**3GPP TSG-CT WG1 Meeting #151C1-245236**

Hefei, CN; 14 – 18 October 2024 (revision of xx-yyxxxx)

3GPP TSG CT WG3 Meeting #137 C3-245056

Hefei, CN; 14 – 18 October 2024 (revision of xx-yyxxxx)

**3GPP TSG-CT WG4 Meeting #125C4-244210**

Hefei, CN; 14 – 18 October 2024 (revision of xx-yyxxxx)

**Source: Nokia**

**Title: New WID on CT aspects of Extended Reality and Media service (XRM) Phase 2**

**Document for: Approval**

**Agenda Item: 19.1.1**

3GPP™ Work Item Description

Information on Work Items can be found at <http://www.3gpp.org/Work-Items>
See also the [3GPP Working Procedures](http://www.3gpp.org/specifications-groups/working-procedures), article 39 and the TSG Working Methods in [3GPP TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm)

Title: New WID on CT aspects of Extended Reality and Media service (XRM) Phase 2

Acronym: XRM\_Ph2

Unique identifier: to be assigned

Potential target Release: Rel-19

# 1 Impacts

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Affects: | UICC apps | ME | AN | CN | Others (specify) |
| Yes |  | X |  | X |  |
| No | X |  | X |  | X |
| Don't know |  |  |  |  |  |

# 2 Classification of the Work Item and linked work items

## 2.1 Primary classification

### This work item is a …

|  |  |
| --- | --- |
|  | Study  |
|  | Normative – Stage 1 |
|  | Normative – Stage 2 |
| X | Normative – Stage 3 |
|  | Normative – Other\* |

**\* Other = e.g. testing**

## 2.2 Parent Work Item

|  |
| --- |
| Parent Work / Study Items  |
| Acronym | Working Group | Unique ID | Title (as in 3GPP Work Plan) |
| XRM\_Ph2 | SA2 | 1040032 | Extended Reality and Media service (XRM) Phase 2 |

### 2.3 Other related Work Items and dependencies

|  |
| --- |
| Other related Work /Study Items (if any) |
| Unique ID | Title | Nature of relationship |
| 980016 | (Stage 2 for XRM) Architecture Enhancements for XR (Extended Reality) and media service | SA2 Work Item on XRM Phase 1 in Rel-18 |
| 990006 | Architecture Enhancements for XR and media services | CT Work Item on XRM Phase 1 in Rel-18 |
| 1010032 | Study on Extended Reality and Media service (XRM) Phase 2 | SA2 Study Item on XRM Phase 2 in Rel-19. |
| 1030007 | Study of 5G Real-time Transport Protocol Configurations, Phase 2 | SA4 Study Item on RTP transport of XR metadata and enhancements of RTP header extensions for PDU set marking |

**Dependency on non-3GPP (draft) specification:**

N/A.

# 3 Justification

SA2 studied enhancements for the support of Extended Reality and Media service (XRM) under SID FS\_XRM\_Ph2. The "Study on Extended Reality and Media service (XRM) Phase 2" has agreed conclusions for most of the key issues in 3GPP TR 23.700-70. In addition, TSG-SA has approved a normative stage 2 work item (in SP-241385) on "Extended Reality and Media service (XRM) Phase 2" in TSG SA Meeting #105 (September 2024) to capture the required stage 2 requirements and work.

A new CT work item is required to specify the stage 3 protocol enhancements to implement the stage 2 requirements on XRM Phase 2.

# 4 Objective

The objective of this work is to specify the CT aspects of Extended XR (Extended Reality) and Media services (XRM) Phase 2 in CT WGs specifications based on the stage 2 normative work. The expected work per TSG CT working group includes:

For CT1:

1) For supporting additional packet filter for UL:

- Potential update the NAS procedures to support handling of the additional packet filter information (e.g., Synchronization Source (SSRC), Payload Type (PT) and RTP-M header) used to differentiate the media flow among multiple media flows that are multiplexed in the same transport connection in uplink.

- Potential update the NAS procedures on indicating the UE capability information for support of the additional packet filter information to the SMF.

2) For supporting L4S in trusted/untrusted non-3GPP access:

- Potential enhancement for support of ECN mark handling in wireline access (W-AGF, 5G-RG) in UL.

- Potential enhancement for support of dedicated 5G QoS Flow(s) and non-3GPP access resources (e.g. IPsec Child SAs) for carrying L4S enabled IP traffic.

