vivo

3GPP TSG RAN Rel-18 workshop RWS-210164

Electronic Meeting, June 28 – July 2, 2021

Enhanced support for XR services in Rel-18

Source: vivo

Document for: Discussion & Decision

Agenda Item: 4.1

Contents

1. Use cases and challenges of XR
2. Potential enhancements for XR
3. Summary

Use cases of XR

- XR applications cover lots of daily life use cases including entertainment, office work, navigation, shopping and etc.

Virtual reality (VR)

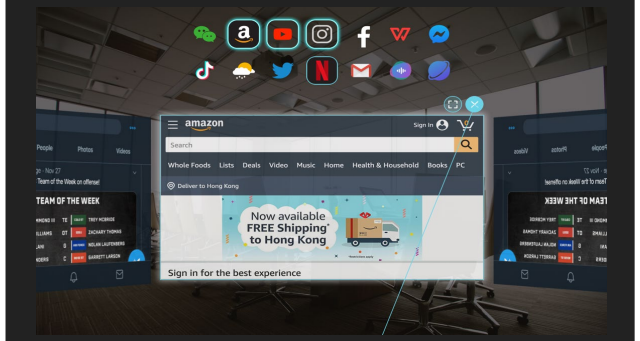
Completely immersive experience with no sense of real world

- 3D video with immersive experience
- Gaming with extraordinary 6DoF operation

Augmented reality (AR)

Interactive experience of a real-world environment with virtual objects

- Object recognition
- Navigation,
- Shopping assistance, etc.



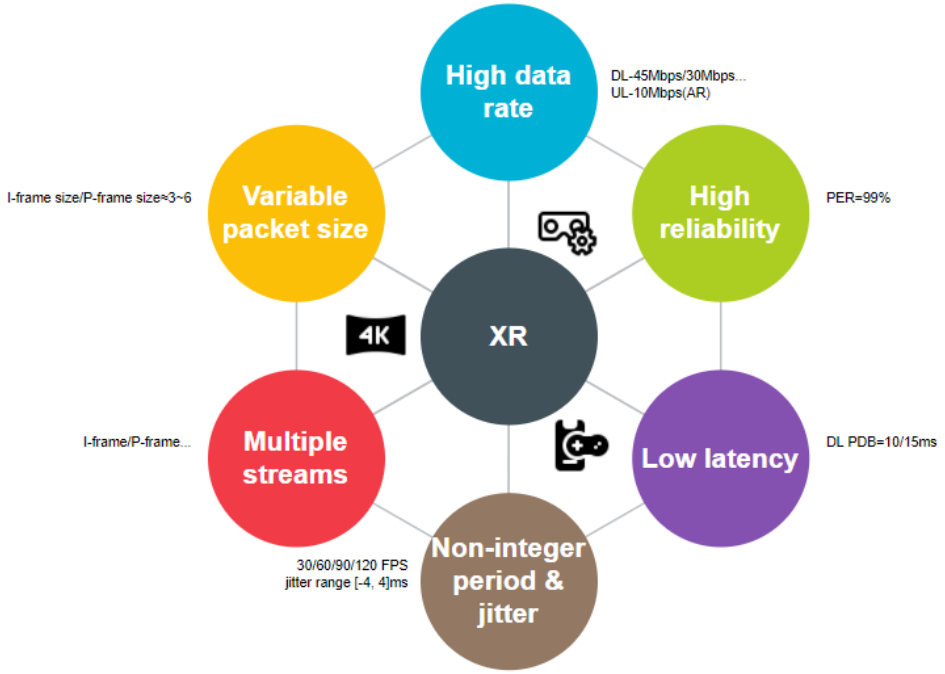
Mixed reality (MR)

