3GPP TSG RAN meeting #106 DRAFT RP-242517

Madrid, Spain, December 9-12, 2024

## Status Report to TSG

**Agenda item:** 9.3.2.3

|  |  |
| --- | --- |
| **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:55% | Performance Part: 0% | 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 |

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

## 2.1 RAN1

### 2.1.1 Discussions and Agreements

#### 2.1.1.1 RAN1#118-bis

During RAN1#118-bis, the following was agreed:

- At least for self-scheduling case, for explicit indication by DCI to skip a particular gap/restriction, one bit indication is included as part of DCI formats 0\_1/1\_1 and 0\_2/1\_2.

* FFS: Cross carrier scheduling.
* FFS: DCI formats 0\_3/1\_3.
* Explicit indication can be configured for each DCI format individually by higher layer.
* Clarify the note from previous agreement as follows:
* 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.
* In case of cross carrier scheduling, for explicit indication by DCI to skip a particular gap/restriction, one bit indication included as a part of DCI formats 0\_1/1\_1 and 0\_2/1\_2 corresponds to a scheduled cell.
* From RAN1 perspective, the case where an occasion of gap/restriction that is caused by RRM measurements is cancelled/skipped partially is not supported in Release 19.

#### 2.1.1.2 RAN1#119

During RAN1#119, the following was agreed:

- For explicit indication by DCI, bit value equal to “1” indicates the corresponding gap/restriction occasion is to be “skipped”.

- FFS: Interpretation of bit value equal to “0”.

* A component of an FG can have Option 1 as a first value and Option 2 as a second value:

- Option 1: For explicit indication by DCI, bit value equal to “0” means UE ignores the indication of this field in the DCI.

- Option 2: For explicit indication by DCI, bit value equal to “0” means UE behaviour for the corresponding gap/restriction occasion is as per legacy behaviour.

- Note: UE indicates only one value of this component.

* For explicit indication by DCI to skip a particular gap/restriction, in addition to DCI formats 0\_1/1\_1 and 0\_2/1\_2, one bit indication can be included as a part of DCI formats 0\_3/1\_3.

- Explicit indication can be configured for each DCI format individually by higher layer.

- The skipping indication corresponds to the first gap/restriction occasion among co-scheduled cells by the DCI (Type-1C field)

- Above applies only for intra-band CA cases (same SCS for cells in the set of co-scheduled cells).

### 2.1.2 Main Open issues

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

## 2.2 RAN2

### 2.2.1 Discussions and Agreements

#### 2.2.1.1 RAN2#127bis

Agreements for RRM measurement gap skipping:

1. RAN2 assumes that at least some impact on DSR from MG skipping can be avoided by NW implementation. FFS whether there is an impact which would require some specification changes/enhancements.

2. No need to have delay-aware LCP enhancements specific for MG skipping, i.e. MG skipping and delay-aware LCP are designed as independent features

3. RAN2 can further evaluate whether there is any impact on DRX from MG skipping. For the moment, the issue is unclear.

4. RAN2 will focus its work on supporting the solution chosen by RAN1/RAN4.

5. RAN2 can discuss whether there is a need to additionally have other solution (e.g. RRC-based) which can be decided after RAN1/RAN4 evaluation and knowing more details of DCI-based solution.

Agreements on LCP enhancements:

1. As a baseline, additional LCH priority is applied for an LCH in both 1st and 2nd Rounds of resource allocation procedure in LCP, as long as the LCH has delay-critical data available for transmission when starting the 1st Round.

2. FFS if we can still change the priority for the 2nd round to ensure fairness, but we need to consider tight timeline of LCP procedure and UE complexity. Companies can also check whether we can leave this to UE implementation.

3. Introduce an independent per-LCH remaining time threshold for applying delay-critical priority.

4. We do not introduce any setting restrictions of this new remaining time threshold with relation to DSR triggering threshold.

Agreements on DSR enhancements:

1. We do not change the definition of delay-critical data

2. For the sake of RAN2 discussions, we use the following terms: triggering threshold, reporting threshold(s)

3. Companies should analyse the impact of setting the triggering threshold to value lower than largest reporting threshold on DSR procedure, e.g. triggering, cancellation etc.

4. For Rel-19 DSR, the buffered data is divided into multiple portions based on the multiple reporting time threshold levels configured for an LCG. The Rel-19 DSR indicates the following information for each portion for which BS>0:

• Buffer size of data volume in each portion

• Shortest remaining time among PDCP SDUs buffered in each portion.

