3GPP TSG RAN Meeting #101

RP-231735

Bangalore, India, September 11-15, 2023

Google

Views on XR Evolution for Rel-19

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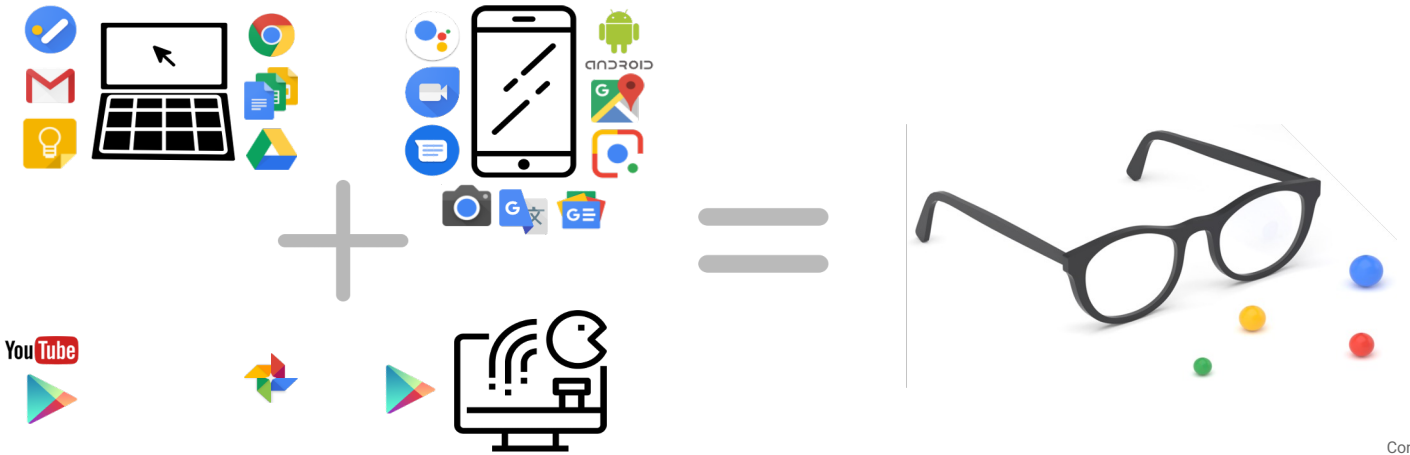
North Star Goal

- Give people superpowers by making information instantly and intuitively accessible.
- Full realization of immersive wearable AR is being able to mix relevant and compelling information and imagery with real world view in a glasses form factor
- Always available and minimal social cost.



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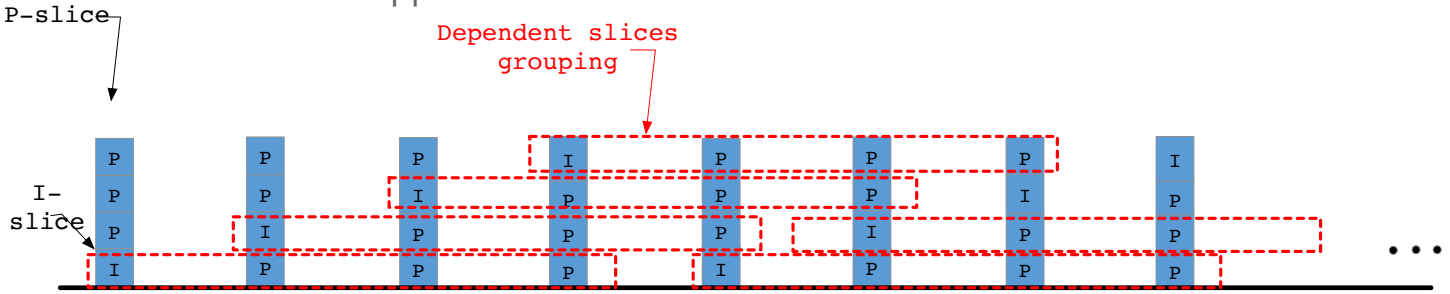
Further XR Awareness: Inter-PDU-Set dependency

Motivation:

- In order to optimize scheduling and discard, a deeper awareness of XR traffic characteristics at RAN is imperative.
- Inter-dependency among video frames/slices can be translated into inter-dependency between PDU-Sets, underscoring the importance of leveraging the awareness about this dependency within RAN.
- SA4/SA2 to identify essential dependency information that can be effectively communicated to RAN.