- Support for the indication of ECN marking for L4S for a corresponding QoS Flow(s). This can be applied to proper mapping between L4S-enabled QoS rule(s) and L4S-enabled W-UP resource(s).

- Potential support of 5G-RG in DL for the IP-in-IP tunnel behaviour of copying ECN bits between the outer and inner headers as per IETF RFC 6040.

3) For supporting PDU set handling in trusted/untrusted non-3GPP access:

- Potential description update to explain PDU set handling for non-3GPP accesses.

- Potential impact on wireline access (W-AGF, 5G-RG) to receive the UL Protocol Description associated with the QoS rule over N1 from SMF to identify PDU Sets.

For CT3:

1) Support of PDU set based QoS handling enhancement:

- Potential impacts on the NEF and PCF for QoS Notification control without Alternative QoS profile (AQP) when the QoS profile contains UL and/or DL PSDB and/or PSER: the fulfilment or not to determine QoS notification if the PDU Set QoS handling is applied in the corresponding direction.

- Potential impacts on the NEF, PCF for alternative QoS profile which may contain the UL and/or DL PDU Set QoS Parameters (i.e. UL PSDB, DL PSDB, UL PSER and/or DL PSER).

- Potential impact on the SMF to support PDU set based handling in the QoS profile and/or Alternative QoS Profiles.

* Potential impacts on NEF, PCF, and SMF to support signaling the content ratio per QoS flow.

2) Enhancement to support QoS control and PDU Set identification for XR traffic stream with e2e encryption:

- Potential impacts on the NEF and PCF to support Protocol Metadata extension and its corresponding format for MoQ traffic.

 - Potential impacts on the NEF and PCF to provide the requirement for MoQ.

- Potential impacts on the PCF to instruct SMF to identify PDU set information for MoQ traffic.

- Potential impacts on the NEF to support UDP connect between UPF and AS

- Potential impacts on the PCF to include the indication of UDP tunnel establishment and AS address

- Impacts to define the metadata information in user plane over N6

3) Enhancement for traffic detection and QoS flow mapping for multiplexed data flows

- Potential impacts on the NEF to support additional packet filtering information from the AF through the "AF session with required QoS" API.

- Potential impacts on the PCF to support additional packet filtering information.

- Potential impacts on the PCF to generate PCC rules under consideration of UE capability for the additional packet filtering and the QoS requirements provided by AF.

4) QoS Handling when Traffic Characteristics Change Dynamically

- Potential impacts on the NEF to support to mark the burst size, time to next burst based on the input received from the AF.

- Potential impacts on the PCF to mark the burst size per flow, time to next burst.

- Potential impact on NEF, PCF, SMF for the filter information to be able to detect the "expedited transfer indication" in N6 metadata for QoS flow mapping.

5) Enhancement for XR related network information exposure

- Potential impact on the NEF enhancement to handle the provisioning, forwarding, and usage of GBR QoS flow’s available data rate information provided by the AF

- Potential impact on the NEF enhancement to expose GBR QoS flow’s available data rate through NEF event exposure mechanisms.

- Potential impact on PCF for monitoring and reporting of GBR QoS flow available data rates.

- Potential impact on the SMF to support the monitoring of GBR QoS flow available data rate.

- Exposure of rate limiting information for non-GBR QoS flow:

- Potential impact on the NEF enhancement to expose non-GBR QoS flow rate limiting information through NEF event exposure mechanisms.

- Potential impact on the PCF to determine the rate Limiting information per non-GBR QoS flow and provide it to the NEF/AF.

6) Support for PDU Set in non-3GPP access:

- Potential impacts on PCF to support the use of PDU set based QoSin policy decisions for non-3GPP access networks.

For CT4:

1) Enhancement for PDU Set based QoS Handling:

- New indicators over N16/N16a to indicate support of DL PDU Set Information marking and for anchor SMF performing DL PDU Set Information marking based on information from NG-RAN.

- Enhancement over N16/N16a to support (QoS profile and/or) Alternative QoS Profiles including/excluding UL and/or DL PDU Set QoS parameters (i.e. UL PSDB, DL PSDB, UL PSER and/or DL PSER) during PDU session establishment/modification procedures, based on the PDU Set Based Handling Support Indication from NG-RAN and/or the QoS requirements from the AF.

- Potential enhancement to the PDU Set QoS parameters and to N16/N16a to provide content ratio to the NG-RAN when establishing/modifying a QoS flow.

