3GPP TSG-RAN WG2 Meeting #126 DRAFT\_R2-2405706

Fukuoka, Japan May 20th – 24th, 2024

Source: Session chair (Huawei)

Title: Report from session on R18 MBS, R18 QoE and R19 XR

# AT-meeting offline discussions:

* [AT126][600] Organizational – Session on R18 MBS, R18 QoE and R19 XR

Scope:

* + - Share plans and list of ongoing email discussions for the session on R18 MBS, R18 QoE and R19 XR
    - Share meeting notes and agreements for review and endorsement
* [AT126][601][XR] Reply LS to SA2 on FS\_XRM PH2 (vivo)

Scope: Prepare and review the reply LS to SA2 based on the agreements and discussion during the meeting

Intended outcome: Agreeable LS

Deadline: LS ready for offline approval: Friday 0900

* [AT126][602][XR] Reply LS to SA2 on application-layer FEC awareness at RAN (Qualcomm)

Scope: Prepare and review the reply LS to SA2 based on the agreements and discussion during the meeting

Intended outcome: Agreeable LS

Deadline: LS ready for offline approval: Friday 0900

* [AT126][603][XR] LS to SA2 on multi-modality awareness at RAN (Nokia)

Scope: Prepare and review the reply LS to SA2 based on the agreements and discussion during the meeting

Intended outcome: Agreeable LS

Deadline: LS ready for offline approval: Friday 0900

* [AT126][604][QoE] Remaining QoE issues (Samsung)

Scope: Discuss P1, P2, P3 from R2-2404604

Intended outcome: Report with agreeable proposals to be approved offline (report in R2-2405777)

Deadline: Friday 2024-05-24 0900

* [AT126][605][TEI18] MBS TEI18 CRs (Ericsson)

Scope: Revise R2-2404993, R2-2404994 and R2-2405558 according to the agreements

Intended outcome: Agreeable CR in R2-2405773 (38.300), R2-2405774 (38.306 draft CR) and in R2-2405775 (38.304 CR)

Deadline: CRs available for offline approval: Friday 2024-05-24 0900

* [AT126][606][TEI18] Correction on the configuration of Redcap CFR (Huawei)

Scope: Discuss whether to apply change as per R2-2405130

Intended outcome: Report with a proposal in R2-2405776

Deadline: Report available: Friday 2024-05-24 0900

## 2.4 Instructions

CRs

* Use latest CR template version 12.3 for all CRs submitted to RAN2 meeting

Rel-17 maintenance CRs

* Only essential/critical corrections are expected
* Editorial and clarification corrections should be sent to be reviewed and approved by spec rapporteurs prior to submission.
* Editorials corrections should be collected and submitted by spec rapporteurs.

Rel-18 CR Handling

- CR editors / Rapporteurs continue to support maintenance related to their respective CR / WI and are required to follow drafting rules

- Single correction CR per spec coordinated by CR editor/rapporteurs will be agreed per feature for RAN#104

- CR editors / Rapporteurs are to gather miscellaneous and non-controversial issues, if any, for their respective specification prior to submission deadline. Other companies are expected to give inputs to these CRs and not have contributions on such issues.

- Companies should give inputs on editorials and clarifications to the CR editors/rapporteurs and not have individual CRs/contributions on such issues. Emails to CR editors/rapporteurs should follow the following naming convention when sending emails to rapporteurs:

[Pre\_RAN2#126][CR xx.yyy] Clarification CRs

- The organizational AIs for each WIs are reserved for rapporteurs only. CR rapporteurs are expected to submit only 1 CR per spec.

- For RRC corrections, only selected RIL can be submitted in the agenda (i.e. only if RRC editor suggests to discuss the RIL under this agenda)

- Companies are expected to submit Tdocs with TP (not CRs). More specifically, the Tdoc should contain description of open issues/proposal and the proposed corrections/TP in the contribution itself. Small issues can be included in the tdoc with just short justification, same level of detail as in cover sheet.

- RRC ASN.1 changes can be drafted in a NBC way until ASN.1 is frozen, to avoid unnecessary RRC overhead. The focus should be on drafting the changes in the best possible way.

- Inter-op analysis on Rel-18 CR coverpages in NOT needed

Remaining/updated Rel-18 RRC parameters and MAC CEs

- RRC parameters updates/corrections, including those requested by other groups, e.g. RAN1, are covered by WI-specific RRC CRs.

- MAC CE parameters updates/corrections, including those requested by other groups, e.g. RAN1, are covered by WI-specific MAC CRs

Rel-18 UE capabilities

- EUTRA UE capabilities corrections are covered by separate CRs

- NR UE capabilities (new) and corrections are covered in Rel-18 common MegaCRs (38306 and 38331) covering all rel-18 WIs (end outcome).

- UE capabilities in LPP 37355 and SLPP 38355 are covered in the main CRs for the Positioning WI.

During the work on NR UE caps:

- In a Common Rel-18 Agenda Item (AI): RAN1 and RAN4 feature corrections are handled jointly under a common AI, with some explicit exceptions. Running UE cap MegaCRs are maintained for the parts handled in the common AI.

- In WI-specific Rel-18 Agenda Items: RAN2 features/corrections are handled per WI and only a draft CR per WI is expected and will be merged with the running mega CR

**ASN.1 Review**

- Please follow the instructions provided in ASN.1 review rapporteur and read section “Review execution” on what to expect for paper submission.

<https://www.3gpp.org/ftp/Email_Discussions/RAN2/%5BMisc%5D/ASN1%20review/Rel-18%202024-03>

* Contributions on WI specific RILs should be submitted under the corresponding WI specific AI and NOT in the general ASN.1 review AI (7.0.3). That AI is reserved for common/cross-WI specific identified RILs
* Title of contribution should start with [RIL number] Title, or "[RIL number1][RIL number N] Title” if there are more than one RIL in a Tdoc.
* Proposals related to RIL resolution should include RIL number in the proposal

**ASN.1 Review deadlines**

* ANS.1 review final deadline: May 3rd
* RIL resolution proposals from CR rapporteurs: May 7th
* Tdoc reservation and submission: May 10th same as normal Tdoc deadline
* IMPORTANT: Please follow the guidelines in the “review execution” for resolving RIL issues. Companies are expected to coordinate with other companies and WI CR rapporteurs on ASN.1 issues identified, either postponed from last meeting or newly identified.

<https://www.3gpp.org/ftp/Email_Discussions/RAN2/%5BMisc%5D/ASN1%20review/Rel-18%202024-03>

Tdoc limitations

Tdoc limitations doesn’t apply to Rapporteur Input, i.e.

- Assigned summary rapporteur input of the summary.

- Email / offline discussions outcomes by discussion rapporteur,

- WI rapporteurs input for WI planning etc,

- TS rapporteur input for TS maintenance.

- Contact Company of a LSin that triggers RAN2 action may submit one tdoc to facilitate the LS reply. This only applies to one of the contact companies in case there are several (default the first).

- Spec rapporteur list of open issues for Rel-18 items

Tdoc limitations doesn’t apply to Input created at the meeting, revisions, assigned documents etc.

Tdoc limitations doesn’t apply to shadow / mirror CRs (Cat A), or In-Principle Agreed CRs.

Tdoc limitations doesn’t apply to Tdocs related to RILs which has been assigned during ASN.1 review. **Single Tdoc containing 1 or more RIL resolutions per WI is expected**.

Tdoc limitations applies to all other submitted tdocs (e.g. discussion tdoc and CR tdoc are counted as two).

Tdoc request/submission for RAN2#126 deadlines:

* Tdoc Submission deadline: May 10th, 2024 1000 UTC

## 2.5 Others

[R2-2404103](D:\\3GPP\\TSGR2\\TSGR2_126\\docs\\R2-2404103.zip" \o "D:\3GPP\TSGR2\TSGR2_126\docs\R2-2404103.zip) RAN2 Handbook MCC discussion

## 7.11 Enhancements of NR Multicast and Broadcast Services

(NR\_MBS\_enh-Core; leading WG: RAN2; REL-18; WID: RP-231829)

Time budget: 0 TU

Tdoc Limitation: 1 tdoc

### 7.11.1 Organizational

LS in, rapporteur input (e.g. rapporteur CR, open issues list)

[R2-2404411](D:\\3GPP\\TSGR2\\TSGR2_126\\docs\\R2-2404411.zip" \o "D:\3GPP\TSGR2\TSGR2_126\docs\R2-2404411.zip) RIL list for MBS Huawei, HiSilicon report Rel-18 NR\_MBS\_enh-Core

Todo RILs: C150 N102 S731 X151

* Noted

[R2-2405113](file:///D:\3GPP\Extracts\R2-2405113%20MBS%20Rapporteur%20CR%20for%20RRC.docx) MBS Rapporteur CR for RRC Huawei, HiSilicon, CATT, Samsung, LG Electronics Inc., CMCC, Xiaomi CR Rel-18 38.331 18.1.0 4688 2 F NR\_MBS\_enh-Core R2-2404019

* To be reviewed during post-meeting e-mail discussion

### 7.11.2 RRC corrections

Corrections related to RILs from ASN.1 review.

**ToDo RILs**

[R2-2404339](file:///D:\3GPP\Extracts\R2-2404339%20%5bC150%5d%20Issue%20on%20applying%20PTM%20configuration%20in%20RRC%20Release.docx) [C150] Issue on applying PTM configuration in RRC Release CATT, Huawei, HiSilicon, CBN, China Broadnet discussion Rel-18 NR\_MBS\_enh-Core

Proposal 1: To support the case that PTM configuration for SCell can be included in RRCRelease message, “on the cell where the MBSMulticastConfiguration message was received” is to be removed in 5.10.3.2. TP in Annex 1 is agreed.

DISCUSSION:

* Nokia agrees with the proposal.
* Samsung thinks we can modify the wording instead of removing this description.
* Huawei thinks MRB establishment can happen not only when the config is received so it is better to remove. Nokia agrees, it is better to remove.
* ZTE would like to add an explicit indication.
* Ericsson indicates we have information in MCCH or we can rely on Paging in MCCH-less cell.
* Remove “on the cell where the MBSMulticastConfiguration message was received” from 5.10.3.2 in RRC.

[R2-2405078](file:///D:\3GPP\Extracts\R2-2405078%20%5bS731%5d%20SDT%20failure%20and%20multicast%20reception.docx) [S731] SDT failure and multicast reception Samsung discussion Rel-18

Proposal 1: Upon unsuccessful completion of the SDT procedure:

(a) UE which is configured for multicast reception in RRC\_INACTIVE, transits to RRC\_IDLE (same as legacy spec).

(b) UE forwards TMGI(s) to upper layers for multicast session(s) that UE is configured for multicast reception and receiving in RRC\_INACTIVE. Adopt the text proposal given in the annex.

DISCUSSION:

* Nokia does not think this is required as it is clear from CT1 specs.
* LGE thinks it is possible in CT1 specs, but it causes service interruption.
* ZTE does not like LGE’s solution, it is a modification of legacy SDT behaviour.
* Ericsson does not think we need to change anything in RAN2 specs.
* Huawei shares views from Nokia, Ericsson, ZTE.
* Samsung thinks in NAS there is no list of active sessions, so they propose to send this.
* S731 is rejected

[R2-2405483](file:///D:\3GPP\Extracts\R2-2405483%20%5bX151%5d%20Discussion%20on%20frequency%20information%20reported%20for%20shared%20processing.docx) [X151] Discussion on frequency information reported for shared processing Xiaomi, Huawei, HiSilicon discussion Rel-18 NR\_MBS\_enh-Core R2-2402849

Proposal: RAN2 is kindly requested to clarify that the frequency band information reported is based on the UE capability supporting MBS.

DISCUSSION:

* Xiaomi clarifies there was some offline discussion and SA4 made some changes.
* To be discussed during CR review whether it is OK to remove “acquired from the *SIB21* or the USD” from freqInfoMBS field description.

