



3GPP TSG RAN 102  
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# Views on Rel-19 XR Scope

Apple

- Synchronisation of Multi-Modality seems to be an important requirement to optimise XR user experiences.
- Some potential directions to support multi-modal synchronisation have been discussed, including:
  - Scheduling enhancement to achieve coordinated or synchronised transmission of multi-modal flows.
  - Awareness of inter-dependencies among multi-modal flows at RAN/AS
- However, whether any RAN enhancement is needed may be subject to SA2/SA4 conclusions.
  
- **Proposal 1: For coordination/synchronization among multi-modal flows RAN/AS awareness of inter-dependency, a study involving SA2/SA4 is needed to confirm to justify RAN enhancements.**

# Rel-19 XR Scope | Measurement Gaps

- According to the summary for RAN Rel-19 package from the RAN Chair RP-232745, the following objective may be included in Rel-19 XR:
  - **Measurement Gaps / Scheduling restrictions**: Specify enhancements for reducing the impact to capacity and impact to individual UEs with respect to scheduling restrictions for FR1 and FR2 inter-frequency RRM measurements with measurement gaps and FR2 intra-frequency measurements w/o measurement gaps. [RAN1, RAN2, RAN4].
- Any enhancements should take the impacts to RRM into account, and this has to be validated by RAN4.
- If any enhancements on measurement gaps and scheduling restrictions are needed, it should be RAN4's scope.
- **Proposal 2: Update the objective on measurement gaps as following:**
  - **Measurement Gaps / Scheduling restrictions**: Specify enhancements for reducing the impact to capacity and impact to individual UEs with respect to scheduling restrictions for FR1 and FR2 ~~inter-frequency~~ RRM measurements with measurement gaps and FR2 intra-frequency measurements w/o measurement gaps **and FR1 intra-frequency measurements with mixed numerology, considering UE operational complexity and timeline**. [RAN1, RAN2, RAN4].
    - **Associated impact to existing requirements on RRM measurement requirements needs to be validated by RAN4.**
    - **If justified, specify the enhancements on measurement gap based on the identified enhancements by RAN1/RAN2 [RAN4]**
    - **If justified, specify the enhancements on scheduling restriction on the identified need by RAN1/RAN2 [RAN4]**

# Rel-19 XR Scope | UTO for Multiple Configured Grants

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- The UTO-UCI mechanism introduced in Rel-18 focusses on single CG configuration.
- Some proposals on multiple CG configurations have been discussed, but not in a comprehensive manner due to time limitation.
- We think this is a reasonable continuation in Rel-19.
  
- **Proposal 3: Rel-19 XR WI scope can include the following objective:**
  - **Specify enhancements in providing UTO information for multiple CG configurations.**



# Rel-19 XR Scope | Soft HARQ, Enhanced CQI & CSI Measurement

- Soft HARQ enhancement can be quite useful to XR traffic, especially for latency sensitive XR traffic. The delta MCS or HARQ redundancy sequence can be considered for that.
- We are not convinced PDSCH/DMRS based CQI derivation is necessary: for the ongoing PDSCH transmission, soft HARQ should be a better and more relevant solution, for scheduling decision in the future, the current design in NR is enough.
- In Rel-18, the DRX periodicity is updated to support a rational number for DRX periodicity. We consider CSI/CQI measurements and reporting to be aligned with XR traffic/periodicity to enhance the accuracy/applicability, to avoid unnecessary UE power consumption and capacity loss as otherwise interference measurement may not reflect interference the XR traffic really suffers from.
- **Proposal 4: Rel-19 XR WI scope can include the following objective:**
  - **Specify enhancements to align CSI/CQI measurements with XR traffic/periodicity.**
  - **Specify HARQ enhancements to provide additional information other than ACK/NACK regarding current transport block's reception from UE to gNB.**



# Rel-19 XR Scope | Delay/Jitter-Aware Enhancements

- There are several proposals of using delay information for LCP enhancements. While we are not against LCP enhancements based on delay, we would like to point out that LCP is a complicated mechanism and utilizing delay information for LCP may not be straightforward. Thus, we think the scope should not be limited to LCP.
- On the other hand, the buffer delay information (e.g. remaining time till discard timer expiry) could be simply used by the UE to optimize some timer-based operations. In particular, the UE may stop a running CG Timer or a DRX Retransmission Timer in accordance to the remaining time of data in the MAC PDU stored in the corresponding HARQ process.
- From end-to-end service requirement point of view, we think “jitter” information may be even more useful than “delay” (i.e. remaining time till discarding). Note that UL jitter represents the latency a packet can already experience even before reaching 3GPP AS, which is not negligible especially in tethering-based scenarios considered in Rel-18. Since in Rel-18 the UE can already track/report jitter information, we think it can be utilized for some scheduling enhancement as well.
- **Proposal 5: Rel-19 XR WI scope can include the following objective:**
  - **Specify enhancements that allow the UE to use jitter and/or delay information of XR traffics for UL transmission (e.g. optimization of timer-based operations based on the knowledge of buffer delay).**



# Rel-19 XR Scope | Summary of Our views

- **For coordination/synchronization among multi-modal flows RAN/AS awareness of inter-dependency, a study involving SA2/SA4 is needed to confirm to justify RAN enhancements.**
- **Rel-19 XR WI scope can include the following objectives:**
  - **Specify enhancements for reducing the impact to capacity and impact to individual UEs with respect to scheduling restrictions for FR1 and FR2 RRM measurements with measurement gaps and FR2 intra-frequency measurements w/o measurement gaps and FR1 intra-frequency measurements with mixed numerology, considering UE operational complexity and timeline. [RAN1, RAN2, RAN4].**
    - **Associated impact to existing requirements on RRM measurement requirements needs to be validated by RAN4.**
    - **If justified, specify the enhancements on measurement gap based on the identified enhancements by RAN1/RAN2 [RAN4]**
    - **If justified, specify the enhancements on scheduling restriction on the identified need by RAN1/RAN2 [RAN4]**
  - **Specify enhancements in providing UTO information for multiple CG configurations. [RAN1, RAN2]**
  - **Specify enhancements to align CSI/CQI measurements with XR traffic/periodicity. [RAN1]**
  - **Specify HARQ enhancements to provide additional information other than ACK/NACK regarding current transport block's reception from UE to gNB. [RAN1]**
  - **Specify enhancements that allow the UE to use jitter and/or delay information of XR traffics for UL transmission (e.g. optimization of timer-based operations based on the knowledge of buffer delay).**