Mixed interactive experience of real-world and virtual environment

- New collaboration mode
- Multi-task processing
- Holographic conference

Challenges of XR

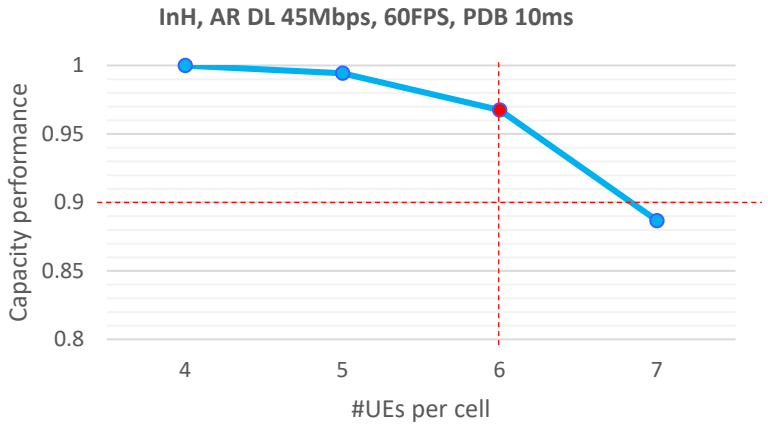
- XR applications bring great challenges for current 3GPP RAN.



Challenge 1:

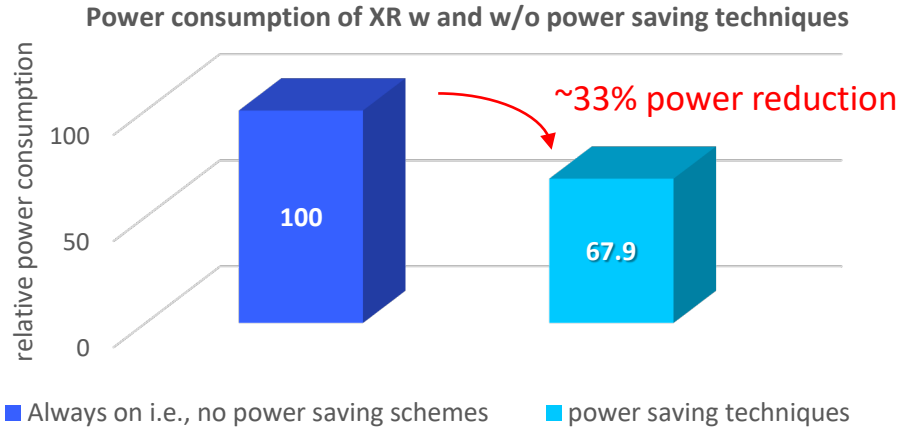
XR services demand high data-rate, high reliability, low latency, variable traffic characteristics and unpredictable jitter.

It is necessary to enhance NR RAN to better accommodate XR services.



Challenge 2:

System capacity of XR is limited due to large data volume.



Challenge 3:

Power consumption of XR devices for communication is critical due to limited battery size.

Potential enhancements for XR

vivo

Power saving enhancements

- Dynamic adaptive DRX behavior
- Tackling for jitter impact
- UL and DL alignment