[R2-2405564](file:///D:\3GPP\Extracts\R2-2405564%20%20%5bN101%5d%20%5bN102%5d%20%5bN103%5d%20%5bN104%5d%20%5bN105%5d%20Control%20plane%20aspects%20of%20multicast%20reception%20in%20RRC_INACTIVE%20state.docx) [N101] [N102] [N103] [N104] [N105] Control plane aspects of multicast reception in RRC\_INACTIVE state Nokia discussion Rel-18 NR\_MBS\_enh-Core

Proposal 1 [N102]: RAN2 discusses the following options:

1- Default values are introduced to DMRS type, DMRS additional position and max length for multicast reception in RRC\_INACTIVE state (no changes in specification required),

2- RRC release/MCCH indicate DMRS type, DMRS additional position and max length for multicast reception in RRC\_INACTIVE state. (requires changes in the specification).

DISCUSSION:

* Samsung is OK to use default values, but the values should be decided by RAN1.
* Huawei thinks default values are already defined in 38.214 and we can reuse those values.
* QCM prefers having default values, but thinks this needs to be clarified by RAN1.
* Ericsson thinks the default values are already there.
* RAN2 thinks default values of DMRS type, DMRS additional position and max length should be used for multicast reception in RRC\_INACTIVE state.
* If companies think there is some RAN1 impact, the contributions can be brought to RAN1 directly.

**Other**

[R2-2404992](file:///D:\3GPP\Extracts\R2-2404992%20MBS%20open%20issues.docx) MBS open issues Ericsson discussion Rel-18 NR\_MBS\_enh-Core

[R2-2405293](file:///D:\3GPP\Extracts\R2-2405293%20Multicast%20reception%20in%20RRC_INACTIVE%20when%20an%20SDT%20procedure%20fails.docx) Multicast reception in RRC\_INACTIVE when an SDT procedure fails LG Electronics Inc. discussion Rel-18 NR\_MBS\_enh-Core

[R2-2405681](file:///D:\3GPP\Extracts\R2-2405681%20Which%20cell%20to%20apply%20the%20PTM%20configuration.doc) [C150] Which cell to apply the PTM configuration in RRC\_INACTIVE ZTE, Sanechips discussion Rel-18 NR\_MBS\_enh-Core

**Withdrawn**

R2-2405472 Paging message Sharp discussion Withdrawn

### 7.11.3 Other corrections

*Corrections related to other specs, e.g. 38.300, 38.321, 38.323, UE capabilities.*

[R2-2404667](D:\\3GPP\\Extracts\\R2-2404667_Clarification on MAC reset for multicast reception in RRC_INACTIVE.doc" \o "D:\3GPP\Extracts\R2-2404667_Clarification on MAC reset for multicast reception in RRC_INACTIVE.doc) Clarification on MAC reset for multicast reception in RRC\_INACTIVE Apple, CATT discussion Rel-18 NR\_MBS\_enh-Core

Proposal 1: Clarify that during RRC Resume procedure, UE only perform the MBS multicast specific MAC reset with the following operations:

- Stop the MBS multicast DRX timers;

- Flush the soft buffers for all DL HARQ processes used for MBS multicast;

- For each DL HARQ process used for MBS multicast, consider the next received transmission for a TB as the very first transmission.

Proposal 2: Reflect MBS multicast specific MAC reset operation in MAC spec, and agree the TP in Option 1.

* Noted

[R2-2404668](file:///D:\3GPP\Extracts\R2-2404668_CR38321(Rel18)_Clarificatoin%20on%20MAC%20reset%20for%20multicast.docx) Clarification on MAC reset for multicast reception in RRC\_INACTIVE Apple, Samsung, CATT, Huawei, HiSilicon, Nokia, Sharp, Qualcomm Incorporated, Ericsson CR Rel-18 38.321 18.1.0 1842 - F NR\_MBS\_enh-Core

* Update with the TP from R2-2405582.
* Revised in R2-2405771 which is agreed unseen.

[R2-2405582](file:///D:\3GPP\Extracts\R2-2405582%20Error%20data%20handling%20for%20MBS.docx) Error data handling for MBS Langbo discussion Rel-18 38.331 NR\_MBS\_enh-Core

Proposal 1: The MAC entity shall discard the received subPDU containing an LCID or eLCID value associated with a suspended multicast MRB.

Proposal 2: Adopt one of the TP in the Annex.

DISCUSSION:

* LGE, Nokia support the change.
* Xiaomi asks whether this also applies to G-CS-RNTI. Huawei thinks the issue happen for the UE in RRC\_INACTIVE, so there is no need to include this.

* The MAC entity shall discard the received subPDU containing an LCID or eLCID value associated with a suspended multicast MRB.
* Adopt the TP in the Annex of R2-2405582.

## 7.14 Enhancement on NR QoE management and optimizations for diverse services

(NR\_QoE\_enh-Core; leading WG: RAN3; REL-18; WID: RP-223488)

Time budget: 0 TU

Tdoc Limitation: 1 tdoc

### 7.14.1 Organizational

LSs and rapporteur inputs (e.g. rapporteur CR, open issues list)

[R2-2404145](D:\\3GPP\\Extracts\\R2-2404145_S5-241925.docx" \o "D:\3GPP\Extracts\R2-2404145_S5-241925.docx) Reply LS on area scope handling for QoE measurements (S5-241925; contact: Ericsson) SA5 LS in Rel-18 NR\_QoE\_enh-Core To:RAN2 Cc:RAN3, SA4

* Noted

[R2-2404480](file:///D:\3GPP\TSGR2\TSGR2_126\docs\R2-2404480.zip) RIL issue list for QoE Ericsson discussion Rel-18 NR\_QoE\_enh-Core

PropAgree: H173

PropReject: H170, H171

ToDo: E224, E214, H079, H174, E216

* Ericsson clarifies that RAN3 is discussing a correction for E216 and RAN2 may need to do something.
* PropAgree and PropReject RIL conclusions are endorsed
* For E216, RAN2 will only do something if requested by RAN3.

[R2-2404479](file:///D:\3GPP\Extracts\R2-2404479%20-%20Correction%20CR%20for%20QoE%20measurements.docx) Correction of Enhancement on NR QoE management and optimizations for diverse services Ericsson CR Rel-18 38.331 18.1.0 4781 - F NR\_QoE\_enh-Core

* To be reviewed via post-meeting e-mail discussion

### 7.14.2 RRC corrections

*Corrections related to RILs from ASN.1 review.*

[R2-2404481](file:///D:\3GPP\Extracts\R2-2404481%20-%20Open%20RIL%20issues%20for%20QoE%20measurements.docx) Open RIL issues for QoE measurements Ericsson discussion Rel-18 NR\_QoE\_enh-Core

Proposal 1 RAN2 to clarify or solve the different parameter configuration behaviours between UE AS layer and UE application layer for RVQoE configuration. [E214]

Proposal 2 Include measConfigReportAppLayerAvailable in RRCReconfigurationComplete or RRCReestablishmentComplete message if the UE has stored QoE configuration with appLayerIdleInactiveConfig configured, but it has not been successfully transmitted since the UE entered RRC\_CONNECTED. (Reference TP in Annex.3) [E224]

Proposal 3 RAN2 to keep the current description for QoE MBS area scope checking.

Proposal 4 UE releases all NR QoE configurations and reports upon successful completion of the mobility from NR.

DISCUSSION on P1:

* CATT prefers to fix this issue in NAS specs. Nokia agrees, clarification should be done in NAS specs.
* Huawei thinks this can be left to UE implementation.
* Ericsson thinks the issue is in RRC specifications. Samsung agrees with Ericsson.
* QCM thinks there is no QoE modification procedure. Setup/release can be used.
* [E214] We add a note to clarify that modification of RVQoE config is not possible, i.e. release/setup procedure should be used.

DISCUSSION on P2:

* Samsung thinks this is an optimization and we don’t need this.
* Ericsson asks if then the UE will keep on repeating the same information. Samsung confirms.
* QCM agrees with the intention of the change, but perhaps there can be a better wording to capture it.
* CATT asks whether we should also add another limitation for the UE not to resend the indication.
* Ericsson thinks this can be discussed as part of the TP discussion.
* [E224] RAN2 understanding is that UE should include measConfigReportAppLayerAvailable in RRCReconfigurationComplete or RRCReestablishmentComplete message if the UE has stored QoE configuration with appLayerIdleInactiveConfig configured, but it has not been successfully transmitted since the UE entered RRC\_CONNECTED. FFS how to capture in specification.

DISCUSSION on P4:

* Nokia agrees with the intention. Also – should this be also handled for R17? Nokia thinks we should add a condition that this is only executed when there is valid QoE configuration.
* Huawei would like to avoid R17 CR.
* In Rel-18, we correct the QoE config release procedure in the following way: UE releases all NR QoE configurations and reports upon successful completion of the mobility from NR.
* Can consider applying this from Rel-17. Check offline whether applying this from Rel-17 causes IOT issues.

[R2-2405341](file:///D:\3GPP\Extracts\R2-2405341%20Discussion%20on%20serving%20cell%20for%20MBS%20QoE%20collection.docx) Discussion on serving cell for MBS QoE collection Huawei, HiSilicon discussion NR\_QoE\_enh-Core

Proposal 1: RAN2 discuss the following solutions

- Solution 1: UE checks the area scope when the cells receiving the MBS broadcast service changes.

- Solution 2: UE checks the area scope upon cell reselection.

Proposal 2: RAN2 to discuss the following rule for area scope checking:

if any of MBS service cells belong to the area scope, UE is within the area scope. Otherwise, the UE is out of the area scope.

DISCUSSION:

* Ericsson thinks there is no standardization in SA WGs for MBS in IDLE/INACTIVE, would prefer not to do anything at this stage. Nokia agrees that nothing is needed now. Nokia indicates area scope checking is only done during session start, so we do not have to optimize.
* CATT understands the intention from Huawei and is OK to fix it.
* QCM thinks that it is better to keep it simple since there is no clear definition from SA5 on area scope.
* RAN2 to keep the current description for QoE MBS area scope checking.

[R2-2405342](file:///D:\3GPP\Extracts\R2-2405342%20Discussion%20on%20the%20condition%20QoENRDC%20%5bH174%5d.docx) Discussion on the condition QoENRDC [H174] Huawei, HiSilicon discussion NR\_QoE\_enh-Core

Proposal 1: For H174, RAN2 to agree on the following definition of the condition QoENRDC:

This field is optionally present, Need M, when SRB5 is configured. Otherwise, it is absent.

DISCUSSION:

* Ericsson thinks the proposal is not aligned with the agreement RAN2 made in the past. There is also impact on QoE pause mechanism. Prefer to keep current wording.
* Samsung prefers the current wording, there is already note about what UE does when there is no SRB.
* Nokia agrees.
* Ericsson thinks that maybe note needs to be updated but it can be discussed later.
* RIL H174 is rejected

[R2-2404604](file:///D:\3GPP\Extracts\R2-2404604.docx) Discussion on remaining QoE issues Samsung Shenzhen discussion Rel-18 NR\_QoE\_enh-Core

Proposal 1. UE suspends sending MBS QoE reports to gNB, when QoE reporting is paused. Adopt the following proposed text.

Proposal 2. UE sets each entry of measReportAppLayerContainerList in the order of time. Adopt the following proposed text.

Proposal 3. UE uses measReportAppLayerContainerList-r18 only to include QoE reports for Rel-18 MBS QoE measurement. Adopt the following proposed text.

DISCUSSION on P1:

* Ericsson does not think the scenario can happen.
* P1 is postponed to clarify whether the described scenario can happen.

