with their SA2/CT1 colleages internally and present the opinion here. |
| LG | Yes | To make better decision in RAN2, it’s better to clarify with CT1 and SA2. |
| vivo | No | If Option 1 is adopted, we don’t see the necessity. |
| MediaTek | No | Agree with ZTE. |
| Nokia | Yes, if | Only if option 2/3 is selected |
| Xiaomi | No | Agree with others above that in the case of option 1 there seems no need |
| Intel | No |  |

Summary:

Majority companies (7/12) prefer not to further clarify with CT1 and SA2 on whether to reuse legacy non-IP code point or introduce three new code points of PDCP SDUtype. Actually, SA2 has captured in TS 23.304 that the new PDCP SDU types are defined. CT1 just want to check with RAN2 whether "*Ethernet PDCP SDU type*" and "*Unstructured PDCP SDU type*" are really supported by AS layer. If RAN2 confirms that the new PDCP SDU types in AS layer can be supported, they are ready to remove the non-IP type in CT1’s TS 24.554. Considering that the specification impact on TS 38.323 is small, RAN2 may decide to support it and the following proposal is given:

**Proposal 2: RAN2 send replay LS to CT1 to confirm that the “Ethernet PDCP SDU type” and “Unstructured PDCP SDU type” are supported by AS layer.**

# 4 Conclusions

In this contribution, we have the following proposals based on the email discussion.

# 5 References

1. R2-2204447 LS on the SDU type used over user plane for NR PC5 reference point (C1-221835; contact: ZTE).
2. TS 23.304 3GPP TSG service and system aspects, ProSe in 5GS, R17.
3. R2-2204633 Discussion on CT1 LS on SDU type (C1-221835) OPPO.
4. R2-2204771 Issues on the SDU Type Used over User Plane for NR PC5 Reference Point CATT.
5. R2-2204772 Correciton on PDCP for SL relay CATT.
6. R2-2204798 Discussion on the SDU type used over user plane for NR PC5 reference point ZTE.
7. R2-2204799 Draft reply LS on SDU type used over user plane for NR PC5 reference point ZTE.
8. R2-2205611 Support of non-IP PDU type in PDCP protocol Samsung.
9. TS 24.554 Proximity-services (ProSe) in 5G System (5GS) protocol aspects; Stage 3.