2) Enhancement to support QoS control and PDU Set identification for XR traffic stream with e2e encryption:

- Enhancements over N4 to support Media over QUIC (MoQ), Proxy-UDP-in-HTTP/3+QUIC-Aware Proxying and UDP Options, for XRM metadata delivery for XR traffic stream with e2e encryption.

3) Enhancement for PDU Set based DSCP marking over N3/N9:

- Enhancements over N4 for DSCP marking over N3/N9 in the transport network based on PDU Set Importance (i.e. to enable differentiated handling of PDU Sets within QoS Flow).

4) QoS handling enhancement for XRM services:

- Enhancements over N4 to enable the SMF to provide additional packet filter information in PDR to the UPF for traffic detection and QoS Flow mapping, used to differentiate the different media flows among multiple multiplexed media flows that share the same UDP/IP 5-tuple and that cannot be differentiated without the additional packet filter information.

- Potential enhancement over N16/N16a to indicate to the anchor SMF the support by the UE of the additional packet filter information and to enable the anchor SMF to provide additional packet filter in QoS rules to the UE.

5) Dynamic traffic characteristics update:

- Enhancements over N4 to enable the SMF to instruct the UPF to identity and mark the Burst size in GTP-U packets sent to the NG-RAN.

- Enhancements over N4 to enable the SMF to instruct the UPF to identity and mark the Time to Next Burst in GTP-U packets sent to the NG-RAN.

- Potential enhancement to the Protocol Description information for the determination of the Time to Next Burst and/or Burst size.

- Enhancements over N4 to support data boosting triggered by AF (i.e. detecting the "expediting transfer indication" in N6 metadata and applying better QoS).

6) Further enhancement to support XR based on non-3GPP access:

- Potential description updates for N16/N16a for the support of L4S for untrusted/trusted non-3GPP access networks and wireline access.

7) Extend PDU Set QoS Control mechanisms to non-3GPP access networks:

- Potential description updates for N16/N16a for the support of PDU Set and DSCP marking based on PDU Set Importance for non-3GPP access.

8) Extend exposure framework for XRM related information:

- Potential enhancements over N4 for instructing the UPF to report the available data rate for a GBR QoS flow.

- Enhancements to the Nupf\_EventExposure service to report available data rate.

- Potential enhancements over N16/N16a to support instructing the RAN to report the available data rate.

# 5 Expected Output and Time scale

|  |
| --- |
| New specifications {One line per specification. Create/delete lines as needed} |
| Type  | TS/TR number | Title | For info at TSG#  | For approval at TSG# | Rapporteur |
| N/A |  |  |  |  |  |