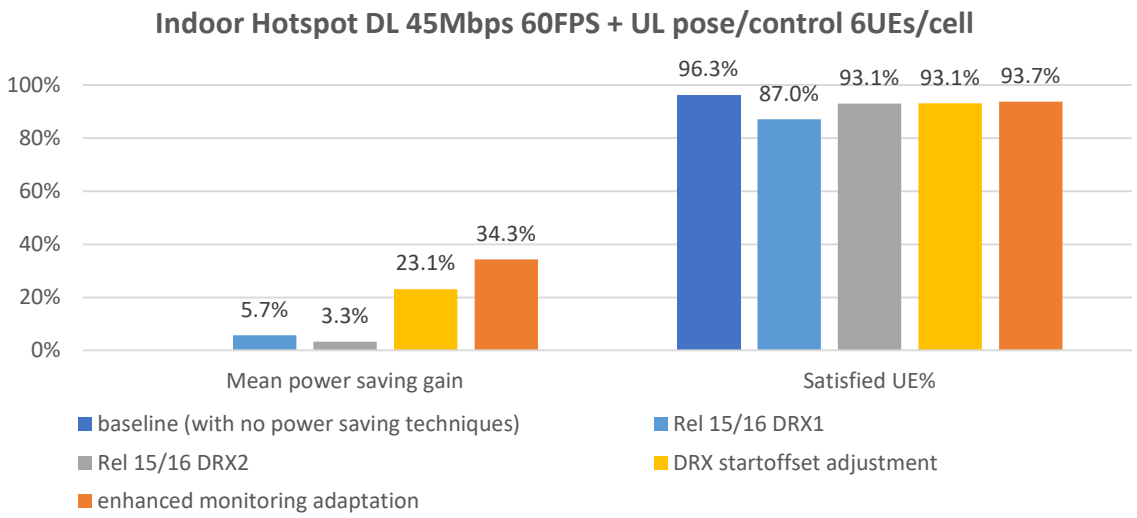
Capacity enhancements

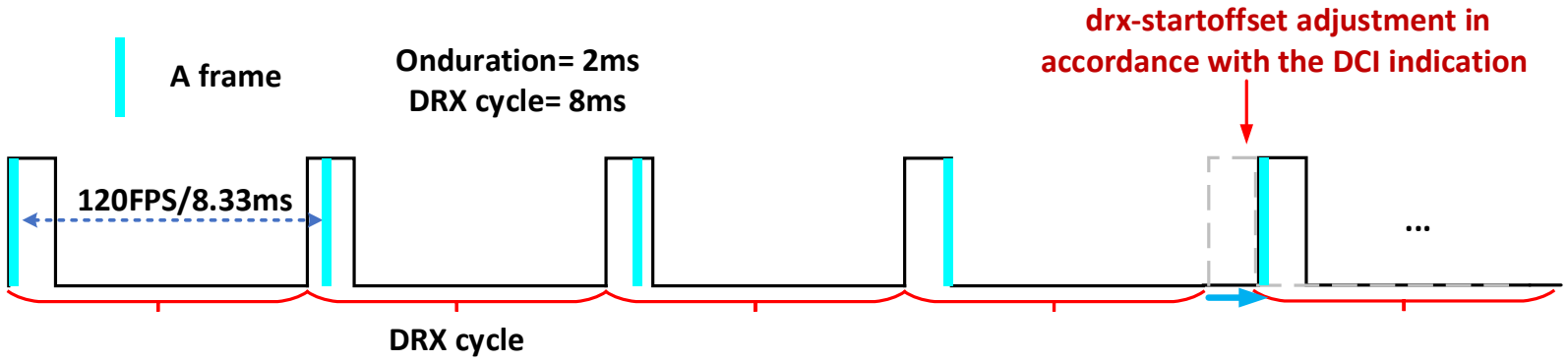
- Dynamic adaptive CG/SPS transmission
- UE assisted transmission
- Traffic aware transmission
- UL triggered DL reception
- CSI enhancement

Dynamic adaptive DRX behavior

- **Motivation:** Due to non-integer periodicity and variable packet size of XR traffic, the existing DRX behavior would potentially cause transmission delay and absorb the power saving benefit. Hence, it is unsuitable for XR traffic.

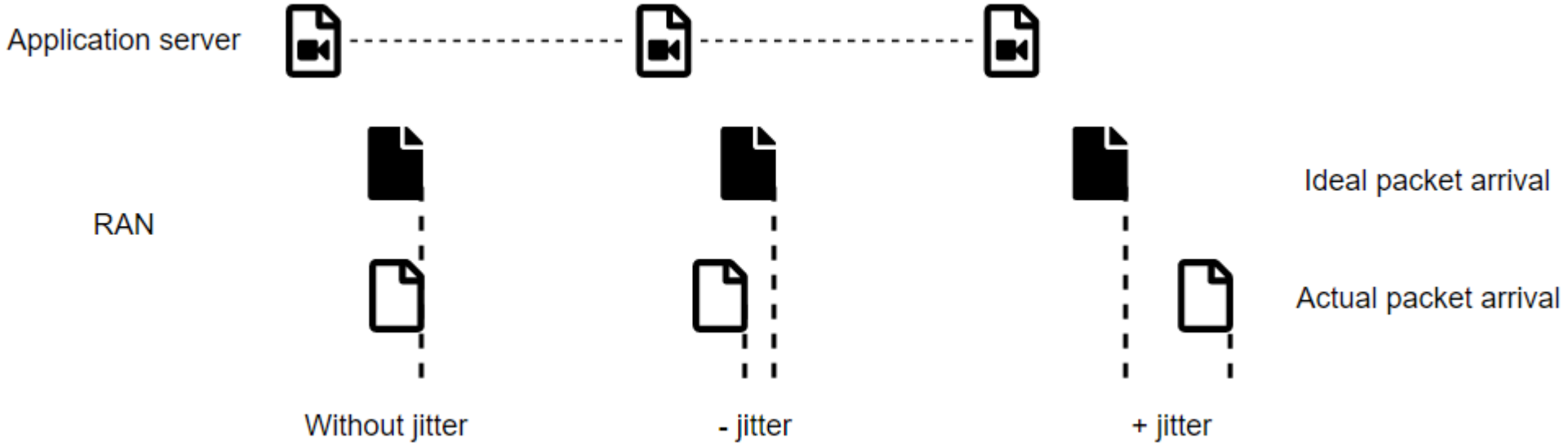
- **Proposal: Specify features to support dynamic adaptive DRX behavior, including dynamic DRX parameters adjustment, enhanced monitoring adaptation.**