DISCUSSION on P2:

* Ericsson indicates the time stamp is in the container (as opposed to RVQoE).
* Huawei agrees with Ericsson, the time stamp in container is enough. QCM agrees.
* Samsung indicates the timestamp is needed for MDT alignment.
* P2 is not agreed unless critical issues are found

DISCUSSION on P3:

* Ericsson thinks it is not a problem as R17 gNB will just not read this IE. Samsung indicates that then some reports will be lost.
* Huawei thinks there should be no problem. Samsung clarifies that
* Offline Samsung to discuss P1, P2 and P3. If companies think the issues exist, they solutions can be captured during the RRC CR review.
* [AT126][604][QoE] Remaining QoE issues (Samsung)

Scope: Discuss P1, P2, P3 from R2-2404604

Intended outcome: Report with agreeable proposals to be approved offline (report in R2-2405777)

Deadline: Friday 2024-05-24 0900

[R2-2405086](file:///D:\3GPP\Extracts\R2-2405086%20Consideration%20on%20QoE%20remaining%20issues.doc) Consideration on QoE remaining issues ZTE Corporation, Sanechips discussion Rel-18 NR\_QoE\_enh-Core

[R2-2405443](file:///D:\3GPP\Extracts\R2-2405443%20Discussion%20on%20QoE%20left%20open%20issues.docx) Discussion on QoE left open issues Nokia, Nokia Shanghai Bell discussion Rel-18 NR\_QoE\_enh-Core

### 7.14.3 Other corrections

Corrections related to other specs, e.g. 38.300, 37.340, UE capabilities.

## 7.24 TEI18

Specific items may be allocated to a breakout session for treatment.

Time budget: 1 TU

### 7.24.2 TEI proposals by RAN2

Items initiated in RAN2 for NR and LTE.

No contributions should be submitted under 7.24.2. They should be submitted under 7.24.x

Tdoc limitation: 1 tdoc, limitation applicable to new proposals. No new Cat. B proposals expected for this meeting

#### 7.24.2.0 In Principle agreed CRs

[R2-2405114](file:///D:\3GPP\Extracts\R2-2405114%20Correction%20on%20MBS%20search%20spaces%20configuration%20for%20(e)Redcap%20%5bRedCapMBS_Bcast%5d.docx) Correction on MBS search spaces configuration for (e)Redcap [RedCapMBS\_Bcast] Huawei, CATT, Xiaomi, HiSilicon CR Rel-18 38.331 18.1.0 4689 1 F TEI18, NR\_MBS\_enh-Core, NR\_redcap\_enh-Core R2-2402770

* Revised in R2-2405772 to use proper 3GPP styles
* Agreed in R2-2405772 (unseen)

#### 7.24.2.2 Other RAN2 TEI-18

Contributions should focus only critical issues/corrections for already agreed TEI-18 topics. NCo-sourcing of such proposals is encouraged. Contributions on items that were explicitly downprioritized from Rel-18 WIs should not be brought as TEI18. No new Cat. B proposals expected for this meeting

Including outcome of [POST125bis][019][Emergency Calls] Common solution (Lenovo)

[R2-2404993](file:///D:\3GPP\Extracts\R2-2404993%20Clarifications%20for%20MBS%20RedCap%20CFR.docx) Clarifications for MBS RedCap CFR Ericsson, CATT CR Rel-18 38.300 18.1.0 0864 - F TEI18, NR\_MBS-Core, NR\_redcap-Core, NR\_redcap\_enh-Core

* Remove impact analysis
* Remove the following part “The NG-RAN node also ensures that in case of a single DCI transmission that only the UE for which the transmission is intended can receive it.” and update the cover page accordingly.
* Revised in R2-2405773
* ZTE asks why companies do not want the last sentence.
* Huawei thinks the last sentence is not aligned with the agreement and the previous sentence captures it already.
* Ericsson wonders whether another clarification should be added.

[R2-2404994](file:///D:\3GPP\Extracts\R2-2404994%20Clarification%20for%20RedCap%20UE%20supporting%20MBS%20broadcast.docx) Clarification for RedCap UE supporting MBS broadcast Ericsson CR Rel-18 38.306 18.1.0 1111 - F TEI18, NR\_MBS-Core, NR\_redcap-Core, NR\_redcap\_enh-Core

* Remove impact analysis
* Should be submitted as a draft CR in R2-2405774
* Can discuss the exact wording of the change during offline
* The intention is agreed
* Huawei thinks existing text already is clear so we do not need this CR.
* QCM supports the intention of clarifying in 38.306, but prefers not to refer to RRC parameters, but talk about features.
* Xiaomi also supports the intention of the CR.

[R2-2405558](file:///D:\3GPP\Extracts\R2-2405558%20CR%20on%20MBS%20operation%20with%20eDRX%20MICO%20%5bTEI18%20NR_MBS_enh%5d.docx) MBS operation with eDRX MICO [TEI18 NR\_MBS\_enh] Nokia, Ericsson CR Rel-18 38.304 18.1.0 0399 1 F TEI18 R2-2403598

* Add clauses affected
* Avoid having hanging paragraph
* Change the TEI18 identifier
* Keep one Tdoc number
* Revised in R2-2405775
* Ericsson clarified why they deviated from IPA CR.
* ZTE agrees with the current CR.
* [AT126][605][TEI18] MBS TEI18 CRs (Ericsson)

Scope: Revise R2-2404993, R2-2404994 and R2-2405558 according to the agreements

Intended outcome: Agreeable CR in R2-2405773 (38.300), R2-2405774 (38.306 draft CR) and in R2-2405775 (38.304 CR)

Deadline: CRs available for offline approval: Friday 2024-05-24 0900

[R2-2404995](file:///D:\3GPP\Extracts\R2-2404995%20Scheduling%20restrictions%20with%20RedCap%20CFR%20and%20eRedCap%20UEs.docx) Scheduling restrictions with RedCap CFR and eRedCap Ues Ericsson discussion Rel-18 TEI18, NR\_MBS-Core, NR\_redcap-Core, NR\_redcap\_enh-Core

[R2-2405130](file:///D:\3GPP\Extracts\R2-2405130%20Correction%20on%20the%20configuration%20of%20Redcap%20CFR%20%5bRedCapMBS_Bcast%5d.docx) Correction on the configuration of Redcap CFR [RedCapMBS\_Bcast] Huawei, HiSilicon CR Rel-18 38.331 18.1.0 4816 - F TEI18, NR\_MBS\_enh-Core, NR\_redcap\_enh-Core

- QCM thinks that this CR will prevent some deployment cases.

- Huawei thinks having only MCCH and not having CFR should not happen.

- Nokia indicates the change would affect NEED code.

* Offline Huawei
* [AT126][606][TEI18] Correction on the configuration of Redcap CFR (Huawei)

Scope: Discuss whether to apply change as per R2-2405130

Intended outcome: Report with a proposal in R2-2405776

Deadline: Report available: Friday 2024-05-24 0900

# 8 Rel-19

## 8.7 XR Enhancements Ph3

(NR\_XR\_Ph3-Core; leading WG: RAN2; REL-19; WID: RP-240791)

Time budget: 2 TU

Tdoc Limitation: 4 tdocs

### 8.7.1 Organizational

LS, Rapporteur input, including workplan, etc.

[R2-2404288](file:///D:\3GPP\Extracts\R2-2404288%20XR%20Work%20Plan.docx) XR Workplan Nokia, Qualcomm (Rapporteurs) Work Plan Rel-19 NR\_XR\_Ph3-Core

* Rapporteur suggests we start work on RRM gaps in October.
* Noted

[R2-2404289](file:///D:\3GPP\Extracts\R2-2404289%20XR%20Agreements.docx) XR Agreements Nokia, Qualcomm (Rapporteurs) discussion Rel-19 NR\_XR\_Ph3-Core

* Noted

[R2-2404290](file:///D:\3GPP\Extracts\R2-2404290%20XR%20SA2%20Overview.docx) SA2 Overview Nokia, Qualcomm (Rapporteurs) discussion Rel-19 NR\_XR\_Ph3-Core

* Noted

[R2-2404291](file:///D:\3GPP\Extracts\R2-2404291%20XR%20RAN3%20Overview%20R19.docx) RAN3 Overview Nokia, Qualcomm (Rapporteurs) discussion Rel-19 NR\_XR\_Ph3-Core

* Noted

[R2-2404138](file:///D:\3GPP\Extracts\R2-2404138_S2-2405604.docx) LS on Application-Layer FEC Awareness at RAN (S2-2405604; contact: Qualcomm) SA2 LS in Rel-19 FS\_XRM\_Ph2 To:RAN2, SA4 Cc:RAN3

* RAN2 is expected to answer the question on PSI as well.
* Lenovo thinks this is more in the expertise of SA4. LGE, Nokia, MTK agrees.
* OPPO thinks that for DL there is no RAN2 impact, if UL is in scope, then we might need to reply.
* Vivo thinks we may need to reply in case we think UL is affected.
* Huawei think it is better to leave this to SA4.
* Intel thinks we should indicate we only use two levels of PSI and we can indicate this.
* RAN2 thinks the question on using PSI as PDU set ratio is in SA4 scope at least for DL.

[R2-2404139](file:///D:\3GPP\TSGR2\TSGR2_126\docs\R2-2404139.zip) LS on FS\_XRM Ph2 (S2-2405625; contact: vivo) SA2 LS in Rel-18 FS\_XRM\_Ph2 To:SA4, RAN2, RAN3

* Noted

#### 8.7.1.1 Discussion on LSs from SA2

Discussion on RAN2 replies to SA2 LS on FS\_XRM Ph2 (S2-2405625) and SA2 LS on Application-Layer FEC Awareness at RAN (S2-2405604)

**Draft reply LSes**

[R2-2404174](file:///D:\3GPP\Extracts\R2-2404174%20Draft%20reply%20LS%20on%20XRM%20ph2.docx) Draft reply LS on FS\_XRM PH2 Qualcomm Incorporated LS out Rel-19 NR\_XR\_Ph3-Core To:SA2; Cc:SA4, RAN3

[R2-2404175](file:///D:\3GPP\Extracts\R2-2404175%20Draft%20reply%20LS%20on%20Application-Layer%20FEC%20Awareness%20at%20RAN.docx) Reply LS on application-layer FEC awareness at RAN Qualcomm Incorporated LS out Rel-19 NR\_XR\_Ph3-Core To:SA2; Cc:SA4, RAN3

[R2-2404424](file:///D:\3GPP\Extracts\R2-2404424_Draft%20reply%20LS%20to%20SA2%20on%20FS_XRM%20PH2.doc) Draft reply LS to SA2 on FS\_XRM PH2 vivo LS out Rel-19 NR\_XR\_Ph3-Core To:SA2; Cc:RAN3, SA4

[R2-2405301](file:///D:\3GPP\Extracts\R2-2405301%20Draft%20Reply%20LS%20to%20SA2%20on%20XR.docx) Draft Reply LS to SA2 on XR CMCC LS out Rel-19 NR\_XR\_Ph3-Core To:SA2

**Discussion on XRM Phase 2 LS**

[R2-2404423](file:///D:\3GPP\Extracts\R2-2404423_Discussion%20on%20LS%20from%20SA2%20on%20FS_XRM%20Ph2.docx) Discussion on LS from SA2 on FS\_XRM Ph2 vivo discussion Rel-19 NR\_XR\_Ph3-Core

Proposal 1: RAN2 understands adding inter-PDU set correlation information would assist RAN making PDU set discarding decision as comparing to the existing Rel-18 PDU Set discarding with some complexity.

Proposal 2: It is feasible for the NG-RAN to provide available data rate for the (non-)GBR QoS flows. Detail is up to RAN3.

Proposal 3: RAN2 understands the size of incoming burst is not useful for RAN resource scheduling.