Proposal:

- **Leveraging PDU-Set dependency awareness:** The identified dependency is important to optimize discard and scheduling and curtailing error propagation across video frames/slices.
- **Signalling loss to Application or XR server:** In case of reference PDU-Set loss, the UE/RAN can efficiently communicate this event to the application or the XR server.



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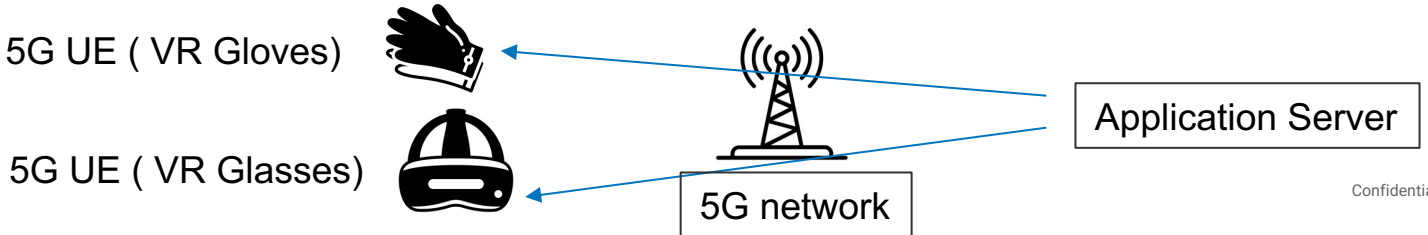
Further XR Awareness: Synchronization of multi-modal XR traffic

Motivation:

- An XR user requires synchronous arrival of different multi-modal flows, e.g. video, audio and haptic. The more asynchronous different modalities are, the less present and immersed users will feel.
- SA1 introduced in TS 22.261 the typical synchronization thresholds for immersive multi-modal VR applications.
- SA2 introduced a common ID for a multi-modal service that can be used to identify a group of QoS flows and map them to the same multi-modal service.
- Current user plane protocols do not support coordinated handling of multiple QoS flows.

Proposal

- Study and specify RAN enhancement for synchronization of QoS flows belonging to the same multi-modal XR service.



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XR traffic aware beam management

Motivation:

- XR traffic is sensitive to events that can disturb the transmission of UL AR or DL VR traffic. These events can include, beam switching, RRM measurements, CSI measurements and reporting, ...
- For beam switching, two cases can be distinguished:
  - **Case 1:** New beam is better than the old beam, and the old beam can still provide good performance to support the XR traffic
  - **Case 2:** New beam is better than the old beam, and the old beam cannot provide good performance to support the XR traffic

Proposal:

- **For Case 1: The UE can provide assistance information to the network for the deferral of the beam switching, e.g.,**
  - UE informs about its preference to stay on the ongoing beam or move to the new beam. The gNB takes the UE preference into account when switching the ongoing beam.
  - UE can report its action time for the indicated beam (UE reports when is the nearest time to apply the new beam without impact on XR traffic). The gNB takes the indicated action time into account when switching the ongoing beam.

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XR traffic aware beam management (cont'd)

Proposal:

- **For Case 2: Accelerate the beam switching, e.g.,**
  - Proactive UE beam measurement and reporting:
    - Beam indication signalling, and/or BFR response and/or RAR can trigger reception of AP-CSI-RS to speed up the procedure for identification of beam switching parameters
    - UE proactively measures and stores the beam switching parameters in beam measurement procedure and reports whether such parameters are identified
  - Faster UE measurement and reporting:
    - Use L1-RSRP for pathloss measurement for faster beam switching.
    - Early CSI report : UE can report the CQI or a simplified CQI for each beam.

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Other Possible XR Enhancements

- **CG Enhancement for XR**
  - Align CG periodicities with XR traffic periodicities
  - Indication of unused CG PUSCH occasions across multiple active CG configurations

- **Mobility Enhancement for XR**
  - CHO, DAPS and LTM enhancements for XR
  - DAPS to be extended to FR1 CA and for FR2

- **CSI Enhancement for XR**
  - Aligning CSI reporting with periodicities of XR traffic
  - CSI triggered by Pose/control information

- **XR-specific RRM enhancements**
  - Inter-frequency MGs to consider XR traffic scheduling.

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Thank you

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