Tackling for jitter impact

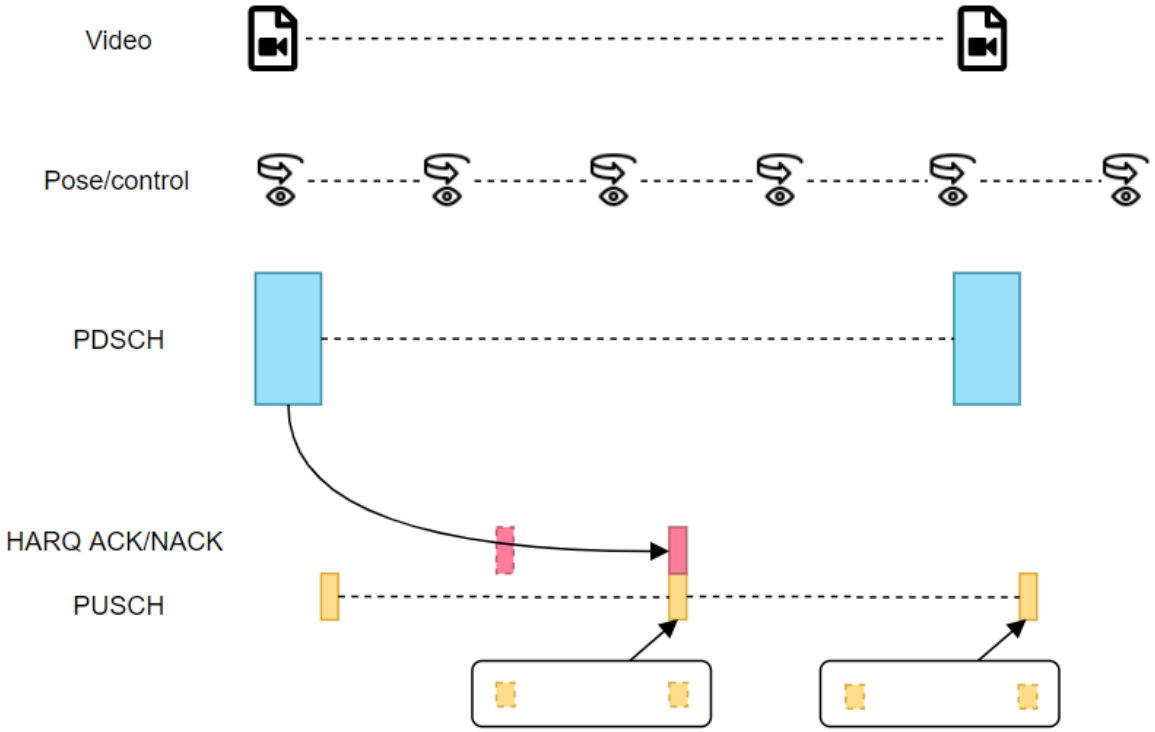
- **Motivation:** Due to jitter characteristic, the actual arrival time of a frame might be unpredictable, which can lead to increased transmission delay or packet loss. Existing method for jitter handling may increase power consumption. Enhanced solutions should be identified to tackle jitter impact with low UE power consumption, as an example, lower power wake-up signal can be considered.



