3GPP TSG RAN meeting #105 RP-241770

Melbourne, Australia, September 9-12, 2024

## Status Report to TSG

**Agenda item:** 9.3.2.3

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| **WI / SI Name** | XR (eXtended Reality) for NR Phase 3 |
| included in this status report | Study Item: No | Core part: Yes | Performance part:Yes | Testing part:No |
| **Acronym** | NR\_XR\_Ph3 |
| **Unique ID** | 1020098 |
| **TSG TDoc of latest approved WI/SI description (if any)** | RP-240791 |
| **Target Completion Date****(indicate if changed)** | Study Item: N/A | Core part: 2025/09 | Performance part:2026/03 | Testing part: N/A |
| **Overall Completion level** | Study Item: N/A | Core part:30% | Performance Part: 0% | Testing part: N/A |

**Source:**

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

## 1 Work plan related evaluation

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

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

## 2.1 RAN1

During RAN1#118, the following was agreed:

- For solutions based on triggering/enabling by network signaling to enable Tx/Rx in gaps/restrictions that are caused by RRM measurements select one among the following options:

* Option 1: Support Alt. 1-1:
* Alt. 1: Dynamic indication to enable Tx/Rx in particular gap(s)/restriction(s) that are caused by RRM measurements.
	+ Alt 1-1: Explicit indication by DCI to skip a particular gap(s)/restriction(s);
		- Indication is included as part of scheduling DCI:
			* FFS: Bit-field size is one bit;
			* FFS: Bit-field size is >1 bit;
		- Note: Minimum time offset(s) between the end of [the first] received dynamic indication and start of corresponding gap(s)/restriction(s) occasion that is going to be skipped shall be introduced.
	+ FFS: DCI format, DCI content, DCI bit-field size;
	+ FFS: Whether indication is for one or more occasions;
	+ FFS: How to consider time offset between the end of received dynamic indication and start of gap(s)/restriction(s) occasion that is going to be skipped.
* Option 2: Support Alt. 3-1:
* Alt. 3: Semi-static solution to enable TX/RX in gaps/restrictions that are caused by RRM measurements.
	+ Alt 3-1: Configure a pattern(s) via RRC to indicate occasions where to skip gaps/restrictions;
		- FFS: Details of pattern:
			* FFS: Pattern is based on periodicity, offset and duration;
			* FFS: Pattern is based on a bitmap;
		- FFS: whether a pattern is applied to all or subset of configured MG configurations/scheduling restrictions.
* If Alt. 1 from RAN1#117 agreement is supported, minimum time offset(s) X between indication to skip and skipped measurement occasion is up to RAN4 to discuss and decide on particular value(s).

The following working assumption was made:

- For solutions based on triggering/enabling by network signaling to enable Tx/Rx in gaps/restrictions that are caused by RRM measurements select the following option:

* Alt. 1: Dynamic indication to enable Tx/Rx in particular gap(s)/restriction(s) that are caused by RRM measurements.
	+ Alt 1-1: Explicit indication by DCI to skip a particular gap(s)/restriction(s);
		- Indication is included as part of scheduling DCI:
			* Bit-field size is one bit;
				+ The bit in the DCI is used to indicate whether to skip the first gap/restriction occasion after a minimum time offset required between the last symbol of the PDCCH carrying the DCI format and the start of corresponding skipped gap/restriction occasion indicated by the DCI.
* Send an LS to RAN4 to inform them of the above working assumption and ask them if there is any issue with it.
* Final LS in R1-2407561.

#### 2.1.1 Remaining Open issues

The one RAN1-related objective (related to RRM measurements) remains open.

## 2.2 RAN2

Regarding an incoming LS from SA2 [[R2-2406433](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_127/Docs/R2-2406433.zip)], RAN2 agreed:

- From RAN2 periodicity can already be provided to gNB via TSCAI and/or UAI, which is sufficient for infrequent periodicity changes;

- RAN2 does not have consensus on whether additional indication for dynamic changes of the periodicity is needed;

- RAN2 thinks TTNB may be useful for the NW scheduling for DL, provided it is provided in advance and is reliable and accurate at RAN.

Then, RAN2 agreed the following regarding multi-modality (study phase):

- Working assumption: Regardless of SA2 decision, RAN2 can extend the UAI for multi-modal awareness at least for uplink QoS flows in Rel-19 XR, by having the UE report existence of multi-modality application and association information among QFIs to gNB.

- FFS whether this can be applied to DL

- RAN2 considers that based on multi-modal information:

- The gNB may perform joint admission control. Details can be left up to RAN3 in potential WI phase. FFS if MMSID can be used for this purpose.

- The gNB may consider this information during QoS flow to DRB mapping (up to gNB implementation)

- For UL, RAN2 does not intend to perform LCP enhancements due to complexity vs gains concerns.

