**3GPP TSG RAN meeting #99 RP-230276**

**Rotterdam, Netherlands, March 20-23, 2023**

## Status Report to TSG

**Agenda item:** 9.2.8

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| --- | --- |
| **WI / SI Name** | Study on XR Enhancements for NR |
| included in this status report | Study Item: Yes | Core part: No | Performance part:No | Testing part:No |
| **Acronym** | FS\_NR\_XR\_enh |
| **Unique ID** | 940087 |
| **TSG Tdoc of latest approved WI/SI description (if any)** | [RP-220285](http://3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_95e/Docs/RP-220285.zip) |
| **Target Completion Date****(indicate if changed)** | Study Item: 03/2023 | Core part: N/A | Performance part: N/A | Testing part: N/A |
| **Overall Completion level** | Study Item: 100% | Core part: N/A | Performance Part: N/A | Testing part: N/A |

**Source:**

|  |  |
| --- | --- |
| **Leading WG** | RAN2 |
| **Rapporteur** | **Name** | Benoist Sébire |
| **Company** | Nokia |
| **Email** | benoist.sebire@nokia.com |

## 1 Work plan related evaluation

|  |  |
| --- | --- |
| **Do you want to modify the time budget for this WI/SI compared to what was endorsed at the last RAN meeting?** | No |

RAN2 has completed the study and the TR is submitted for approval at this meeting (RP-230307).

## 2. Detailed progress in RAN WGs since last TSG meeting (for all involved WGs)

## 2.1 RAN1

RAN1 had already completed the study at RAN#98.

## 2.2 RAN2

#### 2.2.1 Agreements

New agreements from **RAN2#121** meeting:

- RAN2 thinks that how PSER is enforced is up to network implementation.

- Introduce UL PDU Set Importance. How UE derives this will be handled in UE implementation.

- Can indicate that in RAN2 considers PDU set concept applicable to both UL and DL in LS to SA2.

- RAN2 thinks UL jitter may be present for XR (e.g. for tethering use cases). It is unclear how network would use UL jitter information (depends on what would be signalled and would anyway be up to network implementation).

- RAN2 intends to support tethering use case for XR. This may require signalling of some UL traffic arrival information from UE to network.

- Since we already agreed to not support delay-aware LCP, RAN2 aims not to introduce changes to LCP due to PDU prioritization.

- RAN2 thinks PSI can be useful for PDU set-based discard. RAN2 aims to introduce a mechanism to allow UE to handle discarding of packets with different PSI in case of congestion. FFS for other cases.

- Support of RLC bearer splitting should be limited to existing cases (e.g. PDCP duplication), no new XR-specific functionality.

#### 2.2.2 Open Issues

None.

## 3. Detailed progress in SA WGs since last TSG meeting (for all involved WGs)

## 4. References

New references since the last status report.