Proposal 4: Regarding PDU Set Delay measurement and exposure, RAN2 understands the Alt 1 and Alt 2-1 are feasible and have no impact on the Uu interface, while Alt 2-2 has some impacts on the UE behaviour and Uu interface.

- Alt1: DL PDU Set Delay based on T2 minus T1

- Alt2: PDU Set Delay = Tend\_N – T1\_i

 Alt2-1: Tend\_N is the sending of the last PDU of the PDU Set to the UE

 Alt2-2: Tend\_N is the reception time of the last PDU of the PDU Set at the UE.

Proposal 5: Regarding PDU Set Loss Rate measurement and exposure, RAN2 understands it is feasible only if PSIHI is indicated and RLC AM mode is configured. In case RLC UM mode is configured, it is not feasible to measure and expose the PDU Set Loss Rate. If PSIHI is not configured, it is up to SA4 to decide.

Proposal 6: In the reply LS to SA2, RAN2 should inform SA2 that: if any of the above topics impacts RAN, e.g. on UE behavour or Uu interface, SA should inform RAN and RAN WG to extend the corresponding Rel-19 XR WID in RAN.

DISCUSSION on P1:

* Xiaomi thinks it is more to SA4 to discuss this solution.
* QCM thinks SA4 can decide whether this is useful, RAN2 can discuss RAN2 impacts.
* Ericsson does not think this is useful.
* Intel thinks that would be helpful, we do not have to mention complexity.
* Huawei thinks this is related to RAN2, this is old issue discussed in Rel-18. There is complexity and impact on PSER. We should mention complexity and impact on PSER.
* LGE is not sure whether this is useful, but considering this is for DL this can be up to gNB implementation.
* Nokia thinks it is beneficial to avoid sending useless PDU sets. We can mention complexity. App layer issues should be up to SA4. Lenovo agrees.
* Mediatek thinks it is unclear whether this is useful.
* Apple asks whether there are RAN2 impacts if we just focus on DL?
* CMCC thinks we can study both UL and DL. CMCC thinks the correlation information can also be used for scheduling.
* Smasung agrees there is no spec impact for DL. Samsung would prefer not to mention complexity.
* RAN2 thinks adding inter-PDU set correlation information can potentially help RAN to avoid sending of unnecessary PDU sets provided that there is correlation between the discarded PDU sets.
* RAN2 thinks it is up to SA4 to reply whether such correlation truly exists.
* RAN2 thinks there is additional complexity with the solution and impact on PSER.

DISCUSSION on P2:

* Vodafone wonders if we already have mechanism for this, e.g. L4S. Wonders how often it has to be done as data rate changes dynamically.
* CATT thinks it is RAN3 scope. QCM agrees. RAN2 can only provide data rate at granularity at DRB level, but not QoS flow basis.
* Samsung thinks this is RAN2 scope as we are responsible for scheduling. Samsung thinks network should be able to estimate data rate. Huawei agrees, there are already mechanisms which utilize such information so gNB has to be able to do it.
* OPPO thinks it is more RAN3 scope, similar to QNC, it impacts gNB only.
* Nokia wonders what is the available bit rate.
* Lenovo agrees to leave this up to RAN3.
* Apple agrees this is up to RAN3 whether this can be provided to app layer.
* Xiaomi agrees this is up to RAN3.
* LGE this can be totally up to RAN3.
* RAN2 thinks that whether it can be estimated at QoS flow level is up to RAN3 to answer.

DISCUSSION on P3:

* Nokia thinks this is useful. Huawei agrees this is useful.
* QCM is not clear why this is useful.
* Samsung thinks this is for DL only but thinks this is not useful unless there is also arrival time.
* Ericsson thinks this is useful if it is provided up front. ZTE agrees.
* Intel thinks for UL that could also be useful. ZTE agrees.
* QCM indicates we should not impact latency.
* RAN2 only discussed the question for DL only
* RAN2 understands the size of incoming burst is useful for gNB resource scheduling if it can be provided early enough, e.g. in the first packet of the burst.

DISCUSSION on P4/P5 (PSDB/PSER):

* Samsung thinks it is feasible for both PSDB and PSER by simple extension of PDB and PER measurements.
* Intel thinks there is significant work to make it possible as it involves UE and PDU set info is not transmitted over the air.
* Huawei thinks we need to discuss for DL and UL separately. For UL, we would need to add in-band marking. For DL there is complexity. Not clear about the benefits.
* LGE thinks we can focus on DL. It can be measured by gNB implementation but it may be inaccurate especially for PSER.
* Lenovo does not think this can be reliably done and also wonders about the purpose of this info.
* Ericsson agrees with Lenovo and LGE.
* For DL, RAN2 thinks that some PSDB/PSER estimation by gNB implementation is possible, but its accuracy and reliability is unclear based on existing mechanism. However, RAN3 is in a better position to reply this question.
* For UL, RAN2 thinks currently it is not possible to have info about PSDB/PSER and such mechanism would add significant complexity.
* RAN2 is not clear about the benefits and usage of such information by application layer.
* [AT126][601][XR] Reply LS to SA2 on FS\_XRM PH2 (vivo)

Scope: Prepare and review the reply LS to SA2 based on the agreements and discussion during the meeting

Intended outcome: Agreeable LS

Deadline: LS ready for approval for R19 XR CB session on Thursday

R2-2405779 LS on XRM vivo

**Discussion on AL-FEC LS**

[R2-2405199](file:///D:\3GPP\Extracts\R2-2405199%20Application-Layer%20FEC%20awareness%20at%20RAN%20v1.docx) Discussion on AL-FEC Awareness at RAN NEC discussion Rel-19 NR\_XR\_Ph3-Core

Proposal 1: Reply SA2 that NG-RAN can determine whether a PDU was successfully delivered over an unacknowledged mode data bearer, and NG-RAN get this information sufficiently early to decide whether or not to drop subsequent AL-FEC packets.

Proposal 2: Inform SA2 that RAN2 is discussing to enhance RLC AM in Rel-19, with feature of skipping/speeding up further retransmission of a packet, which could be used in conjunction with AL-FEC awareness.

Proposal 3: Reply to SA2 that no additional impact on NG-RAN to support dynamic redundancy ratios comparing to support static redundancy ratio, and it could be up to network implementation on how to use the AL-FEC information.

[R2-2405546](file:///D:\3GPP\Extracts\R2-2405546%20Discussion%20on%20SA2%20LS%20on%20AL-FEC%20Awareness%20at%20RAN.docx) Discussion on SA2 LS on AL-FEC Awareness at RAN Futurewei discussion Rel-19 NR\_XR\_Ph3-Core

Proposal 1. RAN2 do not see a major benefit of dropping AL-FEC packets based on a known ratio and a reception status of a PDU Set for XR traffic that can justify the complexity to be added to RAN and the following potential drawbacks:

• The transmitter needs to intentionally transmit some but not all AL-FEC packets of the same PDU Set and then stop and wait for feedback before deciding whether to transmit any of the remaining AL-FEC packets.

• Delay due to the stop-and-wait reduces the delay budget that can be used for the gNB’s scheduling. The more efficiency gain being targeted at, the more rounds of stop-and-wait cycle may be needed to add redundancy incrementally, and hence the more delay. To not to violate the PSDB, the delay budget for the gNB to schedule the transmission of each individual round needs to be cut short significantly, putting more constrains on the gNB’s scheduling and potentially resulting in a lower radio efficiency in the transmissions.

• A potential need for more frequent sending of PDCP SN gap report.

DISCUSSION on whether “NG-RAN can determine whether a PDU was successfully delivered over an unacknowledged mode data bearer? If so, does NG-RAN get this information sufficiently early to decide whether or not to drop subsequent AL-FEC packets?”:

* Nokia thinks HARQ is unreliable, otherwise why would we have RLC AM.
* Ericsson agrees this cannot be done reliably.
* LGE agrees it is unreliable and cannot be timely. There are HARQ errors.
* QCM thinks that for DL, relying on HARQ is good enough, the error rate is not significant. QCM indicates in MBS we rely on HARQ already.
* Intel agrees with QCM, this is a good estimation, even though not 100% reliable.
* ZTE indicates there are impact on, e.g. in CU-DU split. RAN3 would need to specify network interactions.
* Lenovo thinks it is clear HARQ is not reliable, we cannot discard something based on such unreliable means.
* Vivo thinks HARQ accuracy is sufficient. Feedback is immediately after receiving data at PHY layer and it is fast enough.
* CMCC indicates multiple LCHs can be multiplexed in one TB which is another issue.
* MTK agrees HARQ is not reliable enough. NACK->ACK misdetection is dangerous.
* Nokia indicates that HARQ error is only one issue and there are other issues if we want to be precise, e.g. PDU to TB mapping etc.
* RAN2 thinks it is not possible for NG-RAN to reliably determine whether a PDU was successfully delivered over an unacknowledged mode data bearer.
* [AT126][602][XR] Reply LS to SA2 on application-layer FEC awareness at RAN (Qualcomm)

Scope: Prepare and review the reply LS to SA2 based on the agreements and discussion during the meeting

Intended outcome: Agreeable LS

Deadline: LS ready for approval for R19 XR CB session on Thursday

[R2-2405780](file:///D:\3GPP\Extracts\R2-2405780%20Reply%20LS%20on%20application-layer%20FEC%20awareness%20at%20RAN.docx) Reply LS on Application-Layer FEC Awareness at RAN Qualcomm Incorporated

* Replace “RAN2 do not believe it is possible for NG-RAN to determine with 100% reliability” with “RAN2 do not believe it is possible for NG-RAN to reliably determine“
* QCM thinks we should mention that it is not **100%** reliable.
* Intel thinks we could mention that HARQ gives some rough idea.
* Nokia, Samsung, Ericsson, LGE, Lenovo think we should just say is cannot be done reliably. If we add something on HARQ, then we need to mention other issues, e.g. additional delay etc.
* Vivo thinks we can mention HARQ.

For Q2:

* Nokia thinks RAN2 should reply to this question. Nokia thinks for DL solution might be easy, but for UL there are additional impacts.
* OPPO think that we can reply for DL it is up to NW implementation, for UL it is more complex.
* Ericsson think that even for DL it can impact NW implementation.
* Ericsson thinks we should mention impact of FEC on capacity.
* Intel thinks that dynamic ratios might imply that different PDU sets should be treated differently over the air.
* Ericsson thinks that there is also an issue with how we interpret intentional drop vs non-intentional drop.
* Nokia proposes to delay the reply.
* For Q2 (on dynamic ratios), RAN2 reply that:
  + - **RAN2 did not have time to analyse the proposal in detail**
    - **Based on initial analysis:**
      * **For both UL and DL, there is additional complexity for RAN**
      * **For DL, there is no RAN2 specifications impact but there is an impact on network implementation complexity**
      * **For UL, there might be additional impact on specifications**
      * **This may also have negative impact on RAN performance due to intentional dropping of packets, but RAN2 did not asses the details**

[R2-2404264](file:///D:\3GPP\Extracts\R2-2404264_R19-XR_SA2-rsp.docx) RAN2 responses to SA2 LSs on Rel-19 XR Intel Corporation discussion Rel-19 NR\_XR\_Ph3-Core

[R2-2404292](file:///D:\3GPP\Extracts\R2-2404292%20XR%20SA2%20LSs.docx) Discussing SA2 Liaisons Nokia, Nokia Shanghai Bell discussion Rel-19 NR\_XR\_Ph3-Core

[R2-2404294](file:///D:\3GPP\Extracts\R2-2404294.docx) Discussion on SA2 LSs for Rel-19 XR Xiaomi discussion Rel-19 NR\_XR\_Ph3-Core

[R2-2404329](file:///D:\3GPP\Extracts\R2-2404329%20Discussion%20on%20SA2%20LSs.docx) Discussion on SA2 LSs CATT discussion Rel-19 NR\_XR\_Ph3-Core