- For DL, whether traffic synchronization (on a per packet basis) can be achieved depends on whether packet level synchronization information can be provided from CN to RAN.

- For PDU set discard enhancements:

- RAN2 thinks PDU Set discard across QoS flows of the same multi-modal service based on the dependency information between the multi-modal flows can only be achieved in case the synchronization information can be available at the UE which is up to SA2/SA4.

- RAN2 thinks in case this is feasible, it should be limited to intra-DRB case.

- For DRX enhancements:

- Not support multiple active DRX configurations

Regarding scheduling enhancements (also study phase), RAN2 agreed:

- RAN2 to no longer consider the enhancement of the LCP restriction, as one of the candidate solutions for LCP enhancements in Rel-19 XR

- Network should be able to configure multiple remaining time thresholds for reporting for each LCG to report multiple pairs of remaining time and buffer sizes per LCG.

- For enhanced DSR:

- There will be a single triggering threshold, as in Rel-18. FFS whether there are any constraints on how the NW configures DSR triggering and reporting thresholds

- FFS whether there is any impact on delay critical data definition due to multiple reporting thresholds in the DSR

- FFS whether to include non-delay critical data ahead of delay critical data in the buffer size calculation for DSR

- FFS whether/how additional priority impacts intra-UE prioritization (can be discussed in stage-3)

Regarding RLC enhancements:

- For Unnecessary retransmissions:

- Any solution should ensure that windows at Tx side and Rx side are not out of sync. As a baseline, we assume Rx window advances before Tx window advances FFS if for Tx approach window sync needs to be achieved in another way, e.g. advancing Tx window first.

- In the RX-initiated approach for avoiding unnecessary retransmissions, RLC receiver abandons missing SDUs like already done by PDCP, i.e. based on a timer.

- In addition to Tx and Rx approaches, RAN2 will consider a combined Rx and Tx approach, where

- Tx side stops to retransmit an obsolete SDUs based on the discard indication/a number of retransmissions as for Tx initiated approach

- Rx side stops to receive an obsolete SDU based on local timer as for Rx initiated approach

#### 2.1.3 Remaining Open issues

The RAN2-related objectives remain open.

Regarding the study phases scheduled for completion at this meeting, the agreements reached during the last three meetings (including the above) which are relevant to conclude are:

1. For Multi-Modality:

- RAN2 assumes that traffic of different modals having different QoS requirements is mapped to different QoS flows;

- Existing QoS flow to DRB mapping framework is used as a baseline, i.e. up to gNB how to map QoS flows to DRBs.

- Support Multi-Modality awareness in RAN in Rel-19 for UL and DL.

- Working assumption: Regardless of SA2 decision, RAN2 can extend the UAI for multi-modal awareness at least for uplink QoS flows in Rel-19 XR, by having the UE report existence of multi-modality application and association information among QFIs to gNB.

- FFS whether this can be applied to DL

- RAN2 considers that based on multi-modal information:

- The gNB may perform joint admission control. Details can be left up to RAN3 in potential WI phase. FFS if MMSID can be used for this purpose.

- The gNB may consider this information during QoS flow to DRB mapping (up to gNB implementation)

- For UL, RAN2 does not intend to perform LCP enhancements due to complexity vs gains concerns.

- For DL, whether traffic synchronization (on a per packet basis) can be achieved depends on whether packet level synchronization information can be provided from CN to RAN.

- For PDU set discard enhancements:

- RAN2 thinks PDU Set discard across QoS flows of the same multi-modal service based on the dependency information between the multi-modal flows can only be achieved in case the synchronization information can be available at the UE which is up to SA2/SA4.

- RAN2 thinks in case this is feasible, it should be limited to intra-DRB case.

- For DRX enhancements:

- Not support multiple active DRX configurations

2. For LCP Enhancements:

- Delay-aware LCP enhancement to resolve the issue of data with low remaining time being delayed due to data from other LCHs with no delay critical data is supported in Rel-19 XR;

- The solution should consider impact on UE complexity (as already indicated in SI objective description);

- For delay-aware LCP enhancement, RAN2 considers the following option to override/adjust the priority of LCH based on delay/deadline information as a baseline:

- Use additional priority configured to LCHs in case of these LCHs with delay-critical data.

- RAN2 to no longer consider the enhancement of the LCP restriction, as one of the candidate solutions for LCP enhancements in Rel-19 XR.

- For DSR enhancements:

- Enhance DSR to report with multiple pairs of remaining time and buffer size for the LCG;

- There will be a single triggering threshold, as in Rel-18.

