**Title: Informal feedback on companies' position in xRM\_ph2 (TR 23.700-70 v0.4.0)**

# 1 Overall description

TR 23.700-70 v0.4.0 contains 30 solutions covering all KIs except for KI#8. Some solutions contain various options as well like (e.g., using control plane vs. user plane, UPF detection vs. info sending from AS, etc).

To optimize (or consolidate) the input paper for future meetings; companies are requested to provide feedback regarding the solution(s) and/or agreeable principles for various KIs, currently documented in TR 23.700-70 v0.4.0. It also helps to determine the solutions that have majority interest and/or result in significant concerns.

We ask each company to give your view towards this question (one so far). This is not an evaluation for each of the solutions that are currently documented. It is mainly to seek your view on how each key issue can be addressed, based on the input form TR 23.700 so far. Then we will seek a volunteer for each key issue to drive summarizing the input.

**Q1. How should this problem be resolved?**

E.g., list the principles you think are the right approach to resolve this key issue and point to the subclause of TR 23.700-70

E.g., none of the principle suggested defined so far is good enough and why.

**Key Issue #1**

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| Key area | Input from Company - ABC |
| (1a): Active discard by RAN due to FEC (all FEC related Solutions - #1, #2, #3, #4, #21) | [Nokia] – prefer approach where FEC ratio parameter is provided via the CP rather than a UP approach where a FEC ratio parameter is included as PDU Set Information. Note SA4 has a new study item 5G\_RTP\_Ph2 as part of Rel 19. Any new RTP HE extensions, including studying FEC in RTP HE will be part of this SID. This will have to wait for the next 9-12 months for completion  [Tencent] prefer to provide FEC ratio parameter via CP.  [Lenovo] In general, either confirmed by SA4 or indicated by Application that FEC based discard is allowed, NG-RAN can perform active discard. Whether NG-RAN performs active discard when congestion happens or based on implementation, should be discussed by RAN WG.  Meta:   1. RAN should only be allowed to discard PDU of a PDU set in abnormal condition like congestions. 2. During congestion, RAN may discard PDU up to the ratio given by UPF (option 2 of Sol#21). Ratio is dynamically assigned per PDU set by AS during encoding, and this ratio is indicated via inband (N6). 3. The ratio of PDUs that are discarded by RAN needs to feedback to AS via inband in uplink direction. This allows the AS (sender) to combine the RTCP feedback from device and the RAN feedback for bandwidth and FEC allocation. |
| (1b): Alternative PDU Set QoS handling (Sol #6, #7, #19) | [Nokia] – Prefer solution #19 - allow alt-QoS profiles with PDU Set QoS parameters, to enable switching between profiles based on PDU Set information (e.g. media type, or QoS/Alt-QoS Indicator) provided as PDU Set Information to the RAN, and notification of profile switching to the AF. This switch can happen when there is a transition in the media transition over a period of time.  [LGE] - Solution #19, Support the Alternative QoS profile to include alternative PDU Set QoS parameter Set(s) with PSDB and PSER and QoS notification via control plane  [Tencent] Solution #6 and19# are aligned in some aspects ie.g. media type information and also the idea to extend AQP to include PSDB and PSER. Prefer to capture common principles from solutions.  [Lenovo] PDU set QoS parameters should be included in the alternative QoS profile, which enables NG-RAN to perform PDU set based handling based on the alternative PDU set QoS. |
| (1c): Other PDU set and QoS related topics (Sol #5, #8, #20, #22, #23) | [Nokia] – Solution 8 is a must to provide consistent PDU Set handling between AF and UPF. Also, Solution #23 with PDU Set Group and cross-PDU Set correlation identifier should be considered  [LGE] - Solution #23, Agreable for the PDU Set correlation to be taken into account for the RAN discarding decision during congestion.  Meta:  Supports Solution #23: PDU set discard based on PDU sets correlation info from AS/AF. We propose to keep the solution simple by only considering I and P-frame relationship in this release. The use of B-frame with this solution is Out of scope. |
| Do you plan to submit a new solution for this KI? | [Nokia] – Yes - discard notification contribution S2-2401170 was not opened at S2-161  [Tencent] No  [Lenovo] Yes  Meta: YES- for feedback signal from RAN to AS (application) on active discarded ratio. |
| What is your preferred conclusion (e.g. solution#, agreeable principles) for this KI? | [Nokia] – Support: 1 – FEC ratio in CP is sent to the RAN, 2 – Solution #19 - Alt-QoS with PDU Set QoS Params and profile switching based on new PDU Set Information (in GTP-U HE from UPF) 3 – AF providing info. on PDU Set Types and PSI mapping to UPF (solution 8) 4 – Discard notification optimization.  [LGE] - RAN2 specified discarding PDU Set in the congestion based on the PDU Set Importance in TS 38.300 and SA4 specified the guidance for PDU Set marking in TS 26.522 with the PDU set importance considering PDU set dependencies. Prefer solutions having less impact on legacy.  [Tencent]We propose to focus on resolving the ENs and update solutions in Apirl meeting and make evaluation and conclusion in May meeting.  [Lenovo]. For 1a, either FEC ratio or source/repair marker should be supported, e.g., solution#21. and For 1b, the basic principle is to add PDU set QoS parameters into alternative QoS profile, e.g., solution#7.  Meta: See Meta input above. |