5. There is no need to include PSI in the enhanced DSR MAC CE.

6. A one-bit indication may indicate whether a certain/further pair of remaining time information and buffer size information is present in the new DSR MAC CE for the associated LCG.

7. FFS whether old and new DSR can be configured/used at the same time or we always use a new DSR in case there is at least one LCG configured with multiple reporting thresholds

Agreements on RLC timely retransmissions:

1. RAN2 confirm that existing mechanisms are insufficient to resolve the timely RLC retransmission problem and RLC enhancements for timely RLC retransmission are investigated in Rel-19.

2. Exclude enhanced status reporting.

3. Focus the discussion on autonomous retransmission and polling enhancements, e.g. we need to understand how each option affects the capacity and packet delay

Agreements on avoiding unnecessary retransmissions:

1. RAN2 confirm the previous baseline assumption: the RLC receiving window always advances to any given RLC SN before the transmitting window does.

2. RAN2 will adopt a “combined” approach for avoiding unnecessary RLC retransmissions, i.e.

• TX side stops transmissions of an outdated SDU

• RX side abandons the SDU based on a local timer

• Rx informs Tx side about the abandoned SDUs, as a baseline we assume existing SR can be reused unless issues are identified

• FFS if some C-PDU handling is needed to avoid C-PDU discard

• FFS if some indication is sent from Tx to Rx. The assumption is this is not a full status report, but something simple (if needed)

Agreements on XR rate control

1. FFS if the indication is per DRB or per QoS flow. Companies should analyse the impact on QoS enforcement, interworking with L4S etc.

2. RAN2 to consider the following approaches to provide recommended bit rate values better fitting XR applications:

- Extend the Bit Rate field

- Define a new bit rate table to provide sufficient granularity for XR traffic

- Introduce new values for the bitRateMultiplier

3. Send LS to SA4 asking about range/granularity which is required

#### 2.2.1.2 RAN2#128

Agreement for the reply to SA2 on PDU set information: RAN2 confirms that it can be useful for gNB to have PDU Set Information marking without PDU Set QoS parameters.

Agreements on RRM measurement gaps impacts:

1. No MG-specific enhancements is needed on DSR operation.

2. RAN2 assumes that UE follows DRX pattern as currently, even when MG is indicated as skipped

3. No MG-specific enhancements is needed for DRX operation.

Agreements on LCP prioritization:

1. As a baseline, the additional LCH priority is applied to both the first round and the second round of the LCP procedure. The UE does not fallback to the default LCH priority in the second round even if there is no more LCH priority-adjusted data after the first round.

2. As an optional capability, the UE can also support to fallback to default priority in the 2nd round of LCP.

Agreements on DSR enhancements:

- Let the network configure the triggering and reporting thresholds without constraints.

- RAN2 understanding is that the data that has been already reported in the DSR should not trigger another DSR

- The existing cancelling and triggering of Rel-18 DSR is reused for the enhanced DSR.

- The UE may also support including non-delay critical data ahead of delay critical data in the buffer size calculation for DSR, which is a capability indicated to the NW.

Agreements on AL-FEC (related to LS from SA2):

- There is no consensus in RAN2 that AL-FEC ratio information is useful for the gNB for both RLC AM and RLC UM.

- RAN2 understanding is that in case this information would be provided to the gNB, it is up to gNB how/whether to consider it, i.e. no impact on RAN2 specifications

Agreements on unnecessary RLC retransmissions:

- There is no clear understanding on how the indication would look like or what problem it would solve that cannot be solved by the local timer

- Unless critical issue is identified, no Tx to Rx indication will be introduced

- Special handling to avoid PDCP control PDU discard is not needed.

- A new RLC timer at the Rx is introduced to determine obsolete RLC SDUs. The timer starts when the gap is detected at RLC layer.

- The abandoned RLC SDUs determined by a new RLC timer are positively acknowledged in the STATUS report.

Agreements on timely RLC retransmissions:

- Timely RLC retransmission solution covers both autonomous retransmission and polling enhancement and NW can configure either or both of them.

Agreements on XR rate control

1. RAN2 confirms it is feasible for RAN to estimate the congestion information at both per-DRB and per-QoS flow level.

2. gNB can be indicated which QoS flows can be throttled. FFS whether this is indicated from UE/CN

3. Rate indication from gNB to the UE on a per QoS flow level is supported. FFS the details, e.g. if: 1) flows are indicated by MAC CE or 2) by RRC while MAC CE is per DRB.