## 2.3 RAN3

**For SA2 LS (**[**R3-244045/S2-2407351**](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_125/Docs/R3-244045.zip)**)**:

- For Q1, RAN3 agreed the control plane based solution providing periodicity per QoS flow as part of the TSCAI is sufficient for semi-static periodicity case. Other potential cases (e.g. dynamic case) need to be clarified by SA2, if any.

- For Q3, RAN3 agreed For semi-static periodicity traffic, it is feasible for NG-RAN node to provide the available data rate to CN via UP. For dynamic traffic, some companies have concern that the reporting of available data rate may not be accurate. RAN3 would like SA2 to further clarify the definition of “available data rate”, e.g., it is only below the GFBR, or between GFBR and MFBR, or even above MBFR; whether it should be periodic reporting, on demand reporting, or threshold(s) defined reporting.

Reply LS to SA2 agreed in [R3-244844](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_125/Docs/R3-244844.zip).

**Support XR in NR-DC**

For PDU Set based handling, RAN3 agreed turn the WA to agreement, and no NGAP enhancement. TP to BL CR for TS 38.423 agreed in [R3-244760](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_125/Docs/R3-244760.zip).

WA: SN reports the PDU Set based Handling Indicator in S-NG-RAN node Addition Preparation procedure and M-NG-RAN node initiated S-NG-RAN node Modification Preparation procedure for the MN-terminated SCG bearer, SN-terminated MCG bearer and SN-terminated SCG bearer.

For DL PSI based Discard coordination, RAN3 agreed MN/SN notifies SN/MN whether the DL PSI based discard is configured or not via XnAP signaling. RAN3 to introduce new notification over F1AP and F1-U for DL PSI Discard. TP to BL CR for TS 38.423 agreed in [R3-244762](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_125/Docs/R3-244762.zip). TS 38.473 BL CR endorsed in [R3-244767](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_125/Docs/R3-244767.zip). TP to BL CR for TS 38.425 agreed in [R3-244768](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_125/Docs/R3-244768.zip).

For End of Data Burst Indication to the peer gNB, RAN3 agreed source gNB forward the End of Data Burst Indication to target gNB during the data forwarding for handover. TS 38.300 BL CR endorsed in [R3-244845](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_125/Docs/R3-244845.zip).

For Burst Arrival Time reporting, RAN3 agreed the SN can receive it from UE. TP to BL CR for TS 37.340 agreed in [R3-244846](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_125/Docs/R3-244846.zip).

For ECN marking and congestion exposure, TS 38.325 BL CR endorsed in [R3-244847](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_125/Docs/R3-244847.zip).

For ECN marking for SN-initiated modification procedure, RAN3 agreed IEs added into the “S-NODE MODIFICATION REQUEST ACKNOWLEDGE” message for ECN marking should be copied into the “S-NODE MODIFICATION REQUIRED” message. TP to BL CR for TS 38.423 agreed in [R3-244771](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_125/Docs/R3-244771.zip).

**RAN3 concluded XR for NR-DC is completed in RAN3.**

## 2.4 RAN4

During RAN4#112, the following was agreed in R4-2414027 and R4-2414043:

Workplan

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| RAN4 meeting | Tasks |
| RAN4 #112August 2024 | Approval of workplanInitial discussion on scenarios for measurement skipping based on RAN1 conclusions.  |
| RAN4 #112bisOctober2024 | Conclusions on scenarios for measurement skipping based on RAN1 conclusions.Discussion on the need for UE assistance information regarding measurements occasions needed.  |
| RAN4 #113November 2024 | Discussion on RRM requirements with measurement skipping.Discussion on the necessary UE assistance information.  |
| RAN4 #114February 2025 | Conclusion on RRM requirements with measurement skipping.Discussion on the need for UE assistance information regarding measurement skipping.Agreement of CR work split. |
| RAN4 #114bisApril 2025 | Conclusion on the necessary UE assistance information..First Draft CRs for RRM core requirements (draft CRs for 38.133 expected)First big Draft CR. |
| RAN4 #115May 2025 | Discussion on remaining open issues for RRM core  |
| RAN4 #116August 2025 | Discussion on remaining open issues for RRM core .Revision of CRs for RRM core requirements.Planning of RRM performance.Initial discussion on RRM test cases. |

And workscope:

- As starting point, RAN4 to discuss the Tx/Rx in occasions of L3 measurement.

- The progress in RAN1/2 should be taken into account.

- FFS whether/when to start the discussion of Tx/Rx in occasions of scheduling restriction due to L1 operation.

- RAN4 to discuss

- The potential impact on measurement requirements due to measurement cancellation

- The corresponding solution to address the impact if needed.

#### 2.4.1 Remaining Open issues

The one RAN4-related objective (related to RRM measurements) remains open. See agreed WF in R4-2414043.