Key Issue #2

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| (2): end-to-end encrypted XRM (Sol #9, #10, #11, #12, #24, #25, #26, #27) | Nokia preferred approach is based on UDP-Connect from UE to AS. Nokia views that MoQ is not mature enough IETF and is too early for 3GPP. Nokia will not support non-secure solution such as UDP-option, ~~PDU set information in GTP-U headers~~.  Sol #9, and Sol#10 are based on MoQ. IETF work is not complete and matured enough.  Sol#11 complex solution on correlating QUIC and XRM metadata deviating from IETF protocol  Sol#12. Better align with IETF/industry solution for security aspect.  Sol#24: UDP-Connect (between UPF and AS) is feasible solution. Nokia will support.  Sol#25: Adding PDU Set information over GTP-U (between AS and UPF) requires AS to support GTP-u and IPsec which may not take place in actual deployments.  Sol#26 UDP-Connect (UPF and AS) is feasible solution. Nokia will support  Sol#27: UDP-option is not secure.  Lenovo] Solution#9 and 10 are based on MoQ scheme, which enables PSA UPF to acquire PDU set information via metadata as the MoQ relay. The MoQ is still in early stages in IETF and it is not clear yet whether MoQ is a suitable method to convey XR related media. 3GPP SA4 should also provide feedback on the feasibility of using MoQ for XR services. An LS should be sent to SA4 for feedback.  Solution 11,12 and 27 are based on RTP over QUIC, which enables PSA UPF to acquire PDU set information via metadata/OFC contained in UDP-option. We see disadvantages with this option as any proxy in the path over N6 between the Application Server and the UPF could change/tamper with PDU set information which would impact handling of PDU-set in the RAN. An also should also be sent to SA4 on the feasibility of using UDP-Options to include PDU-set information as well as to SA3 to identify any security impacts.  Solution#24, 25 and 26 are based on supporting a tunneled connection over N6 between th ePSA UPF and AS. Solutions 24 and 26 propose leveraging the Connect-UDP option where PDU set information is included within HTTP Datagrams whereas Solution#26 propose including PDU-set information within GTP-U header.  Meta:  We support the solution principles in Sol#26, or with Sol#24 with “6.24.3.2/Using Connect-UDP”.  In addition, SMF may be configured with the information to establish “Connect-UPF” from UPF to AS proxy without receiving PCC rules from PCF. This is same principle for PDU set QoS in 23.501 … “the SMF may be configured to support PDU Set based QoS Handling without receiving PCC rules from a PCF.” |
| Do you plan to submit a new solution for this KI? | [Nokia] we will submit a solution with UDP-connect starting from the UE because the UE is more suitable (than UPF) to know that an XRM app has started and a related UDP Connect to the AS is needed (The UPF cannot easily detect an XRM app due to traffic being ciphered)  [Nokia] we are also planning to resubmit the IPSec based solution as an alternative.  [Tencent] No |
| What is your preferred conclusion (e.g. solution#, agreeable principles) for this KI? | [Nokia] IETF MASQUE based tunnelling (UDP-connect) based solution started from the UE (see above). Metadata defined in 3GPP (SA4)  [Nokia] No MoQ based solutions as they are less generic and also less mature in IETF  [Lenovo] Lenovo preferred option is to introduce a tunnelled connection over N6 between PSA UPF and AS, which enables PSA UPF to obtain PDU set information either via HTTP datagrams or GTP-U header, e.g., solution#24-26  Meta: In general, we see the need to define a generic framework from this KI2 to carry additional information from UPF to AS and/or AS to UPF as defined is some solutions related to KI1/KI4/KI5/KI9. See response to these related KIs. |