[R2-2404333](file:///D:\3GPP\Extracts\R2-2404333%20Discussion%20on%20SA2%20Liaisons%20on%20Rel-19%20XR.docx) Discussion on SA2 Liaisons on Rel-19 XR Meta discussion

[R2-2404511](file:///D:\3GPP\Extracts\R2-2404511%20-%20Discussion%20on%20LSs%20from%20SA2.docx) Discussion on LSs from SA2 Ericsson discussion Rel-19 NR\_XR\_Ph3-Core

[R2-2404552](file:///D:\3GPP\Extracts\R2-2404552%20Discussion%20on%20LSs%20from%20SA2.docx) Discussion on LSs from SA2 ZTE Corporation, Sanechips discussion

[R2-2404775](file:///D:\3GPP\Extracts\R2-2404775%20Discussion%20on%20LSs%20from%20SA2%20for%20XR.docx) Discussion on LSs from SA2 for XR Huawei, HiSilicon discussion Rel-19 NR\_XR\_Ph3-Core

[R2-2404812](file:///D:\3GPP\Extracts\R2-2404812%20Discussion%20on%20RAN2%20replies%20to%20SA2%20LS.docx) Discussion on LS from SA2 Lenovo discussion Rel-19

[R2-2405003](file:///D:\3GPP\Extracts\R2-2405003%20(R19%20NR%20XR%20A8711_Discussion%20on%20LSs%20from%20SA2).docx) Discussion on LSs from SA2 InterDigital discussion Rel-19 NR\_XR\_Ph3-Core

[R2-2405050](file:///D:\3GPP\Extracts\R2-2405050%20-%20Discussion%20on%20RAN2%20impact%20based%20on%20SA2%20LS.docx) Discussion on RAN2 impact based on SA2 LS OPPO discussion Rel-19 NR\_XR\_Ph3-Core

[R2-2405300](file:///D:\3GPP\Extracts\R2-2405300%20Discussion%20on%20SA2%20LS%20on%20XR.doc) Discussion on SA2 LS on XR CMCC discussion Rel-19 NR\_XR\_Ph3-Core

[R2-2405542](file:///D:\3GPP\Extracts\R2-2405542%20Discussion%20on%20SA2%20LSs%20for%20XR.docx) Discussion on SA2 LSs for XR LG Electronics Inc. discussion Rel-19 NR\_XR\_Ph3-Core

[R2-2405593](file:///D:\3GPP\Extracts\R2-2405593%20XRM%20and%20ALFEC.docx) RAN2 Aspects of SA2 LSes on XRM and AL-FEC Samsung discussion Rel-19 NR\_XR\_Ph3-Core

[R2-2405662](file:///D:\3GPP\Extracts\R2-2405662_Discussion%20on%20LS%20from%20SA2%20on%20AL-FEC%20awareness.docx) Discussion on LS from SA2 on AL-FEC awareness vivo discussion Rel-19 NR\_XR\_Ph3-Core

### 8.7.2 Multi-modality support

Objective: Study and if justified, specify aspects related to multi-modality (intra-UE) (with coordination with SA2/SA4 as needed by LS request). Aim to facilitate efficient and effective support for XR application with Multiple QoS flows with multi-modal inter-dependencies, meeting multi-modal QoS requirements, e.g. synchronization and/or coordination. Efficiency enhancements are expected to be visible in terms of capacity or power consumption.

Including aspects such as:

* what kind of multi-modality information is useful at the gNB and/or UE
* how is this information used by the gNB/UE and what benefits this brings
* what are the potential benefits and enhancements from multi-modal awareness depending on traffic direction (UL/DL)
* identification of potential impacts on other WGs due to multi-modal awareness enhancements
* other enhancements for multi-modal traffic, e.g. power saving, scheduling

**Multi-modality awareness at RAN - benefits**

[R2-2404549](file:///D:\3GPP\Extracts\R2-2404549_xrMultiModality_v03.docx) RAN enhancements for Multi-Modality support ZTE Corporation, Sanechips, China Telecom, Meta, Sony, China Unicom discussion

Observation 1: Static PDB based scheduling may not satisfy the synchronization requirements in some scenarios

Observation 2: If multi-modal dependencies and synchronization requirements are not known to RAN, transmission of dependent data may be delayed beyond the synchronization requirements with respect to the associated data and this may result in

- capacity loss at RAN (due to unnecessary transmissions) and/or

- unnecessary power consumption at the UE (as the UE has to transmit/receive and process the packets which will eventually be discarded at the upper layers)

Proposal 1: Support Multi-Modality awareness in RAN in Rel-19 for UL and DL

Proposal 2: Multi-modal dependencies (including the multi-modal service ID – MMSID) and associated synchronization requirements between multi-modal flows should be visible to RAN to satisfy the corresponding QoS requirements and to improve the radio capacity and reduce power consumption at the UE.

Proposal 3: Send an LS to SA2/SA4 to inform about the above conclusions and ask SA2/SA4 to define the necessary signalling to provide multi-modality awareness in RAN

[R2-2404403](file:///D:\3GPP\Extracts\R2-2404403%20Multi-modality%20support.docx) Multi-modality support Nokia, Nokia Shanghai Bell discussion NR\_XR\_Ph3-Core

Observation 1: Current 3GPP specification is sufficient to achieve the goal of synchronized delivery of multi-modal flows.

Observation 2: Current available mechanism should be sufficient to handle different modals with different QoS requirements.

Proposal 1: For synchronized delivery of multi-modal flows, no additional/new RAN mechanism is required.

Proposal 2: For QoS insurance of multi-modal flows, no additional/new RAN mechanism is required.

DISCUSSION on whether to support multi-modality awareness:

* Xiaomi thinks that application layer alone cannot achieve synchronization requirement and some RAN assistance is needed.
* QCM so far is not sure about whether there is an issue with synchronization as the sync requirement is quite relaxed. QCM thinks that sync related does not have to be studied by RAN2.
* Meta disagrees with QCM, there are use cases where this is needed and current framework does not support it.
* Huawei thinks there are use cases where the flows needs to be synchronized.
* Mediatek thinks there is some info in RTP, but perhaps such information should be also available at RAN layer.
* OPPO supports MM awareness, otherwise we cannot meet the requirements.
* Lenovo also supports MM awareness, gNB should have this knowledge. It can be used at lest for scheduling.
* LGE agrees with the scenario from ZTE paper and support MM awareness. We should request SA2 to deliver this information.
* Ericsson does not think there is a problem.
* Intel thinks companies show a lot of potential enhancements thanks to MM awareness. We can ask SA2 what information they can give us.
* Ericsson thinks there were no capacity gains shown. ZTE clarifies that if we transmit unnecessary packets, then it is clear there is negative impact to capacity. This is similar to dropping correlated packets.
* Meta thinks user capacity is what matters most.
* Spreadtrum thinks that awareness can also be used for admission control.
* Apple thinks that we cannot always assume that we can discard related packets.
* Nokia thinks we can ask about MMSID, but is not clear whether synchronization thresholds are useful.
* MTK is not sure about UL, but for DL this can be done by gNB implementation.
* Vivo thinks we can mention both UL and DL.
* ZTE thinks we can indicate what information we find useful, but details solution are still FFS, perhaps up to WI phase.
* Support Multi-Modality awareness in RAN in Rel-19 for UL and DL.
* Ask SA2 whether/what information could be provided to RAN
* Clarify in the LS how RAN2 considers to use this information, e.g. coordinated handling of multi-modal flows.
* Can consider while drafting the LS to indicate the potential benefits
* [AT126][603][XR] LS to SA2 on multi-modality awareness at RAN (Nokia)

Scope: Prepare and review the reply LS to SA2 based on the agreements and discussion during the meeting

Intended outcome: Agreeable LS

Deadline: LS ready for offline approval: Friday 0900

[R2-2405778](file:///D:\3GPP\Extracts\R2-2405778%20LS%20on%20multi-modality%20awareness%20at%20RAN.docx) LS on multi-modality awareness at RAN TSG RAN WG2

* Put SA4, RAN3 in cc
* Remove “Although discussions are still ongoing in RAN2 about the potential RAN mechanisms and its gains“
* Add “and their gains in next RAN2 meeting” in the second paragraph
* Change “to continue the discussions about the potential RAN” to “to continue the discussions which potential RAN”
* We clarify that we are still in study phase and that we need to understand whether/what information we can get from SA2 (e.g. MMSID, synchronization thresholds) to conclude the study.
* Revised in R2-2405945
* Nokia clarifies that companies want to mention benefits. Nokia thinks we should just mention that RAN2 will continue analysing those.
* Intel would like to add SA4 in the LS (in To field and also request them to provide feedback).
* Huawei has no strong view on sending this to SA4, perhaps adding them in cc is sufficient.
* Huawei thinks we made an agreement on supporting MM, so we should mention benefits.
* ZTE thinks potential gains depend on what information we get.
* ZTE proposes we state that we agreed to support MM awareness and that gains depend on what information we can get from CN. Meta agrees to list the potential gains, potential solutions also how we intend to use it.
* Nokia thinks the reason to agree MM awareness is to check further the gains.
* Mediatek, LGE thinks current LS structure is not logical.
* Interdigital thinks we should at least give SA2 some idea on what we have in mind.
* ZTE proposes to mention MMSID and synchronization thresholds as examples. OPPO agrees.
* Nokia thinks we should clarify that we are still in study phase, but we need information from SA2 to continue it.

[R2-2405945](file:///D:\3GPP\Extracts\R2-2405945%20LS%20on%20multi-modality%20awareness%20at%20RAN.docx) LS on multi-modality awareness at RAN TSG RAN WG2

* Change “In this meeting, as part of this study, RAN2 has agreed that RAN awareness of multi-modality is supported for both UL and DL.” To “In this meeting, as part of this study, RAN2 has agreed that multi-modality awareness at RAN is supported for both UL and DL.”
* Change “MMSID or synchronization thresholds” to “MMSID and/or synchronization thresholds”
* Remove “CC SA4, RAN3” from actions
* With the changes above, the LS is approved unseen in R2-2405782
* Meta and CMCC would like to delete “as part of this study”.
* Nokia thinks that it is a fact that we are in the study phase.
* Apple supports the current version.
* Nokia does not want to mention “in Rel-19”. Intel does not think mentioning it is critical. Samsung also agrees, we should send the LS. LGE thinks we mention “study” too many times.

**Multi-modality awareness at RAN – how is it delivered?**

[R2-2404913](file:///D:\3GPP\Extracts\R2-2404913_XR.docx) multi modal flows and DRB mapping Sony discussion Rel-19 NR\_XR\_Ph3

Proposal 1: RAN2 assumes that multi modal service ID is received in RAN from the core network i.e. there is no need for UE to provide this information to the gNB. Send an LS to SA2.

[R2-2404400](file:///D:\3GPP\Extracts\R2-2404400%20Discussion%20on%20multi-modality%20support%20for%20XR.docx) Discussion on multi-modality support for XR China Telecom discussion

Proposal 2: The Rel-19 XR UE can also provide UL assistance information which may include the synchronization threshold and dependency information to the network.

**Multi-modality awareness at RAN – LCP/DSR/discarding enhancements**

[R2-2404880](file:///D:\3GPP\Extracts\R2-2404880.docx) Enhancements for support of Multi-Modal XR applications Lenovo discussion Rel-19 NR\_XR\_Ph3-Core

Proposal 4: RAN2 to discuss enhancements to the LCP procedure, where the absolute remaining time and in addition the relative remaining time, e.g. enforcing the multi-modal synchronization requirements between PDU sets of LCHs of a multi-modal application, of data is considered when determining the order in which data of LCHs is multiplexed in a TB/UL grant.

Proposal 5: RAN2 to discuss DSR enhancements for multi-modal applications, e.g. UE providing information to gNB on data for which the relative remaining delay, e.g. enforcing the multi-modal synchronization requirement, becomes lower than a threshold.