|  |
| --- |
| Impacted existing TS/TR {One line per specification. Create/delete lines as needed} |
| TS/TR No. | Description of change  | Target completion plenary# | Remarks |
| 24.501 | * Potential update on the NAS procedures to support handling of the Additional Packet Filter used to differentiate the media flow among multiple media flows that share the same legacy packet filter in uplink.
* Potential update on the details on sharing the UE capability information for support of the additional new type of packet filters to the SMF.
* Potential enhancement for support of ECN mark for L4S handling in UE/5G-RG in UL.
* Potential enhancement for support of dedicated 5G QoS Flow(s) and non-3GPP access resources (e.g. IPsec Child SAs) are used for carrying L4S enabled IP traffic.
* Potential support of UE in DL for the IP-in-IP tunnel behaviour of copying ECN bits between outer and inner headers as per IETF RFC 6040.
* Potential update to support PDU set handling for non-3GPP accesses.
* Potential update to remove “PDU set handling does not apply for non-3GPP access.” from 4.7.3 of TS 24.501
 | TSG CT#109 (September 2025) | CT1 responsibility |
| 24.502 | * Potential enhancement for support of ECN mark for L4S handling in 5G-RG in UL.
* Potential support of UE in DL for the IP-in-IP tunnel behaviour of copying ECN bits between outer and inner headers as per IETF RFC 6040.
* Potential update to support PDU set handling for non-3GPP accesses.
* Potential 5G-RG impact to receive the UL Protocol Description associated with the QoS rule over N1 from SMF to identify PDU Sets.
 | TSG CT#109 (September 2025) | CT1 responsibility |
| 29.122 | Potential extension for 1. The PDU Set QoS handling.
2. Protocol Metadata extension including encrypted traffic
3. Burst size determination
4. Handling of the provisioning, forwarding, and usage of GBR QoS flow data rate information provided by the AF
5. QoS requirements for media flows and additional packet filters
6. providing the requirement for MoQ
7. including the indication of UDP tunnel establishment and AS address
8. detecting the "expedited transfer indication" in N6 metadata for QoS flow mapping.
 | TSG CT#109 (September 2025) | CT3 responsibility |
| 29.508 | Potential extension of Nsmf\_EventExposure service to support of 5GS information exposure for extended XR/media enhancements | TSG CT#109 (September 2025) | CT3 responsibility |
| 29.512 | Potential updates of PCF services to support XRM servicesPotential extension for 1. The PDU Set QoS handling.
2. Non-3GPP access networks policy
3. Mark the burst size per flow.
4. Monitoring and reporting of GBR QoS flow available data rates
5. Protocol Metadata extension including encrypted traffic
6. providing the requirement for MoQ
7. including the indication of UDP tunnel establishment and AS address
8. detecting the "expedited transfer indication" in N6 metadata for QoS flow mapping.
 | TSG CT#109 (September 2025) | CT3 responsibility |
| 29.514 | Potential extend the Npcf\_PolicyAuthorization service to support XRM services for 1. The PDU Set QoS handling.
2. Protocol Metadata extension including encrypted traffic
3. Mark the burst size per flow.
4. Monitoring and reporting of GBR QoS flow available data rates
5. providing the requirement for MoQ
6. including the indication of UDP tunnel establishment and AS address
7. detecting the "expedited transfer indication" in N6 metadata for QoS flow mapping.
 | TSG CT#109 (September 2025) | CT3 responsibility |
| 29.522 | Extend NEF northbound to support AF requirements provisioning. Potential extension for 1. The PDU Set QoS handling.
2. Protocol Metadata extension including encrypted traffic
3. Burst size determination
4. Handling of the provisioning, forwarding, and usage of GBR QoS flow data rate information provided by the AF
5. QoS requirements for media flows and additional packet filters
6. providing the requirement for MoQ
7. including the indication of UDP tunnel establishment and AS address
8. detecting the "expedited transfer indication" in N6 metadata for QoS flow mapping.
 | TSG CT#109 (September 2025) | CT3 responsibility |
| 29.513 | Potential updates of PCC signalling flows to support extended XRM services | TSG CT#109 (September 2025) | CT3 responsibility |
| 29.561 |  Impacts to define the metadata information in user plane over N6 | .TSG CT#109 (September 2025) | CT3 responsibility |
| 29.244 | As described in clause 4:* Enhancement to support QoS control and PDU Set identification for XR traffic stream with e2e encryption.
* Enhancement for PDU Set based DSCP marking over N3/N9.
* Additional packet filter information in PDR for QoS handling enhancement for XRM services.
* Enhancements for dynamic traffic characteristics update (Burst size, Time to Next Burst, data boosting).
* Potential enhancements for instructing the UPF to report the available data rate for a GBR QoS flow.
 | TSG CT#109 (September 2025) | CT4 responsibility |
| 29.502 | As described in clause 4:* Enhancements over N16/N16a for PDU Set based QoS handling (new indicators, PDU Set QoS parameters in Alternative QoS Profile, content ratio).
* Potential enhancement over N16/N16a for QoS handling enhancement for XRM services (additional packet filter).
* Potential description updates for N16/N16a to support XR on non-3GPP access (L4S).
* Potential description updates for N16/N16a to support PDU Set QoS Control mechanisms to non-3GPP access networks.
* Potential enhancement over N16/N16a for available data rate reporting by the RAN.
 | TSG CT#109 (September 2025) | CT4 responsibility |
| 29.564 | Enhancements to the Nupf\_EventExposure service to report available data rate. | TSG CT#109 (September 2025) | CT4 responsibility |
| 29.571 | As described in clause 4:* Potential enhancement to the PDU Set QoS parameters to provide content ratio.
* Potential enhancement to the Protocol Description for the determination of the Time to Next Burst and/or Burst size.
 | TSG CT#109 (September 2025) | CT4 responsibility |

# 6 Work item Rapporteur(s)

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# 7 Work item leadership

CT3

# 8 Aspects that involve other WGs

SA4 for RTP transport of XR metadata and enhancements of RTP header extensions aspects

# 9 Supporting Individual Members

|  |
| --- |
| Supporting IM name |
| Nokia |
| Interdigital |
| China Mobile |
| Verizon |
| vivo |
| T-Mobile USA |
| ZTE |