Email discussion summary for [RAN-R18-WS-crossFunc-Rakuten] - Version 0.0.3
RAN

3GPP TSG RAN Rel-18 workshop RWS-210638

Electronic Meeting, June 28 - July 2, 2021

Agenda Item: 4.3

Source: Rakuten Mobile

Title: Email discussion summary for [RAN-R18-WS-crossFunc-Rakuten]

1 Introduction

This email discussion summary covers the Q&A of the following Rakuten documents:

RWS-210201 - XR/VR Enhancements

RWS-210203 - Fixed Wireless Access Enhancements

2 XR/VR Enhancements (RWS-210201)

Background

Scope of XR related Study in Rel-17 included following topics

Channel Modeling, Capacity, Mobility, Coverage and XR UE power consumption

We would like to suggest following enhancements to XR in Rel-17

2.1 Performance Scoring Matric

Based on the outcome of Rel-17 (RAN1), it is suggested to derive a single score based XR User experience performance like MOS for Audio or Video Call.

XR-Score (XRS) would encompass all performance indicators like PER, Delay, Jitter, Frame Rate (both I-frame and P-frame).

Feedback Form 1: Comments on 2.1

1 – CATT

Thanks for sharing the idea of NR enhancement for XR. The proposed area of data transmission with XR application awareness and UE power saving with dynamic DRX are quite interesting. The single XRS scoring system would be challenged since it is multi-dimensional measurements with human factor

taking into consideration. However, we believe the aspects of NR enhancements should be discussed and concluded in the working groups first during the XR study before further discussion of the scope of XR work item.

2 – HuaWei Technologies Co.

We think it is very important to have a specific metric to evaluate the XR experience for UEs and we have a similar proposal in RWS-210439. Do you think such a metric is a new KPI that can quantizie the impact of network transmision on the user experience, especially on the RAN side? We also see some value on studying such a new KPI for XR evaluation in RAN1 may not be enough to reflect E2E user experience, in addtion we also think SA2/SA4 may need to be involved to define such a KPI.

3 – vivo Communication Technology

Thanks for the contribution. Regarding performance scoring metric, MOS for Audio/video call is a numerical measure of the human-judged overall quality of an event or experience. However, user experience of XR may be affected by many aspects, e.g. jitter, latency, packet loss etc., how MOS-like score to accommodate these aspects?

4 – Apple Benelux B.V.

Are you suggesting to do "identification of IP Packets belonging to the same frame" in RAN or 5GC? How would this work for encrypted traffic?

5 – Rakuten Mobile

@CATT: Thank you for the comments and valuable feedback. We think there are reasons to have XR scoring metric defined to judge XR/VR performance.

@Huawei: Thank you for the comments. We agree that other WGs may need to be involved.

@Vivo: Good question; Indeed there are version of MOS R-Factor that accommodate Jitter,Latency,Packet loss,delay etc . R-Factor Model E ITU-T G.107.1.

@Apple Benelux B.V : Indeed this is challenging to achieve. However, doable with assistance from 5GC.

2.2 Application Awareness in RAN and vice versa

Further, QoS can be improved by identification of IP Packets belonging to the same frame. By having such information, network would be able to improve the user experience by decreasing frame error rate.

Similarly, application can be made aware about the RAN capabilities to adjust latency and resolution requirements (SA1, SA2 co-ordination required).

Feedback Form 2: Comments on 2.2

1 – Classon Consulting

[for FUTUREWEI]

We also think enhancements are needed in Rel-18 for application-oriented QoS control to support low/bounded latency high throughput transmission of XR data bursts. Please see RWS-210040 page 8 and NWM https://nwm-trial.etsi.org/#/documents/4751 .

2 – HuaWei Technologies Co. We think it is useful to have the network be aware some information from application layer, while on the other hand this should be an E2E mechanism which requires involvement of CN and 3GPP SA2/SA4, do you also think this should be an E2E mechanism?
3 – Rakuten Mobile **@Futurewei :** Thank you for sharing, we will indeed comment on it and support during workshop. **@Huawei Technologies Co., Ltd** : We do think it is E2E mechanism, however there is a possibility to define such mechanism with little interaction with 5GC.