**RAN2#121**

1. R2-2300019, Reply LS on XR and Media Services (R1-2212994; contact: vivo), RAN1
2. R2-2300022, LS to capture Text Proposal for TR 38.835 (R1-2213016; contact: Nokia), RAN1
3. R2-2300036, Reply LS on XR and Media Services (R3-226885; contact: Ericsson), RAN3
4. R2-2300071, Reply LS on PDU Set Handling (S2-2301378; contact: Tencent), SA2
5. R2-2300072, LS reply on reply LS on XR and Media Services (S2-2301384; contact: vivo), SA2
6. R2-2300086, Reply LS on Pose Information for XR (S4-221626; contact: Qualcomm), SA4
7. R2-2300087, Reply LS on PDU Set Handling (S4aR230035; contact: Ericsson), SA4
8. R2-2300118, Discussion on XR power saving, Huawei, HiSilicon
9. R2-2300149, Work Plan for Rel-18 SI and WI on XR Enhancements for NR, Nokia, Qualcomm (Rapporteurs), Ericsson (RAN1 FL)
10. R2-2300150, SA2 Status for XR, Nokia, Qualcomm (Rapporteurs)
11. R2-2300151, SA4 Status for XR, Nokia, Qualcomm (Rapporteurs)
12. R2-2300152, Update of TR 38.835, Nokia (Rapporteur)
13. R2-2300153, PDU Set and Data Burst Information, Nokia, Nokia Shanghai Bell
14. R2-2300154, PDU Set prioritization, Nokia, Nokia Shanghai Bell
15. R2-2300155, PDU Set Discard, Nokia, Nokia Shanghai Bell
16. R2-2300156, PDU set protocol stack impacts, Nokia, Nokia Shanghai Bell
17. R2-2300185, Discussion on PDU Sets and data bursts, Qualcomm Incorporated
18. R2-2300186, Discussion on PDU discard, Qualcomm Incorporated
19. R2-2300187, Discussion on impacts of PDU Sets on protocol stacks, Qualcomm Incorporated
20. R2-2300188, DRX enhancements for XR, Qualcomm Incorporated
21. R2-2300189, Enhancements for capacity improvements, Qualcomm Incorporated
22. R2-2300222, PDU set and data burst information, CATT
23. R2-2300223, Discussion on the PDU Prioritization, CATT
24. R2-2300224, On PDU Discarding, CATT
25. R2-2300225, Protocol stack impacts from serving an XR QoS flow, CATT
26. R2-2300226, DRX enhancements for XR Power Saving, CATT
27. R2-2300227, The Issues of XR-specific Capacity Improvements, CATT
28. R2-2300256, Dynamic BSR formulation and reporting for XR, Dell Technologies
29. R2-2300320, Discussion on PDU set and data burst information, vivo
30. R2-2300321, Discussion on PDU prioritization for XR awareness, vivo
31. R2-2300322, Discussion on PDU discard for XR awareness, vivo
32. R2-2300323, Discussion on protocol stack impacts and in-sequence delivery, vivo
33. R2-2300324, Discussion on DRX Enhancements for XR Power Saving, vivo
34. R2-2300325, Discussion on Feedback Enhancements for XR, vivo
35. R2-2300340, Discussion on PDU discard, Futurewei
36. R2-2300341, Discussion on PDU prioritization, Futurewei
37. R2-2300397, Discussion on BSR enhancement for XR capacity improvements, TCL Communication Ltd.
38. R2-2300422, Discussing on UE feedback enhancements for XR capacity, Xiaomi Communications
39. R2-2300423, Discussing on XR-specific C-DRX enhancement, Xiaomi Communications
40. R2-2300425, Discussion on the impact of DRB mapping alternatives, Xiaomi Communications
41. R2-2300426, Discussing on PDU discarding of XR traffic, Xiaomi Communications
42. R2-2300427, Discussion on traffic prioritization of XR traffic, Xiaomi Communications
43. R2-2300428, RAN2 implications on PDU Set and Data Burst based on SA2 inputs, Intel Corporation
44. R2-2300429, Differentiated handling of PDU sets with different importance in a QoS flow, Intel Corporation
45. R2-2300430, Criteria and Mechanism of PDU Discard for XR traffic, Intel Corporation
46. R2-2300431, DRB mapping to the RLC bearers for XR traffic, Intel Corporation
47. R2-2300432, C-DRX enhancements for XR traffic, Intel Corporation
48. R2-2300433, Enhancements to Buffer Status Reporting for XR Traffic, Intel Corporation
49. R2-2300459, Discussion on PDU Set, OPPO
50. R2-2300460, Discussion on PDU prioritization, OPPO