Key Issue #3

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| (3): Leverage PDU Set QoS information for DSCP marking over N3/N9 in the transport network (Sol #13, #27) | [Nokia] DSCP marking is done per PDU Set based on the PDU Set Importance either as determined by UPF or based on SMF configuration.  [Lenovo] It makes sense that PSA UPF marks DSCP values based on PSI value of the PDU set. |
| Do you plan to submit a new solution for this KI? | [Nokia] No new solution  [Tencent] No  [Lenovo] Yes. If active discard by RAN due to FEC is considered, PSA UPF may mark different DSCP values based on source/repair packet even for the same PSI value. |
| What is your preferred conclusion (e.g. solution#, agreeable principles) for this KI? | **[Nokia] Solution #13 Multiple DSCP markings per QoS Flow.** DSCP marking is done per PDU Set based on the PDU Set Importance either as determined by UPF or based on SMF configuration.  Do not prefer DSCP marking based on EoDB (drop of the packet with EoDB may also happen, so it is unnecessary to assign a dedicated DSCP value. Also assigning DSCP for a dedicated PDU brings complexity in UPF).  [LGE] - Solution#13, The legacy 5GS considers 5QI, Priority Level and optionally the ARP priority level for the transport level marking. The enhancement in addition to consider the PDU Set Importance based on the mapping information between PSI and DSCP value is sufficient.  [Tencent] Sol#13 and Sol#27 are not completely exclusive. Solution#27 is more related to how encrypted XRM traffic can be mapped. We suggest to resolve ENs for both two solutions in April meeting and make a decsion in May meeting.  [Lenovo] The basic principle is that PSA UPF marks DSCP value based on PSI, e.g., solution 13. New solution should also be considered in case of active discard by RAN due to FEC |

Key Issue #4

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| (4): Traffic detection and QoS flow mapping for multiplexed data flows (Sol #8, #9, #12, #14, #15, #27, #28, #29) | [Nokia] - Support Solution #29 – including extension of traffic flow description information from AF and expansion of PDR PDI to detect unencrypted multiplexed sub-streams so they can be mapped to different QoS flows. Support mapping of PDUs within a media sub-stream that do not belong to PDU Sets (lone PDUs) to a separate QoS flow if requested by the AF. Also support encrypted multiplexed data flows by extending the flow description information so that the AF can target its QoS requirements to a specific encrypted sub-stream.  The above involves extending the PDR’s Packet Detection Information and Packet Filter Set to include Application Layer fields such as the first byte of UDP, SSRC, Payload Type.  [Lenovo] There’re mainly two types of traffic detection and QoS flow mapping for multiplexed data flows. Solution#28 proposes to perform QoS flow mapping based on existing parameters (e.g., PSI). Other solutions introduce new parameters for QoS flow mapping, e.g., track ID, OFC, stream info, media type, QSC-ID etc.  Solutions proposing the AF to include protocol details (e.g. payload type, SSRC info) would require feedback from SA4 to clarify whether XR application server implementation would not alter these parameters regularly.  Solutions proposing to leverage UDP-Options field would require feedback from SA4 and SA3 as also clarified in solutions for KI#2.  It is also necessary to evaluation whether solutions described in KI#2 could also be applicable for this Key Issue as well.  Meta:  The principle of carrying the “priority” signal as part of the metadata over N6 (based on Solution #27: Differentiated Handling for Transporting Encrypted XRM traffics Using Metadata over N6).  However, the transport mechanism to carry the “priority” signal can be defined as part of the solution selection for KI#2 (via Sol#26, #24/Connect-UDP.) |
| Do you plan to submit a new solution for this KI? | [Nokia] - No. Solution updates should be sufficient.  [Tencent] No, plan to update solution and resolve ENs |
| What is your preferred conclusion (e.g. solution#, agreeable principles) for this KI? | [Nokia] - Solution #29 - For (S)RTP based traffic: Support extension of traffic flow description information from AF to PCF and onwards and Packet Detection Information (PDI) in PDRs and UE QoS rules so that individual sub-streams and other protocols (RTCP, data channel, ...) multiplexed into the same transport layer traffic flow can be detected and mapped to dedicated QoS flows as required. Each QoS flow can be provided either “ordinary” or PDU Set based QoS handling. Protocol Description (PD) and PDU Set detection logic can also be used to map lone PDUs in a sub-stream to a separate QoS flowif requested by the AF. (Update to Sol#29)  For end-to-end encrypted traffic (e.g., QUIC connections): Support identification of individual sub-streams so that they can be mapped to dedicated QoS flows similarly to the (S)RTP case. (Update to Sol#29)  [LGE] - Solution #29, The AF to provide QoS requirements for the identified protocol/stream and the 5GS to identify multiplexed stream for transport protocols with existing fields are agreeable. The AF/AS providing additional information that is dependent to specific transport protocol or providing PSI is not preferred.  [Tencent] We plan to update and complete Sol#15 in April meeting to resolve ENs. Meanwhile, we see that principle of Sol#15 is close to Sol#29. There are still quite a lot of open issues remain for quite several solutions captured. We propose to focus on resolving ENs in April meeting and carry out evaluation in May meeting.  [Lenovo] If the XR media are not fully e2e encrypted. It is preferred that flow mapping based on existing parameters (e.g., PSI) shall be considered (solution28). Besides, stream ID may be considered for QUIC transmission.  Meta: See Meta input above |