2.3 Further RAN enhancements for XR

More enhancements can be considered to improve areas like UE Power Consumption (CDRX enhancements), Coverage enhancement , Network Capacity enhancements and Mobility enhancements.

Feedback Form 3: Comments on 2.3

1 – LG Electronics Inc. Thanks for the contribution. Q) In your paper (RWS-210201), you mentioned the application awareness in RAN and RAN awareness in application. From RAN perspective, do you intend to emphasize different aspects from the traffic awareness at RAN, or it is just a different naming? If the objects that need to be aware of mainly involves the traffic characteristics, then we assume they are the same.
2 – Rakuten Mobile @LG Electronics: Traffic Characteristics is one part of awareness. A close integration with RAN would result in more low level ”requirements” exchange (up to frame level).

2.4 XR Enhancements Summary

3 Fixed Wireless Access Enhancements (RWS-210203)

Motivation:

Wireless Network Operators can improve their share of home broadband market by providing comparative or better user experience as compared to Fixed line.

This is possible by further increasing the capability of FWA UE (CPE) and improving spectral efficiency.

3.1 Proposals:

We propose to support the following enhancements of FWA/High Capability CPE

1.Support maximum of 12/16 Layers and 3 /4 CWs. (12/16RX Ant)

2.Higher order modulation (DL): 4096-QAM (FR1) & 1024-QAM (FR2)

3.UL transmission with >4 ant/layers (codebook and non-codebook based)

4.Increased Tx Power for CPE (Power class 1: 29dBm)

5.OTA testing and 4-Layers for FR2

Feedback Form 4: Comments on FWA enhancement proposals

1 – Intel Corporation (UK) Ltd

<Intel>

Q1. According to RAN4, 4Tx UEs (even with 1 MIMO layer) are not supported from performance requirement perspective. Could you please clarify the urgency of this work considering status in RAN4?

Q2. For ”4-layer FR2” - does the proposal consider multi-beam simultaneous reception at the UE side (e.g. UE is equipped with 2 panels and makes simultaneous reception of signals from 1 or more TRPs)?

Q3. For 29dBm - UE PC1.5 with 29dBm is already defined in 3GPP for band n41. Is it proposed to extend the support for additional RF bands? If so, for which bands?

Q4. For higher order modulations - Recent RAN4 studies for FR2 DL 256QAM have shown that it very challenging to achieve big performance improvement over 64QAM for practical scenarios, especially given phase noise impacts. For DL 1024QAM operation in FR1 the operating SNR is very high. Is it expected that higher order modulation will give any meaningful improvement in real networks and is it possible to expect that UEs will experience very high SNR to give further improvement over existing modulations?

2 – Huawei Tech.(UK) Co.. Ltd

Thank you for the contribution. We think it is important to increase the spectral efficiency for FWA. Have you considered DMRS overhead reduction, which takes advantage of the very low Doppler in the FWA channel? DMRS overhead reduction is rather simple and can offer good capacity gains with low standard effort.

3 – Rakuten Mobile

<Intel>

Q1. According to RAN4, 4Tx UEs (even with 1 MIMO layer) are not supported from performance requirement perspective. Could you please clarify the urgency of this work considering status in RAN4?

Ans: We would like to start a study item to explore opportunities for high capabilities UE.

Q2. For ”4-layer FR2” - does the proposal consider multi-beam simultaneous reception at the UE side (e.g. UE is equipped with 2 panels and makes simultaneous reception of signals from 1 or more TRPs)?

Ans: This is correct understanding, we expect multiple TRP’s on the high capability CPE.

Q3. For 29dBm - UE PC1.5 with 29dBm is already defined in 3GPP for band n41. Is it proposed to extend the support for additional RF bands? If so, for which bands?

Ans: We want to extend this to n77,n78 and FR2 bands.

Q4. For higher order modulations - Recent RAN4 studies for FR2 DL 256QAM have shown that it very challenging to achieve big performance improvement over 64QAM for practical scenarios, especially given phase noise impacts. For DL 1024QAM operation in FR1 the operating SNR is very high. Is it expected

that higher order modulation will give any meaningful improvement in real networks and is it possible to expect that UEs will experience very high SNR to give further improvement over existing modulations?