- **Proposal:** **Study and specify features to tackle jitter impact.**

UL and DL alignment

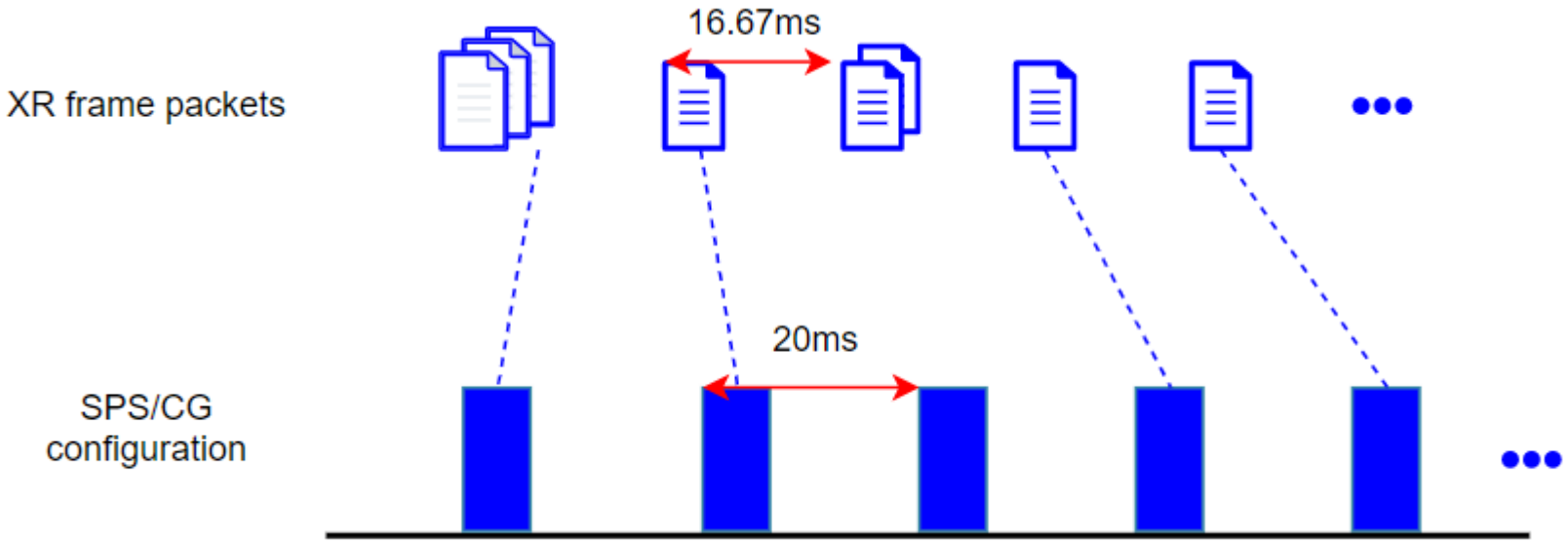
- **Motivation:** The traffic periodicity of UL pose/control is much smaller than DL video. Aligning HARQ-ACK and/or CSI reporting to UL pose/control transmission occasions, or bundling multiple samples of UL pose/control information into a single transmission would benefit power saving.



- **Proposal:** **Study, if needed, and specify features to support UL and DL alignment for power saving.**

Dynamic adaptive CG/SPS transmission

- **Motivation:** Currently CG(Configured Grant) and SPS(Semi-persistent Scheduling) transmission(s) with semi-statically configured integer periodicity and fixed TB size are not suitable for XR traffic with the characteristics of non-integer periodicity and variable packet size.

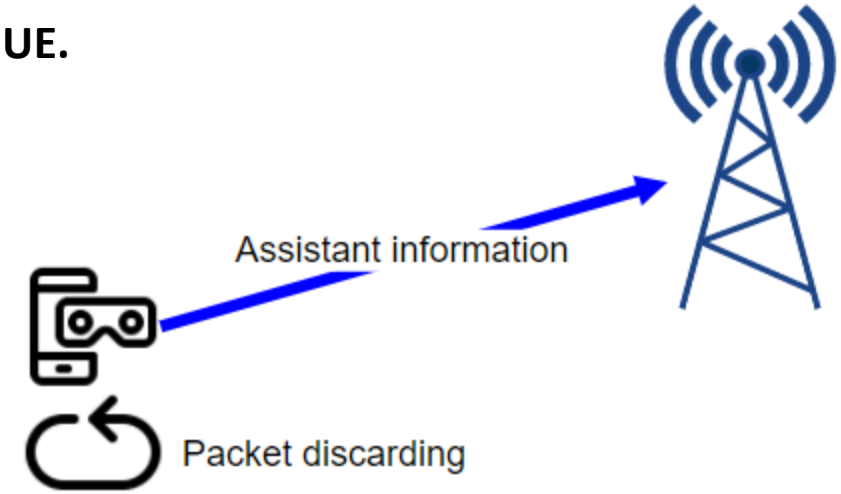


- **Proposal:** **Specify features to support dynamic adaptive CG and SPS transmissions.**