51. R2-2300461, Discussion on PDU discard, OPPO
52. R2-2300462, Discussion on protocol stack impacts, OPPO
53. R2-2300463, Discussion on capacity improvement, OPPO
54. R2-2300500, Discussion on Protocol Stack impacts, Lenovo
55. R2-2300502, Discussion on PDU prioritization, Lenovo
56. R2-2300518, PDU Set and PDCP Discard Handling, Samsung R&D Institute India
57. R2-2300560, BSR enhancements for XR, ZTE Corporation, Sanechips
58. R2-2300561, Protocol stack impacts for XR, ZTE Corporation, Sanechips
59. R2-2300562, PDU discard for XR, ZTE Corporation, Sanechips
60. R2-2300563, PDU prioritization for XR, ZTE Corporation, Sanechips
61. R2-2300564, PDU set and data burst information, ZTE Corporation, Sanechips
62. R2-2300565, XR-Specific power saving, ZTE Corporation, Sanechips
63. R2-2300587, Discussion on PDU Set and Data Burst Information, Google Inc.
64. R2-2300588, Discussion on PDU prioritization, Google Inc.
65. R2-2300589, Discussion on PDU Discard, Google Inc.
66. R2-2300590, Discussion on protocol Stack impact, Google Inc.
67. R2-2300591, XR-specific power saving enhancement, Google Inc.
68. R2-2300592, XR-Specific capacity improvements, Google Inc.
69. R2-2300596, Discussion on PDU set and data burst information, Huawei, HiSilicon
70. R2-2300597, Discussion on PDU prioritization at RAN, Huawei, HiSilicon
71. R2-2300598, Discussion on PDU set discarding for XR traffic, Huawei, HiSilicon
72. R2-2300599, Discussion on L2 protocol stack for differentiated PDU set handling at RAN, Huawei, HiSilicon
73. R2-2300640, Discussion on PDU Prioritization, Meta USA
74. R2-2300641, Considerations on XR capacity improvements, KDDI Corporation
75. R2-2300656, Discussion on PDU set and data burst information, Spreadtrum Communications
76. R2-2300657, Discussion on PDU prioritization, Spreadtrum Communications
77. R2-2300658, Discussion on PDU discard, Spreadtrum Communications
78. R2-2300659, Discussion on protocol stack impacts, Spreadtrum Communications
79. R2-2300665, BSR enhancements for XR, Spreadtrum Communications
80. R2-2300684, Discussion on capacity improvements for XR, Google Inc.
81. R2-2300685, Discussion on PDU prioritization for XR, Google Inc.
82. R2-2300691, PDU set and data burst information, InterDigital
83. R2-2300692, PDU prioritization, InterDigital
84. R2-2300693, PDU discard, InterDigital
85. R2-2300694, Protocol stack impacts, InterDigital
86. R2-2300695, XR-specific power saving, InterDigital
87. R2-2300696, XR-specific capacity improvements, InterDigital
88. R2-2300699, Discussion on XR data periodicity mismatch, FGI
89. R2-2300723, PDU Set Information and Uplink Jitter, Apple
90. R2-2300724, Views on XR-awareness and PDU Prioritization, Apple
91. R2-2300725, Views on Packet Discarding and Reordering, Apple
92. R2-2300726, Views on QoS Mapping and PS Impacts, Apple
93. R2-2300727, Views on BSR Enhancements for XR, Apple
94. R2-2300728, Views on Configured Grant Enhancements for XR, Apple
95. R2-2300774, DRX enhancement for power saving in XR, LG Electronics Inc.
96. R2-2300826, Discussion on BSR enhancement for XR, NEC Corporation
97. R2-2300842, Discussion on LCP enhancement for XR, NEC Corporation
98. R2-2300843, Discussion on C-DRX enhancement for XR, NEC Corporation
99. R2-2300908, Discussion on PDU discarding, Lenovo
100. R2-2300909, C-DRX enhancements for XR-specific power saving, DENSO CORPORATION
101. R2-2300918, Discussion on XR-specific capacity improvements, DENSO CORPORATION
102. R2-2300939, Discussion on the PDU prioritization for XR, ITRI
103. R2-2300944, Discussion on PDU sets awareness in RAN, Lenovo
104. R2-2300945, Discussion of DRX enhancement, Lenovo
105. R2-2300946, Discussion on UE Feedback enhancements, Lenovo
106. R2-2300987, Discussion on mapping the PDU set into DRB/LCH, NEC
107. R2-2301009, PDU set and data burst information, NEC