[R2-2404937](file:///D:\3GPP\Extracts\R2-2404937.doc) Discussion on XR Multi-modality Spreadtrum Communications discussion Rel-19

Proposal 6: Study discard enhancement considering inter dependency among multi-modal QoS flows.

**Other enhancements related to multi-modal traffic**

[R2-2404512](file:///D:\3GPP\Extracts\R2-2404512%20-%20Discussion%20on%20multi-modality.docx) Discussion on multi-modality Ericsson discussion Rel-19 NR\_XR\_Ph3-Core

Observation 1 A single DRX configuration matched to a traffic flow may not be suitable to fulfil the PDBs of other traffic flows, resulting in down to zero capacity.

Observation 2 Multiple active DRX configurations, each matching a traffic flow, are suitable to achieve both high UE power saving gains and many satisfied UEs, if a single DRX configuration matched to one flow does not satisfy the PDBs of other flows.

Proposal 1 Support multiple active DRX configurations to limit the delay and optimize power saving of UEs with multi-flow XR services.

[R2-2404774](file:///D:\3GPP\Extracts\R2-2404774%20Discussion%20on%20multi-modal%20XR.docx) Discussion on multi-modal XR Huawei, HiSilicon discussion Rel-19 NR\_XR\_Ph3-Core

Observation 6: Legacy DG/CG may be not efficient for the transmission of haptic data which have stringent PDB, unpredictable burst size and irregular periodicity.

Observation 7: The transmission of haptic data may impact the transmission of video and audio, and decrease the resource efficiency.

Observation 8: Under the existing scheduling mechanism, the network capacity may be decreased if there is haptic traffic.

Proposal3: RAN2 to confirm whether the existing scheduling mechanism is sufficient to support multi-modal XR services with haptic traffic, from both the haptic KPI and the network capacity perspective.

[R2-2404265](file:///D:\3GPP\Extracts\R2-2404265_R19-XR_Multi-modal.docx) Justification and Enhancements for Multi-modal Services Intel Corporation discussion Rel-19 NR\_XR\_Ph3-Core

[R2-2404330](file:///D:\3GPP\Extracts\R2-2404330%20Discussion%20on%20Multi-Modality.docx) Discussion on Multi-Modality CATT discussion Rel-19 NR\_XR\_Ph3-Core

[R2-2404334](file:///D:\3GPP\Extracts\R2-2404334%20Discussion%20on%20Multi-Modality%20XR.docx) Discussion on Multi-Modality XR Meta discussion

[R2-2404351](file:///D:\3GPP\Extracts\R2-2404351_multi-modal_v2.doc) Discussions on Multi-modality Awareness Fujitsu discussion Rel-19 NR\_XR\_Ph3-Core R2-2402278

[R2-2404425](file:///D:\3GPP\Extracts\R2-2404425%20Discussion%20on%20Multi-modality.doc) Discussion on Multi-modality vivo discussion Rel-19 NR\_XR\_Ph3-Core

[R2-2404455](file:///D:\3GPP\Extracts\R2-2404455%20Discussion%20on%20Multi-modality%20support%20for%20XR%20traffic.doc) Discussion on Multi-modality support for XR traffic Xiaomi Communications discussion

Proposal 4 For multi-modal QoS requirements, LCP enhancement will not be considered until the requirement of multi-modal QoS is clear enough.

Proposal 5 PDU set based discarding across PDU sets/QoS flows should not be considered until we get requirement from SA2.

[R2-2404556](file:///D:\3GPP\Extracts\R2-2404556%20Discussion%20on%20Multi-modal%20support%20for%20XR.docx) Discussion on Multi-modal support for XR LG Electronics Inc. discussion Rel-19 NR\_XR\_Ph3-Core

[R2-2404572](file:///D:\3GPP\Extracts\R2-2404572%20%20Discussion%20on%20Multi-modality%20support%20for%20XR.docx) Discussion on Multi-modality support for XR TCL discussion

[R2-2404649](file:///D:\3GPP\Extracts\R2-2404649%20Views%20on%20Multi-Modality%20Services%20for%20XR.docx) Views on Support of Multi-Modality Services in Rel-19 XR Apple discussion Rel-19 NR\_XR\_Ph3-Core

[R2-2404866](file:///D:\3GPP\Extracts\R2-2404866%20Multi-modality%20support%20for%20XR.docx) Multi-modality support for XR Google Inc. discussion

[R2-2404937](file:///D:\3GPP\Extracts\R2-2404937.doc) Discussion on XR Multi-modality Spreadtrum Communications discussion Rel-19

[R2-2405000](file:///D:\3GPP\Extracts\R2-2405000%20(R19%20NR%20XR%20A872_Multi%20modality%20support).docx) Multi-modality support for XR InterDigital discussion Rel-19 NR\_XR\_Ph3-Core

[R2-2405016](file:///D:\3GPP\Extracts\R2-2405016%20Further%20discussion%20on%20multi-modality%20support%20for%20XR.docx) Further discussion on multi-modality support for XR CMCC discussion Rel-19 NR\_XR\_Ph3-Core

[R2-2405051](file:///D:\3GPP\Extracts\R2-2405051%20-%20Discussion%20on%20the%20multi-modality%20support.docx) Discussion on the multi-modality support OPPO discussion Rel-19 NR\_XR\_Ph3-Core

[R2-2405072](file:///D:\3GPP\Extracts\R2-2405072.docx) Discussion on multi-modality support NEC discussion Rel-19 NR\_XR\_Ph3-Core

[R2-2405158](file:///D:\3GPP\Extracts\R2-2405158%20R19%20XR%20Multi-Modality.docx) Further aspects of multi-modality support in RAN Samsung discussion

[R2-2405439](file:///D:\3GPP\Extracts\R2-2405439%20Draft%20LS%20to%20SA2%20on%20XR%20multi-modality.docx) Draft LS to SA2 on XR multi-modality CMCC LS out Rel-19 NR\_XR\_Ph3-Core To:SA2

[R2-2405614](file:///D:\3GPP\Extracts\R2-2405614.docx) Discussion on multi-modality MediaTek Inc. discussion Rel-19

### 8.7.3 RRM measurement gaps/restrictions related enhancements

Objective: Specify enhancements to enable transmission/reception in gaps/restrictions that are caused by RRM measurements (from inter-frequency RRM measurement gaps, or intra-frequency measurements, or other scheduling restrictions etc).

**This agenda item will not be treated during RAN2#126 and no contributions should be submitted for this AI for this meeting.**

### 8.7.4 Scheduling enhancements

Objective: For the UL, Study and if justified, Specify enhancements using delay/deadline information, for support of UL scheduling to enable high XR capacity while meeting delay requirements/avoiding too late PDUs.

Including aspects such as:

* whether/how to resolve the issue of data with low remaining time being delayed due to other data from LCHs with higher LCH priority
* enhancing DSR with additional information, e.g. what is additional information, can it refer to non-delay critical data etc.

**LCP enhancements – LCH prioritization**

[R2-2404182](file:///D:\3GPP\Extracts\R2-2404182%20-%20Discussion%20on%20scheduling%20enhancements%20for%20XR.docx) Discussion on scheduling enhancements for XR OPPO discussion Rel-19 NR\_XR\_Ph3-Core

Proposal 1 Delay-aware LCP enhancement to resolve the issue of data with low remaining time being delayed due to other data from LCHs with higher LCH priority is supported in Rel-19 XR.

Proposal 2 For delay-aware LCP enhancement, RAN2 discuss the following options to override/adjust the priority of LCH based on delay/deadline information:

- Option 1: Adjust the LCH with delay-critical data to the highest priority below the priorities of all SRBs

- Option 2: Use additional priority configured to LCHs in case of these LCHs with delay-critical data

DISCUSSION on P1:

* LGE is wondering whether we need to down-select between LCH restrictions and LCH prioritization or we can keep both is study phase.
* OPPO clarifies that with P1 they cover both.
* Ericsson wonders about the gains of this delay approach, in their simulations capacity is lost.
* CMCC thinks this approach helps in the situation where non-delay critical data takes grant of delay-critical data.
* QCM supports proposal 1. Would like to add that we need to consider UE complexity.
* Vivo thinks that this solution helps to increase UE satisfaction rate. OK with the proposal.
* Intel is OK with the proposal, would like to clarify this is for inter-LCH prioritization.
* Futurewei indicates we need to be careful not to prioritize low priority packets.
* 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)

DISCUSSION on P2:

* Apple thinks option 1 is not flexible enough, it is better to have it configurable.
* QCM thinks option 2 is more flexible, no need for option 1. QCM wonders if priority is adjusted only for delay-critical data or for the whole LCH.
* Intel agrees with QCM.
* Xiaomi thinks that configurability brings additional complexity, it would be simpler with static priority.
* Lenovo thinks the network should be above to control when and for which LCH this is used.
* Vivo is fine with option 2, but option 1 is simpler.
* Spreadtrum thinks network should configure the priority.
* Nokia thinks option 2 is OK, there is not additional complexity.
* LGE thinks option 2 is preferable, but option 1 is also OK.
* QCM thinks option 1 is not flexible enough, e.g. if there are different LCH with delay critical data.
* Fujitsu is OK, but wonders whether this new priority applies to al ldata or only delay critical data.
* ZTE thinks PBR will still apply.
* QCM thinks all other parameters stay the same, including PBR. Lenovo agrees.
* Lenovo thinks we should apply the higher priority to the whole LCH
* 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

* FFS whether the priority only applies to delay-critical data within the LCH or for the whole LCH

**LCP enhancements – LCH restrictions**

[R2-2405543](file:///D:\3GPP\Extracts\R2-2405543%20Discussion%20on%20Scheduling%20enhancement%20for%20XR.docx) Discussion on Scheduling enhancement for XR LG Electronics Inc. discussion Rel-19 NR\_XR\_Ph3-Core

Proposal 2. The data with short remaining time should be prioritized only if it is needed, e.g., when it is indicated by the network or when DSR is transmitted.

Proposal 4. Support the enhancement of LCP restrictions to prioritize delay-critical data, e.g., select only the logical channels with delay-critical data, when the delay-critical data needs to be prioritized.

DISCUSSION on P2:

* Apple thinks that such indication may be too late for UE to process it. No need to couple with DSR.
* Lenovo has concerns with P2, it has impacts on RAN1.
* ZTE does not think indication from the network is not a good idea. It should be static configuration, i.e. based on threshold.
* Xiaomi also does not think this is good idea, it is better to base on conditions such as DSR triggering.
* CMCC sees no need for this.
* Huawei thinks this can be done with no RAN2 impact, e.g. whenever delay critical is occurring then the UE uses LCH restriction.
* We try to avoid RAN1 impacts.
* RAN2 assumes no dynamic indications are needed for triggering the delay-aware LCP mechanism. RAN2 assumes this mechanism is configured in a semi-static way.

[R2-2404331](file:///D:\3GPP\Extracts\R2-2404331%20Consideration%20on%20XR-specific%20Scheduling%20Enhancement.docx) Consideration on XR-specific Scheduling Enhancement CATT discussion Rel-19 NR\_XR\_Ph3-Core

Proposal 1: For enhanced LCP restrictions/LCH selection, dedicated UL grant only for data with low remaining time can be considered.

Proposal 2: An indication in DCI can be used to indicate the UL dynamic grant is dedicated for data with low remaining time.

Proposal 3: New LCP restriction can be introduced to indicate whether a logical channel is allowed to use the dedicated UL grant for data with low remaining time.

* ZTE thinks that without RAN1 work, LCP restrictions based solutions are not that interesting.
* Nokia would like to exclude solutions where we disallow completely non-delay critical data from using an UL grant.
* LGE thinks relaxing LCH restrictions has further impact on UE.
* For LCP restrictions based solutions, RAN2 will not discuss solutions requiring RAN1 work. FFS whether other LCP restrictions based approaches are needed/beneficial
* The solutions should not disallow non-delay critical data from using an UL grant.