UE assisted transmission

vivo

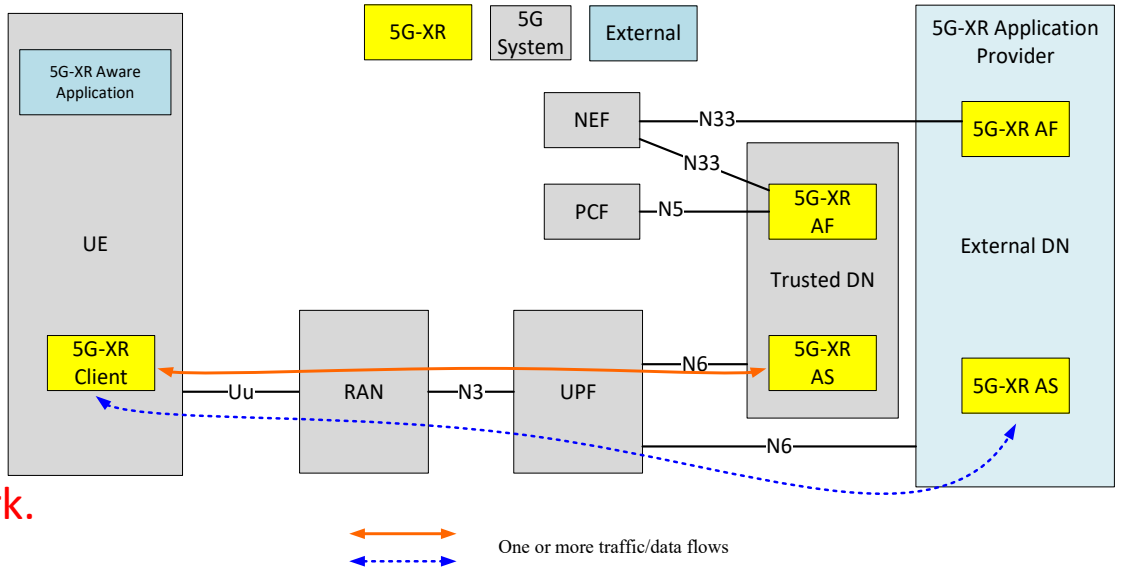
- **Motivations:**
  - UE reporting scheduling assistant information can be beneficial for efficient scheduling and resource utilization, thus improve capacity and user experience.
  - Transmission for packets with nearly exhausted delay budget would consume resources unnecessarily, leading to inefficient resource utilization.
- **Proposals:**
  - **Study and specify scheduling assistant information reported by UE.**
    - UL data burst related information e.g. data volume, arrival/waiting time, linkage among different data bursts
    - DL scheduling recommended information e.g. logical channel(s), PDB, data rate
  - **Study and specify adaptive packet discarding.**
    - Packet discarding when the corresponding PDB has been nearly exhausted