108. R2-2301010, PDU discard, NEC
109. R2-2301028, Discussions on PDU discard, Fujitsu
110. R2-2301029, Discussions on protocol stack impacts of XR, Fujitsu
111. R2-2301030, Discussions on XR-specific capacity improvements, Fujitsu
112. R2-2301089, Considerations on XR PDU prioritization, Sony
113. R2-2301090, Considerations on XR UL PDU discard, Sony
114. R2-2301091, Proposals on XR specific C-DRX power saving enhancements, Sony
115. R2-2301092, Considerations on XR specific capacity improvements, Sony
116. R2-2301168, Discussion on PDU set information, Samsung
117. R2-2301237, Discussion on DRX enhancements, CMCC
118. R2-2301248, Discussion on XR-specific capacity improvement, CMCC
119. R2-2301266, Further Considerations on PDU Discard, CMCC
120. R2-2301267, RAN2 Impact Analysis on PDU Prioritization, CMCC
121. R2-2301268, L2 Protocol Stack for PDU Set, CMCC
122. R2-2301323, Discussion on power saving scheme for XR, Samsung
123. R2-2301369, PDU set characteristics and their usage in RAN, MediaTek Inc.
124. R2-2301370, On the need for modifications to LCP, MediaTek Inc.
125. R2-2301371, PDU discard based on PSDB and PDU set importance, MediaTek Inc.
126. R2-2301372, C-DRX enhancements for XR, MediaTek Inc.
127. R2-2301386, Discussion on protocol stack impact, Samsung
128. R2-2301413, Considerations on XR UL PDU discard, Sony
129. R2-2301416, Discussion on PDU Discard, Meta USA
130. R2-2301423, Capacity enhancement for XR, MediaTek Inc.
131. R2-2301435, Discussion on protocol stack impacts, Futurewei
132. R2-2301506, Discussion on Protocol stack impacts, Ericsson
133. R2-2301507, Discussion on XR-specific capacity improvements, Ericsson
134. R2-2301508, Discussion on XR-specific power saving, Ericsson
135. R2-2301509, Discussion on PDU Discard, Ericsson
136. R2-2301510, Discussion on PDU Sets and Data Burst, Ericsson
137. R2-2301511, Discussion on PDU Prioritization, Ericsson
138. R2-2301516, Power saving enhancements for XR, Nokia, Nokia Shanghai Bell
139. R2-2301517, Capacity improvements, Nokia, Nokia Shanghai Bell
140. R2-2301533, Discussion on PDU set information and remaining time for PSDB, ASUSTeK
141. R2-2301534, Discussion on PDU set discard operation, ASUSTeK
142. R2-2301646, Discussion on PDU set handling and data burst information, LG Electronics Inc.
143. R2-2301647, Discussion on the discard for XR, LG Electronics Inc.
144. R2-2301648, Discussion on the prioritization for XR, LG Electronics Inc.
145. R2-2301721, Discussion on MAC enhancement for XR-specific capacity improvement, Huawei, HiSilicon
146. R2-2301725, Discussion on BSR enhancement and delay information report, LG Electronics Inc.
147. R2-2301734, Discussion on XR impacts on protocol stack, LG Electronics Inc.
148. R2-2301751, Discussion on handling of PDU set prioritization., Samsung Electronics Czech
149. R2-2301767, Discussion on PDU discard, NTT DOCOMO, INC.
150. R2-2301773, Discussion on BSR enhancements for XR, Samsung
151. R2-2301774, Discussion on PDU prioritization, NTT DOCOMO, INC.
152. R2-2301797, Discussion on PDU set and data burst information, III
153. R2-2301798, Discussion on PDU prioritization, III
154. R2-2301805, Discussion on XR-specific capacity improvements, III
155. R2-2301834, Discussion on various frame rates supported for XR-specific power saving, III
156. R2-2301849, Discussions on PDU Set information, TCL Communication
157. R2-2301850, Discussions on Protocol stack impacts from PUD Set, TCL Communication
158. R2-2301861, Discussion on PDU sets and data bursts, Futurewei
159. R2-2301941, LS on the Design of RTP Header Extension for PDU set handling (S4-230419; contact: Intel), SA4
160. R2-2302009, Summary of [AT121][204][XR] Reply LS to SA2 on PSER usage (CMCC), CMCC
161. R2-2302010, Reply LS on PDU Set Handling, RAN2