**LCP enhancements – granularity**

[R2-2404456](file:///D:\3GPP\Extracts\R2-2404456%20Discussion%20on%20scheduling%20enhancements%20of%20XR%20traffic.doc) Discussion on scheduling enhancements of XR traffic Xiaomi Communications discussion

Proposal 3 Prioritization within a logical channel (e.g., by remaining timer or by importance) will not be considered

DISCUSSION:

* QCM thinks we do not have to discuss anything for intra-LCH prioritization.
* Intel, Mediatek agrees with Qualcomm.
* LGE would also like to clarify this is about MAC prioritization.
* Spreadtrum agrees with the proposal.
* LCP prioritization within a logical channel will not be considered in RAN2 discussions

[R2-2404550](file:///D:\3GPP\Extracts\R2-2404550_xrSchedulingEnh.docx) Scheduling enhancements for XR ZTE Corporation, Sanechips discussion

Proposal 3: Introduce a remaining time threshold based LCP mechanism, e.g. At the stage for allocation of resources in LCP, UL grant resource is allocated for the data with remaining time below a threshold firstly; and the remaining resource, if any, is allocated for the non delay-critical data based on legacy LCH priority.

DISCUSSION on whether we have a new remaining time threshold for delay-aware LCP:

* Interdigital thinks we can reuse R18 threshold.
* Vivo prefers separate configuration, up to NW whether value is the same or different.
* Xiaomi, Fujitsu thinks we can reuse DSR threshold.
* Nokia, ZTE, QCM, Lenovo prefers to have a separate threshold. Time to trigger for DSR can be more, but this is stage-3 detail.
* Xiaomi does not see the value of separating. Fujitsu agrees.
* Lenovo clarifies the threshold for DSR might be higher, e.g. to allow SR.
* FFS whether a separate remaining time threshold can be configured for delay aware LCP (i.e. different from the one used for DSR).

**DSR enhancements – multiple thresholds and grouping of data**

[R2-2404176](file:///D:\3GPP\Extracts\R2-2404176%20Discussion%20on%20delay-aware%20scheduling.docx) Discussion on delay-aware scheduling Qualcomm Incorporated discussion Rel-19 NR\_XR\_Ph3-Core

Proposal 5. Network can configure an LCG with multiple DSR reporting thresholds. For each threshold, UE reports data volume whose remaining time is below that threshold.

Proposal 6. Enhanced DSR MAC CE does not need to include any delay information related to PDU Set Importance.

[R2-2404514](file:///D:\3GPP\Extracts\R2-2404514%20-%20Discussion%20on%20scheduling%20enhancements.docx) Discussion on scheduling enhancements Ericsson discussion Rel-19 NR\_XR\_Ph3-Core

Proposal 1 Enhance DSR to report with multiple pairs of remaining time and buffer size.

Proposal 2 Grouping of data in the DSR should be based on PDU Sets.

DISCUSSION on whether to have multiple with multiple pairs of remaining time and buffer size:

* Intel asks whether new threshold are only for delay-critical. Ericsson thinks we cannot refer to delay-critical only.
* Lenovo asks if we report data multiple times.
* Google asks if this means that we will have multiple thresholds for adjusting the priority.
* Nokia is fine with the proposal. Nokia also supports indication of importance.
* Vivo is OK with the proposal, but would also like to clarify about triggering.
* Ericsson thinks one trigger is enough.
* CMCC wonders if this means that we have data with different priority
* Huawei clarifies that we can have data with different PDBs arriving at different times, support the proposal.
* LGE supports the first proposal. We need to consider time gap between DSR triggering and transmission time.
* Enhance DSR to report with multiple pairs of remaining time and buffer size for the LCG.
* FFS whether DSR triggering is impacted
* FFS whether PDU set importance needs to be included

**DSR enhancements – whether to include non-delay critical data**

[R2-2405535](file:///D:\3GPP\Extracts\R2-2405535.docx) Discussion on UL scheduling enhancements MediaTek Inc. discussion Rel-19 38.321 NR\_XR\_Ph3, NR\_XR\_Ph3-Core

Proposal 1: For DSR enhancement, RAN2 only consider information related to delay-critical data. Non-delay critical data can be handled by BSR.

[R2-2404426](file:///D:\3GPP\Extracts\R2-2404426_Discussion%20on%20scheduling%20enhancement%20for%20XR.docx) Discussion on scheduling enhancement for XR vivo discussion Rel-19 NR\_XR\_Ph3-Core

Proposal 5 DSR should be enhanced to comprise both delay-critical data information and non-delay-critical data information.

[R2-2404266](file:///D:\3GPP\Extracts\R2-2404266_R19-XR_LCH_DSR.docx) LCH prioritization and DSR enhancements Intel Corporation discussion Rel-19 NR\_XR\_Ph3-Core

[R2-2404335](file:///D:\3GPP\Extracts\R2-2404335%20Discussion%20on%20Scheduling%20Enhancement%20for%20XR.docx) Discussion on Scheduling Enhancement for XR Meta discussion

[R2-2404352](file:///D:\3GPP\Extracts\R2-2404352%20Discussions%20on%20delay-aware%20LCP.docx) Discussions on delay-aware LCP Fujitsu discussion Rel-19 NR\_XR\_Ph3-Core

[R2-2404401](file:///D:\3GPP\Extracts\R2-2404401%20Scheduling%20enhancements%20for%20XR%20traffic.docx) Scheduling enhancements for XR traffic China Telecom discussion

[R2-2404567](file:///D:\3GPP\Extracts\R2-2404567%20Discussion%20on%20UL%20scheduling%20enhancements.docx) Discussion on UL scheduling enhancements HONOR discussion Rel-19 NR\_XR\_Ph3-Core

[R2-2404573](file:///D:\3GPP\Extracts\R2-2404573%20%20Discussion%20on%20LCP%20enhancements%20in%20XR.docx) Discussion on LCP enhancement in XR TCL discussion

[R2-2404650](file:///D:\3GPP\Extracts\R2-2404650%20Complementary%20RLC%20Mechanisms%20for%20LCP%20Enhancements.docx) Complementary RLC Mechanisms for LCP Enhancements Apple, Lenovo, CATT, OPPO discussion Rel-19 NR\_XR\_Ph3-Core

[R2-2404651](file:///D:\3GPP\Extracts\R2-2404651%20Views%20on%20DSR%20Enhancements.docx) Views on DSR Enhancements for Rel-19 XR Apple discussion Rel-19 NR\_XR\_Ph3-Core

[R2-2404708](file:///D:\3GPP\Extracts\R2-2404708%20Scheduling%20enhancements%20for%20XR.docx) Scheduling Enhancements for XR Nokia, Nokia Shanghai Bell discussion Rel-19 NR\_XR\_Ph3-Core

[R2-2404849](file:///D:\3GPP\Extracts\R2-2404849%20Discussion%20on%20the%20LCP%20enhancements%20for%20XR.docx) Discussion on the LCP enhancements for XR ITRI discussion NR\_XR\_Ph3-Core

[R2-2404878](file:///D:\3GPP\Extracts\R2-2404878.docx) Enhanced uplink scheduling for XR Lenovo discussion Rel-19 NR\_XR\_Ph3-Core

[R2-2404887](file:///D:\3GPP\Extracts\R2-2404887_Considerations%20on%20delay-sensitive%20scheduling%20for%20XR.docx) Considerations on delay-sensitive scheduling for XR NEC discussion Rel-19 NR\_XR\_Ph3-Core

[R2-2404914](file:///D:\3GPP\Extracts\R2-2404914_UL%20Scheduling%20enhancements%20for%20XR_v2.docx) UL Scheduling enhancements for XR Sony discussion Rel-19 NR\_XR\_Ph3

[R2-2404938](file:///D:\3GPP\Extracts\R2-2404938.doc) Discussion on XR scheduling enhancement Spreadtrum Communications discussion Rel-19

[R2-2405001](file:///D:\3GPP\Extracts\R2-2405001%20(R19%20NR%20XR%20A874_Scheduling%20enhancements).docx) Scheduling enhancements for XR InterDigital discussion Rel-19 NR\_XR\_Ph3-Core

[R2-2405017](file:///D:\3GPP\Extracts\R2-2405017%20Further%20discussion%20on%20scheduling%20enhancement%20for%20XR.docx) Further discussion on scheduling enhancement for XR CMCC discussion Rel-19 NR\_XR\_Ph3-Core

[R2-2405119](file:///D:\3GPP\Extracts\R2-2405119%20Delay-aware%20scheduling%20enhancements.docx) Delay-aware scheduling enhancements Huawei, HiSilicon discussion Rel-19 NR\_XR\_Ph3-Core

[R2-2405357](file:///D:\3GPP\Extracts\R2-2405357.docx) Discussion on scheduling enhancement for XR Google Inc. discussion NR\_XR\_Ph3-Core

[R2-2405404](file:///D:\3GPP\Extracts\R2-2405404.docx) Discussion on scheduling enhancements for XR DENSO CORPORATION discussion Rel-19 NR\_XR\_Ph3-Core

[R2-2405446](file:///D:\3GPP\Extracts\R2-2405446-Solutions%20for%20DSR%20enhancement.docx) Solutions for DSR enhancement TCL discussion Rel-19

[R2-2405473](file:///D:\3GPP\Extracts\R2-2405473_LCP%20enhancment.doc) LCP enhancement Sharp discussion

[R2-2405481](file:///D:\3GPP\Extracts\R2-2405481%20Discussion%20on%20XR%20scheduling%20enhancements.docx) Discussion on XR scheduling enhancements III discussion NR\_XR\_Ph3-Core

[R2-2405594](file:///D:\3GPP\Extracts\R2-2405594%20XR%20Scheduling%20Enhancement.docx) Scheduling Enhancements for Rel-19 XR Samsung discussion Rel-19 NR\_XR\_Ph3-Core

[R2-2405654](file:///D:\3GPP\Extracts\R2-2405654%20Discussion%20on%20XR%20Uplink%20Scheduling%20.docx) Discussion on XR uplink Scheduling enhancements Rakuten Mobile, Inc discussion Rel-19

### 8.7.5 RLC enhancements

Objective: RLC re-transmission related enhancements for operation of RLC Acknowledged Mode (AM) with small packet delay budget.

Including aspects such as:

* enhancements to ensure timely RLC retransmission(s) for XR
* how to avoid unnecessary retransmissions (e.g. of out-dated packets)

**Avoiding unnecessary retransmissions**

[R2-2404596](file:///D:\3GPP\Extracts\R2-2404596%20Discussion%20on%20RLC%20AM%20enhancements.docx) Discussion on RLC AM enhancements Huawei, HiSilicon discussion Rel-19 NR\_XR\_Ph3-Core

Proposal 1: RAN2 to enhance the RLC AM by adopting enhancements from one of the following perspectives:

• The Rx RLC entity does not send NACK to the Tx RLC entity for the outdated data even if the data has not been received successfully;

• The Tx RLC entity stops unnecessary RLC retransmission and notifies the Rx RLC entity which RLC SDU will not be retransmitted.