4. RAN2 will not discuss/support rate indication for DL unless WID is updated to include it by RANP.

5. RAN2 assumes that the congestion situation can be known at the gNB without any indication from the UE

6. FFS whether UL MAC CE rate query/preference is supported as UE recommendation to the NW or whether legacy MAC CE can serve this already. FFS in which scenarios this is useful.

### 2.2.1 Main Open Issues

Apart from all the remaining Stage 3 details, one open issue is the possible provision of MMSID to the gNB. RAN2 sent an LS to SA2 but has not received a reply yet ([R2-2409272](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_127bis/Docs/R2-2409272.zip)).

## 2.3 RAN3

#### 2.3.1 Discussions and Agreements

#### 2.3.1.1 RAN3#125bis

RAN3 discussed the SA2 LS on multi-modality awareness at RAN. RAN3 agreed that it is technically feasible to enhance NGAP to provide the MMSID to NG-RAN node. The reply LS to SA2 agreed in [R3-245682](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_125-bis/Docs/R3-245682.zip).

RAN3 discussed the RAN2 LS on UL PSI based PDU discarding in NR-DC. RAN3 agreed: For the UL PSI based discard, no further enhancements between MN and SN are needed in R19.

#### 2.3.1.2 RAN3#126

RAN3 discussed the SA2 LS on PDU Set Information Marking Support without QoS parameters. RAN3 agreed It is feasible to re-use the existing PDU Set Based Handling Support Indication to indicate SMF that PDU Set based handling is supported by NG-RAN when receiving the DL PDU Set Marking indication without PDU Set QoS Parameters. Some companies believe it is beneficial to support dynamic PSI activation/deactivation from RAN to 5GC, but other companies have different view. There is no agreement on supporting dynamic PSI activation/deactivation from RAN to 5GC. RAN3 expects SA2 to further discuss this topic based on RAN3 feedback. Reply LS to SA2 agreed in [R3-247875.](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_126/Docs/R3-247875.zip)

RAN3 discussed the RAN2 LS on usage of multi-modality information. RAN3 would like to confirm the usage of MMSID as concluded by RAN2, while traffic synchronization can be further checked in RAN3 based on progress in RAN2, SA2 and SA4. Reply LS to RAN2 agreed in [R3-247874](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_126/Docs/R3-247874.zip).

#### 2.3.2 Main Open issues

The Stage-2/3 TP to support the SA2 decision on MMSID, PDU Set Information Marking Support, etc., were not discussed yet.

## 2.4 RAN4

#### 2.4.1 Discussions and Agreements

#### 2.4.1.1 RAN4#112bis

Way forward on RRM requirements for XR\_Ph3 agreed in [R4-2416864](http://3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_112bis/Docs/R4-2416864.zip).

For the deployment scenarios:

- Frequency ranges: FR1 and FR2-1

- Start the discussion for NR-SA & Carrier Aggregation

#### 2.4.1.2 RAN4#113

LS Response to RAN1 in [R4-2420198](http://3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_113/Docs/R4-2420198.zip).

Other agreements captured in [R4-2420103](http://3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_113/Docs/R4-2420103.zip).

Deployment scenarios:

- EN-DC and NE-DC for DCI-based solution

- Is NOT supported for measurement gap skipping by the WID

The following measurement types are considered for XR measurement skipping:

- Intra-frequency

- Inter-frequency

- LTE-inter- RAT (NR-EUTRAN FDD/TDD)

- The scenario, where the UE is required to measure SRVCC and perform XR measurement skipping, is not supported from RAN4 point of view. The details about how to capture this agreement is FFS.

General approach for defining requirements for measurements with gaps :

- For the type of measurement gap, as a baseline RAN4 to define requirements due to measurement skipping based on Type 1 measurement gap. Other measurement gap types are deprioritized, but the discussion on other measurement gap types will not impact the completion of the WI.

How to capture impact of measurement skipping:

- Reuse existing measurement accuracy requirements.

- RAN4 shall keep the number of samples for a frequency layer for L3 measurements unimpacted due to gap skipping

- For the delay requirements, FFS whether and how to extend the delay

Time offset requirement for measurement gap skipping:

- Baseline feature 5 ms.

- Optional capability 3 ms, FFS if any condition is needed.

#### 2.4.2 Main Open issues

The one RAN4-related objective (related to RRM measurements) remains open. See agreed WF in [R4-2420103](http://3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_113/Docs/R4-2420103.zip).