Ans: This is indeed true, We would like RAN1 to explore opportunists to explore that may have less stringent requirements for EVM.

@Huawei:

Thank you for the contribution. We think it is important to increase the spectral efficiency for FWA. Have you considered DMRS overhead reduction, which takes advantage of the very low Doppler in the FWA channel? DMRS overhead reduction is rather simple and can offer good capacity gains with low standard effort.

Ans: This is a good proposal, we would like to support it for FWA during Rel-18.

4 Second Round

4.1 XR/VR Enhancements (RWS-210201)

4.1.1 Performance Scoring Matric

Based on the outcome of Rel-17 (RAN1), it is suggested to derive a single score based XR User experience performance like MOS for Audio or Video Call.

XR-Score (XRS) would encompass all performance indicators like PER, Delay, Jitter, Frame Rate (both I-frame and P-frame).

Feedback Form 5: Performance Scoring Matric

4.1.2 Application Awareness in RAN and vice versa

Further, QoS can be improved by identification of IP Packets belonging to the same frame. By having such information, network would be able to improve the user experience by decreasing frame error rate.

Similarly, application can be made aware about the RAN capabilities to adjust latency and resolution requirements (SA1, SA2 co-ordination required).

Feedback Form 6: Application Awareness in RAN and vice versa

4.1.3 Further RAN enhancements for XR

More enhancements can be considered to improve areas like UE Power Consumption (CDRX enhancements), Coverage enhancement , Network Capacity enhancements and Mobility enhancements.

Feedback Form 7: Further RAN enhancements for XR

4.1.4 XR Enhancements Summary

4.2 Fixed Wireless Access Enhancements (RWS-210203)

4.2.1 Proposals:

We propose to support the following enhancements of FWA/High Capability CPE

1.Support maximum of 12/16 Layers and 3 /4 CWs. (12/16RX Ant)

2.Higher order modulation (DL): 4096-QAM (FR1) & 1024-QAM (FR2)

3.UL transmission with >4 ant/layers (codebook and non-codebook based)

4.Increased Tx Power for CPE (Power class 1: 29dBm)

5.OTA testing and 4-Layers for FR2

Feedback Form 8: Comments: Fixed Wireless Access Enhancements

1 – Ericsson LM

Thank you for your contribution. What gains do you expect under typical conditions and what are your assumptions for the respective enhancements?
W r t higher order modulation, how narrow beams are needed to achieve the SNR, does beam management work and what EVM was assumed? What kind of receiver algorithm do you assume for FR2?

2 – Rakuten Mobile

1.Support maximum of 12/16 Layers and 3 /4 CWs. (12/16RX Ant) -> There is already interest from companies to support 8RX. We would like RAN1 to study even higher spec CPE with 12/16Rx.

2.DL): 4096-QAM (FR1) & 1024-QAM (FR2) 10 to 15% gain.

3. We believe that not only high SINR is required but RAN1 need to look into methods that can enable less stringent requirements for EVM.

4.2.2 Summary FWA:

5 Summary

5.1 XR/VR Enhancements Summary:

Multiple XR/VR Enhancements are proposed for Rel-18.

Questions were raised about motivation of having Performance Scoring Matric and feasibility of Application

Awareness.

In general, it is important for 3GPP to study and establish a single metric for XR/VR performance.

Application awareness in RAN can be developed via assistance from 5GC.

5.2 FWA Summary

Multiple companies raised questions about the feasibility and Motivation of having Higher Modulation order in FR1 and FR2.

Rakuten have decided not to promote higher modulation for FWA/CPE instead of downs cope to following enhancements.

Companies also questioned Motivation for higher number of layers; based on feedback from other companies, Rakuten would also downscope the maximum capabilities of FWA/CPE.

1.Support for 12 Rx Ant.

2.UL transmission with >4 ant/layers (codebook and non-codebook based)

3.Increased Tx Power for CPE (Power class 1: 29dBm)

4.OTA testing and 4-Layers for FR2