DISCUSSION:

* Mediatek thinks the first option is not feasible as the timer is maintained at the tx side. Vivo agrees.
* LGE thinks there will be no issue with unnecessary retransmissions if we have a proper solution for timely retransmission. Prefer to have Rx based solution.
* Apple thinks for Rx solution we need some timer at Rx side which can be dynamic in XR and not visible at Rx side.
* Apple thinks that if the number of retransmissions is configured properly, then there might be no issue.
* Ericsson think at Rx side we can use reordering timer, we do not have to have visibility to other traffic related timers.
* Intel thinks we should agree that unnecessary Tx avoidance should consider delay budget. Intel has slight preference for Rx but thinks we should study both.
* QCM would like to prioritize Tx side approach.
* Nokia has the opposite view. Thinks Rx side approach will be much simpler.
* KDDI shares the view with Nokia, Rx approach is simpler. Xiaomi agrees.
* LGE thinks we might not need any solution. Ericsson disagrees.
* Samsung disagrees with LGE, thinks the solution are complimentary.
* For avoiding unnecessary RLC AM retransmissions, RAN2 to enhance the RLC AM by adopting enhancements from one of the following perspectives:

1. **Rx initiated approach**
2. **Tx initiated approach**

* RAN2 will discuss details of both approaches, compare them and choose one once the details are clearer.

[R2-2405032](file:///D:\3GPP\Extracts\R2-2405032.docx) Discussion on RLC retransmission enhancements in XR CMCC discussion Rel-19 NR\_XR\_Ph3-Core

Proposal 1: The transmitting side of AM RLC entity could notify the receiving RLC side with the SN gap when the transmitting side abandons the retransmission of an obsolete RLC SDU or an RLC SDU segment.

DISCUSSION:

* LGE thinks this is complex.
* Lenovo thinks we could also just inform about obsolete PDUs.
* For Tx initiated approach:
  + - The transmitting side of AM RLC entity notifies the receiving RLC side about the obsolete SDUs
    - Tx side stops retransmit obsolete SDUs
    - Rx side updates state variables according to the information from Tx side

[R2-2404293](file:///D:\3GPP\Extracts\R2-2404293%20RLC%20AM%20enhancements.docx) RLC AM enhancements for XR Nokia, Nokia Shanghai Bell discussion Rel-19 NR\_XR\_Ph3-Core

Proposal 4: For proper advancing of the transmitting window, RLC AM is enhanced with a way for the receiver to indicate abandoned SDUs to the transmitter.

* For Rx initiated approach:
  + - For proper advancing of the transmitting window, RLC AM is enhanced with a way for the receiver to indicate abandoned SDUs to the transmitter.
    - Tx side just processes the status report as in legacy
    - **FFS how Rx side determines that an SDU should be abandoned**

**Autonomous retransmissions**

[R2-2404212](file:///D:\3GPP\Extracts\R2-2404212%20%20Discussion%20on%20RLC%20AM%20Enhancements.docx) Discussion on RLC AM Enhancements CANON Research Centre France discussion Rel-19 NR\_XR\_Ph3-Core

Observation 1: In RLC AM, the retransmission of PDUs can experience large delay

Observation 2: Relying on RLC parameter tunning such as polling frequency or t\_reassembly timer cannot solve the issue.

Proposal 1: Consider anticipated retransmission of PDUs with unknown status.

Proposal 2: Further study the criteria for triggering anticipated retransmission of PDUs with unknown status.

DISCUSSION:

* Intel asks what is meant by “anticipated”? Is it autonomous? CANON confirms.
* Nokia, QCM agrees with observations and supports the proposal.
* QCM indicates RTT for RLC AM is too long.
* Mediatek disagrees with the observations. Think we can reconfigure, e.g. polling timer. Autonomous reTx is bad for capacity.
* Ericsson shares an understanding of Mediatek. We can have an earlier feedback to trigger reTx and we should avoid unnecessary duplicate transmissions.
* LGE agrees with the observations, just using shorter timer is not good. It will require a lot of status reports and impacts processing and it can delay actual data.
* Ericsson thinks that timers are always adjusted to traffic requirements.
* Vivo thinks that we need to be careful with autonomous reTx, especially during congestion.
* Samsung think we should study autonomous reTx, it can be complimentary to status reports.
* Xiaomi is also concerned about capacity, gNB implementation can avoid the issues in the paper.
* Apple thinks we need to analyse more what we already have, e.g. repetition, duplication. If something is needed, we should look at polling timer.
* Huawei thinks we need to have some status report to avoid capacity loss.
* KDDI is also concerned about capacity.
* Nokia thinks the whole point was to have RLC retransmissions for cases where HARQ does not work. Nokia thinks we can have a general agreement which covers also solutions including SRs. But the reTx needs to be quick.
* LGE thinks that polling and SR cannot work for delay-critical data. If we retransmit delay critical data timely then we solve both data loss issue and unnecessary reTx issue.
* Ericsson thinks we first need to understand why the current mechanism does not work.
* QCM thinks that even if you reduce timers, that will not be enough.
* NEC thinks we should consider RLF due to autonomous reTx
* To achieve timely retransmissions on RLC layer for XR traffic, RAN2 will consider the following options:
  + - Autonomous retransmission (i.e. without status report) of PDUs based on some triggers (existing or new triggers can be considered)
    - Retransmission based on enhanced status report
    - Retransmission based on enhanced polling

FFS whether any enhancements are needed or this can be solved with proper configuration and current mechanism

* Impact on capacity should be considered
* RAN2 focuses on the enhancements for UL traffic

[R2-2404177](file:///D:\3GPP\Extracts\R2-2404177%20Discussion%20on%20RLC%20enhancements.docx) Discussion on RLC enhancements Qualcomm Incorporated discussion Rel-19 NR\_XR\_Ph3-Core

Proposal 3. If configured by network, a RLC AM transmitter can retransmit a RLC PDU if one of the following conditions is met:

- after the remaining time of the PDU has dropped below a configured threshold; or

- after the PDU has failed a configured number of HARQ transmissions; or

- if the PDU is in the RLC retransmission buffer and there are spare PUSCH resources available after the LCP procedure.

[R2-2405285](file:///D:\3GPP\Extracts\R2-2405285%20-%20Discussion%20on%20RLC%20AM%20Enhancements.docx) Discussion on RLC AM Enhancements Ericsson discussion Rel-19

Observation 1 For traffic in the UL, network can decide when to send the RLC STATUS report and for shorter PDBs, it can send it more often.

Observation 2 For traffic in the DL, the network can configure smaller values for the traffic with shorter PDBs thereby enabling faster feedback/timely retransmissions.

Proposal 1 No enhancements are needed for the RLC STATUS PDU as it is up to network implementation for traffic in the UL and network configuration for traffic in the DL.

Proposal 2 Not pursue solutions relating to autonomous RLC retransmissions based on timers or without the STATUS PDUs.

[R2-2405002](file:///D:\3GPP\Extracts\R2-2405002%20(R19%20NR%20XR%20A875_RLC_enhancements).docx) RLC enhancements for XR InterDigital discussion Rel-19 NR\_XR\_Ph3-Core

Proposal 2: Study polling enhancements to inform the UE of the reception status of each uplink PDU set.

Proposal 3: Support the UE to stop the t-StatusProhibit timer to allow timely reporting of the RLC status. FFS the scenario(s) when the UE stop the timer.

[R2-2404197](file:///D:\3GPP\Extracts\R2-2404197.docx) RLC AM retransmission enhancements Xiaomi discussion Rel-19 NR\_XR\_Ph3-Core

[R2-2404255](file:///D:\3GPP\Extracts\R2-2404255%20-%20Discussion%20on%20RLC%20re-transmission%20related%20enhancements.docx) Discussion on RLC re-transmission related enhancements OPPO discussion Rel-19 NR\_XR\_Ph3-Core

[R2-2404267](file:///D:\3GPP\Extracts\R2-2404267_R19-XR_RLC-reTx.docx) RLC (re)transmission enhancements Intel Corporation discussion Rel-19 NR\_XR\_Ph3-Core

[R2-2404332](file:///D:\3GPP\Extracts\R2-2404332%20Consideration%20on%20XR-specific%20RLC%20Enhancement.docx) Consideration on XR-specific RLC Enhancement CATT discussion Rel-19 NR\_XR\_Ph3-Core

[R2-2404336](file:///D:\3GPP\Extracts\R2-2404336%20Discussion%20on%20RLC%20AM%20Enhancements%20for%20XR.docx) Discussion on RLC AM Enhancements for XR Meta discussion

[R2-2404353](file:///D:\3GPP\Extracts\R2-2404353%20Discussions%20on%20RLC%20enhancements.docx) Discussions on RLC enhancements Fujitsu discussion Rel-19 NR\_XR\_Ph3-Core

[R2-2404359](file:///D:\3GPP\Extracts\R2-2404359.doc) Discussion on RLC enhancements SHARP Corporation discussion NR\_XR\_Ph3-Core

[R2-2404402](file:///D:\3GPP\Extracts\R2-2404402%20Discussion%20on%20RLC%20enhancements%20for%20XR.docx) Discussion on RLC enhancements for XR China Telecom discussion

[R2-2404427](file:///D:\3GPP\Extracts\R2-2404427%20Discussion%20on%20RLC%20enhancement%20for%20XR.docx) Discussion on RLC enhancement for XR vivo discussion Rel-19 NR\_XR\_Ph3-Core

[R2-2404551](file:///D:\3GPP\Extracts\R2-2404551%20xrRlcEnh.docx) RLC enhancements for XR ZTE Corporation, Sanechips discussion

[R2-2404568](file:///D:\3GPP\Extracts\R2-2404568%20Discussion%20on%20RLC%20enhancements%20for%20XR.docx) Discussion on RLC enhancements for XR HONOR discussion Rel-19 NR\_XR\_Ph3-Core

[R2-2404627](file:///D:\3GPP\Extracts\R2-2404627_KDDI_XR_RLC_Enh.docx) Considerations on RLC re-transmission related enhancements for XR KDDI Corporation discussion

[R2-2404652](file:///D:\3GPP\Extracts\R2-2404652%20Views%20on%20RLC-AM%20Enhancements%20for%20XR.docx) Views on RLC-AM Enhancements for Rel-19 XR Apple discussion Rel-19 NR\_XR\_Ph3-Core

[R2-2404813](file:///D:\3GPP\Extracts\R2-2404813%20AM%20RLC%20enhancement.docx) AM RLC Enhancement Lenovo discussion Rel-19

[R2-2404850](file:///D:\3GPP\Extracts\R2-2404850%20RLC%20re-transmission%20enhancements%20for%20XR.docx) RLC re-transmission enhancements for XR ITRI discussion NR\_XR\_Ph3-Core

[R2-2404915](file:///D:\3GPP\Extracts\R2-2404915_XR_RLC_v3.docx) RLC periodic poll based on RLC SN Sony discussion Rel-19 NR\_XR\_Ph3

[R2-2404939](file:///D:\3GPP\Extracts\R2-2404939.doc) Discussion on timely RLC retransmission(s) Spreadtrum Communications discussion Rel-19

[R2-2405195](file:///D:\3GPP\Extracts\R2-2405195%20RLC%20AM%20enhancement%20v1.docx) RLC AM Enhancement NEC discussion Rel-19 NR\_XR\_Ph3-Core

[R2-2405329](file:///D:\3GPP\Extracts\R2-2405329%20Discussion%20on%20details%20of%20RLC%20enhancements%20for%20XR.docx) Discussion on details of RLC enhancements for XR LG Electronics Inc. discussion Rel-19 NR\_XR\_Ph3-Core

[R2-2405380](file:///D:\3GPP\Extracts\R2-2405380.docx) Discussion on RLC enhancements on small packet delay budget scenario MediaTek Inc. discussion Rel-19 38.322 NR\_XR\_Ph3, NR\_XR\_Ph3-Core

[R2-2405445](file:///D:\3GPP\Extracts\R2-2405445-Solutions%20for%20RLC%20AM%20retransmission%20enhancement.docx) Solutions for RLC AM retransmission enhancement TCL discussion Rel-19

[R2-2405493](file:///D:\3GPP\Extracts\R2-2405493%20Discussion%20on%20RLC%20enhancements%20for%20XR.docx) Discussion on RLC enhancements for XR Samsung discussion Rel-19 NR\_XR\_Ph3-Core