

The vivo logo is positioned in the top left corner of the slide. The background of the entire slide is a dark blue, abstract, fiber-optic-like pattern with glowing points and lines.

3GPP TSG RAN#102

RP-233057

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Views on Rel-19 XR evolution (RAN2-led)

Source: vivo

Document for: Discussion & Decision

Agenda Item: 9.1.2.2

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- Multi-flow/Multi-Modality
- Relaxed scheduling restriction/Measurement gaps
- UTO-UCI enhancements
- Rel-18 SI/WI leftover
 - PDU set handling
 - delay aware scheduling

Multi-flow/Multi-Modality

Scenario identification and modeling

Scenarios for multiple streams/flows:

1. Different PDU sets within a single RTP steam may have different QoS requirements, e.g. I frame and P/B frame may have different reliability requirement
 - The corresponding study happened in Rel-18 study item, but was not included in WI
2. An XR gaming service may serve multiple users and it requires approximately synchronous arrival of background data to all the Game Terminals.
3. SA1 Metaverse has studied the use cases about the immersive multi-modal VR application as right (e.g. Video, Vision, Haptic) and defined the related new requirement, as captured in TR 22.847;
 - R18 XR in RAN only focus on single-modal/stream communication, coordinated transmission for multiple streams/flows within a single UE or multiple UEs may bring better immersive user experience for the above scenarios.
 - Current user plane protocol dose not support coordinated handling for multiple streams/QoS flows, which may not guarantee the sync or dependency between stream/QoS flows. This will lead bad UE experience for above scenarios

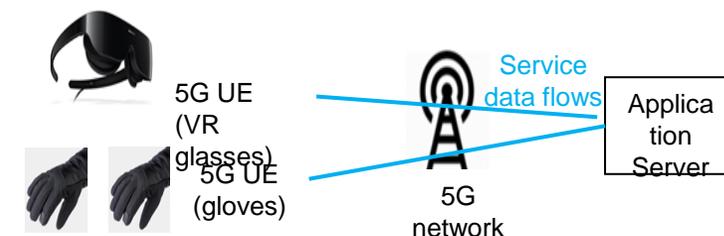


Figure 1. Immersive multi-modal VR application with multiple 5G UEs directly connected to 5G network

Potential Scope: Study and support the modeling and corresponding handling for multi-streams/QoS flows XR traffic (Coordination with SA/CT) [RAN2, RAN3]

1. Identify the scenarios on coordinated transmission for multiple streams/QoS flows, e.g.

- One UE with multiple streams/QoS flows (Partial Rel-18 leftover)
- Multiple UEs with multiple streams/QoS flows
- One stream to multiple QoS flows (Rel-18 Leftover)

2. Modelling and corresponding handling, e.g.

- Capacity enhancement on scheduling and discarding based on different protocol mapping on e.g. DRB(s), LCH(s)
- Coordination between QoS flows/UEs/DRBs/LCHs
- Synchronization, e.g. scheduling strategy enhancement for transmitting multiple-streams/ flows in a synchronization way

Relaxed scheduling restriction/Measurement gaps

- Use case: XR devices are usually operating in low mobility scenario, e.g., VR for game/video in indoor, AR in shopping mall, café, library, super market...
- Motivation
 - In current specification, UE needs to perform RRM measurement in the configured SMTCs or MGs
 - However, for XR UE, such scheduling restrictions would degrade the system capacity and user experience
 - XR UE, usually in low speed, is not necessary to do measurement in each MG
- Potential scope: Specify enhancements for reducing the impact to capacity and impact to individual UEs with respect to: [RAN1, RAN2, RAN4]
 - Dynamic relaxation/adaptation of scheduling restrictions
 - Dynamic relaxation/adaptation of Tx/Rx restriction due to measurement gaps