Traffic aware transmission

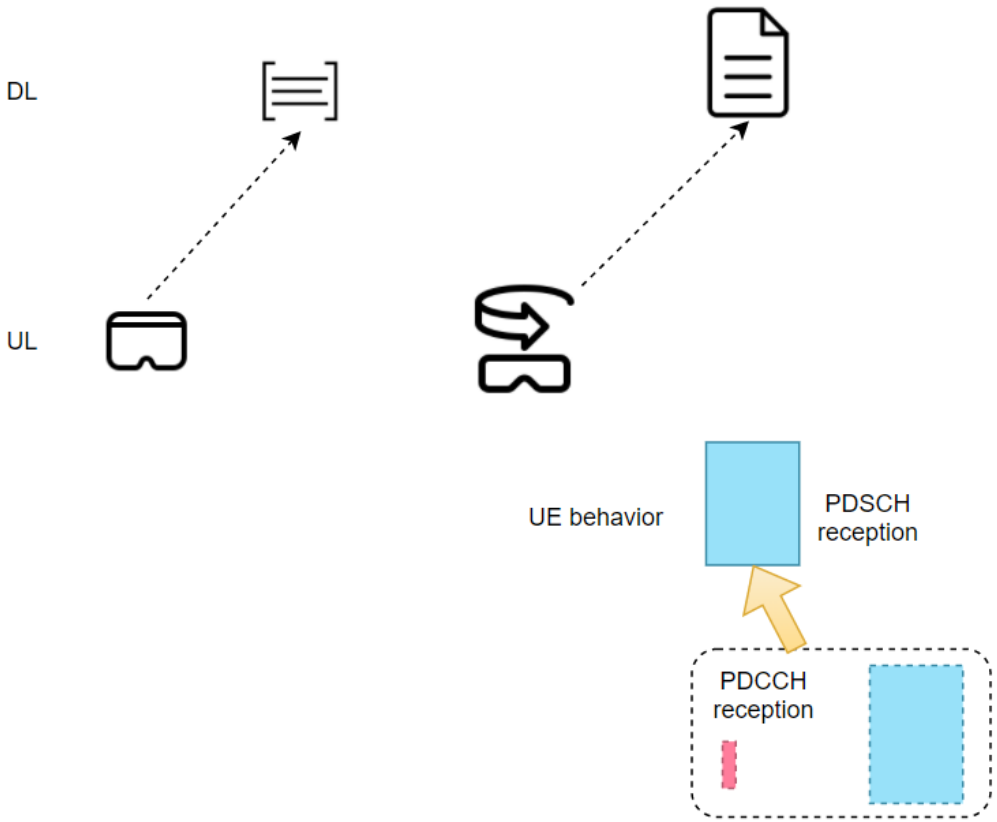
- **Motivation:** Different packets may have different QoS requirements. To handle packets according to specific requirements flexibly and efficiently, packets should be precisely identified, and properly grouped, processed and delivered, where a series of network nodes will be involved.

- **Proposal: Study and specify features to support traffic aware transmission.**
  - Identify frames, I/P frames, frames for basic/enhanced layers, etc. in RAN, e.g. DPI(Deep Packet Inspection)/DFI(Deep/Dynamic Flow Inspection) in SA.
  - Map packets with respective QoS requirements into different traffic flows.
  - Transfer them between different network nodes, potentially along with necessary interface information.
  - Enable more flexible and efficient scheduling and transmission for different traffic flows.
    - Video frame based processing, e.g. scheduling, transmission, and feedback
    - Prioritization and multiplexing between multiple flows
  - Note: SA2/CT1 should also be involved for related work.



UL triggered DL reception

- **Motivation:** If the pose or control information is sent in UL, a large amount of data could be delivered in DL subsequently. It is beneficial to reduce latency if RAN can support UL triggered DL reception behavior.



- **Proposal: Study and specify features to support UL triggered DL reception.**

CSI enhancement

- **Motivations:**
  - XR services require high data rate, high reliability and low latency, which may lead to limited system capacity.
  - Timely and accurate CSI report is beneficial to improve capacity and spectrum efficiency.

- **Proposal: Study enhanced CSI measurement and reporting to improve capacity.**
  - Timely CSI measurement and reporting
  - CSI computation reduction

Summary

Potential enhancements for XR		Lead
Power saving	Specify features to support **dynamic adaptive DRX** behavior, including dynamic DRX parameters adjustment, enhanced monitoring adaptation.	RAN1, RAN2
	Study and specify features to tackle **jitter** impact.	RAN1, RAN2
	Study, if needed, and specify features to support **UL and DL alignment** for power saving.	RAN1, RAN2
Capacity	Specify features to support **dynamic adaptive CG and SPS** transmissions.	RAN1, RAN2
	Study and specify scheduling **assistant information reporting** and **adaptive packet discarding**.	RAN2, RAN1
	Identify and specify features to support **traffic aware transmission**.	RAN2, RAN3
	Study and specify features to support **UL triggered DL reception**.	RAN1, RAN2
	Study **enhanced CSI** measurement and reporting to improve capacity.	RAN1, RAN2

vivo

THANK YOU.
谢谢。