UTO-UCI enhancements

UL scheduling enhancement

- In R18, UTO-UCI is introduced for CG to dynamically indicate unused CG occasions for single CG configuration
 - Motivation
 - Further enhancement on UTO-UCI by extending UTO-UCI to multiple CG configurations
 - XR UL traffic may map to multiple CG configurations, e.g. pose/control or video/steam. And multiple CG configurations may be adopted for traffic with non-integer periodicity
 - It is beneficial for extending UTO-UCI to multiple CG configurations with reduction of overhead and power consumption, and flexibility for earlier indication of the unused transmission occasions
 - Finer granularity for UTO-UCI in case of CG PUSCH repetitions is beneficial for signalling reduction
 - UTO-UCI to indicate insufficient CG resources can be beneficial for latency reduction.
 - E.g., insufficient CG resources may be caused due to collision with DL, dynamically cancelled UL resources, or newly arrived UL packet
- Potential scope: Specify further enhancements to CG for capacity enhancement, including: [RAN1, RAN2]
 - Applying UTO-UCI to multiple CG configurations
 - Finer granularity for UTO-UCI, including for CG PUSCH repetitions
 - Extend UTO-UCI to address insufficient CG resources

Rel-18 SI/WI leftover

PDU set discard enh. and delay aware scheduling

- The following aspects were discussed in Rel-18 SA2 or RAN SI, but was not included in R18 WI due to lack of TU or motivation.
- Regarding discarding enhancements:
 - PDCP discard notification to the receiver, which was discussed in RAN2#124 meeting with large support.
 - There may be dependency between PDU sets in GoP, which is more motivated for multiple-modality flows
 - Coordination between flows is more popular
- Regarding scheduling enhancements:
 - Considering the latency requirement is more critical for XR service, delay aware scheduling could be considered, especially for multi-streams/multi-flows cases
 - Besides, scheduling enhancements based on the importance and PDU set have also been studied in Rel-18, which could be considered in Rel-19 if time is allowed

Potential scope: Specify the below PDU set handling [RAN2, RAN3]:

- PDCP discard notification to PDCP entity at receiver
- the PDU set handling on discard, considering e.g. inter-PDU set dependency, inter-flow coordination
- scheduling enhancements, considering delay, importance, PDU set, e.g.
 - LCP enhancements
 - Periodicity mismatch of UCI/CG
 - Dependence

Conclusions

Potential WID scope for Rel-19 XR enhancements

- Proposal: XR enhancement is introduced as a Rel-19 RAN2-led WI with study phase.
 - The detailed scope is listed as below.
 - The corresponding TU assignment per meeting is: RAN2[2TU], RAN1[1TU], RAN3[1TU], RAN4 RRM[0.5TU]

Multi-flow/Multi-Modality: Check in RAN#105 meeting.

- Study and support the modeling and corresponding handling for multi-streams/QoS flows XR traffic (Coordination with SA/CT) [RAN2, RAN3]
 - Identify the scenarios on coordinated transmission for multiple streams/QoS flows
 - Modelling and corresponding handling

Rel-18 SI/WI leftovers

- Specify the below PDU set handling [RAN2, RAN3]:
 - PDCP discard notification to PDCP entity at receiver
 - the PDU set handling on discard, considering e.g. inter-PDU set dependency, inter-flow coordination
 - the PDU set handling on scheduling enhancements, considering delay, importance, PDU set

Relaxed scheduling restriction/Measurement gaps

- Specify enhancements for reducing the impact to capacity and impact to individual UEs with respect to: [RAN1, RAN2, RAN4]
 - Dynamic relaxation/adaptation of scheduling restrictions
 - Dynamic relaxation/adaptation of Tx/Rx restriction due to measurement gaps

UTO-UCI enhancements

- Specify further enhancements to CG for capacity enhancement, including: [RAN1, RAN2]
 - Applying UTO-UCI to multiple CG configurations
 - Finer granularity for UTO-UCI, including for CG PUSCH repetitions
 - Extend UTO-UCI to address insufficient CG resources

THANK YOU.

谢谢。