Key Issue #5

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| (5): QoS handling with dynamic traffic characteristics (Sol #12, #16, #30) | [Nokia]  [Lenovo] Solution 12 is more focused on solving the objectives of KI#2 but also proposes to include traffic characteristics information within UDP-Options. The use of UDP-Option requires feedback from SA4.  Solution 16, focuses on instructing the UE to use a higher QoS in the uplink so as to transmit high burst size packets.  Solution 30 focuses on the AF notifying the core network of dynamic traffic characteristics change and configuring the UPF to detect dynamic change in traffic characteristics.  Meta: The principle to allow AS to indicate dynamic upgrade of QoS handling over N6 (see Solution #16: AS based trigger of data boost handling with reflective QoS).  The transport mechanism to carry the “boost” signal can be defined as part of the solution selection for KI#2 (via Sol#26, #24/Connect-UDP.) |
| Do you plan to submit a new solution for this KI? | [Nokia] - Yes, resubmit the solution which sends in-band the Time To Next Burst  [Tencent] No  Lenovo] Yes |
| What is your preferred conclusion (e.g. solution#, agreeable principles) for this KI? | [Nokia] A basic principle for this KI is that solutions do not violate QoS/Policy architecture mechanisms and especially authorization.  [Tencent] Sol#12 and Sol#16 proposals are not exclusive and we think both can be considered for normative work.  [Lenovo] The solution propose should allow the RAN to be notified of traffic characteristics change before the PDU-set with high burst size/file size is received at the RAN. The network should be aware if dynamic change of traffic characteristic will occur in an XR session so as the UPF could detect a change. Another approach is that the AF indicates the traffic characteristic dynamic change via either UP or CP. New RTP extension header may be introduced for traffic characteristic dynamic change. This requires feedback from SA4.  Meta: See Meta input above |

Key Issue #6

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| (6): L4S for non-3GPP access networks and intermediate 5GS nodes (Sol #17) | [Nokia] Support Solution #17 with a mechanism ensuring that the ECN markings are forwarded between the inner and outer IP layers, . |
| Do you plan to submit a new solution for this KI? | [Nokia] No. Solution updates should be sufficient.  [Tencent] No  [Lenovo] No |
| What is your preferred conclusion (e.g. solution#, agreeable principles) for this KI? | [Nokia] - Solution #17 with proper updates as described above.  [Tencent]Solution#17 looks fine to us and we suggest to work further on it during April meeting to resolve ENs firstly. Pre-evaluation or interim conclusion can also be made in this meeting if no new solutions submitted for “beauty contest” and the ENs are resolved. |

Key Issue #7

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| (7): Support for PDU Set in non-3GPP access (Sol #18) | [Nokia] Support Solution #18. |
| Do you plan to submit a new solution for this KI? | [Nokia] - No.  [Tencent] No |
| What is your preferred conclusion (e.g. solution#, agreeable principles) for this KI? | [Nokia] Solution #18  [Tencent]Solution#18 looks fine to us and we suggest to work further on it during April meeting e.g. see if any updates are needed. Pre-evaluation and interim concusion can also be made in this meeting if no new solutions submitted for “beauty contest”.  [Lenovo] The standard impacts of PDU set based handling for NG-RAN can be reused for non-3GPP. Besides, leverage PDU Set QoS information for DSCP marking over IPsec Child SA should also be considered for the untrusted/trusted non-3GPP access. |

Key Issue #8

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| (8): Enhancement for UE with the tethered devices (Sol #--) |  |
| Do you plan to submit a new solution for this KI? | [Nokia] yes, need to take into account NAT in the UE applying on tethered traffic (IP address indicated by the device in e.g. sdp may not be accurate if mechanisms like STUN /ICE are not used)  NAT in UPF may also need to be considered  [Tencent] Yes,we have a proposal submitted in Jan meeting but not handled. Plan to update it and submit to April meeting.  [Lenovo] Yes. New solution proposes Tethered policy for UE to map non-3GPP QoS parameters into 3GPP QoS parameters, which assists UE to identify and map UL traffic from tethered devices to the corresponding QoS flow and DRB. |
| What is your preferred conclusion (e.g. solution#, agreeable principles) for this KI? | [Nokia] The normative work will address issues with “stand-alone” tethered devices i.e. application is running in a tethered device and UE act as an IP GW/relay for traffic to/from device (the UE is unaware of XRM application). For this purpose the normative work will at least address issues related with NAT between the tethered device and the XRM AS;  [Tencent] Not sure if it is the right time to decide preferred solution as no solution is agreed yet. Propose to discuss & capture solutions in April meeting and make decsion in May.  [Lenovo] The basic principle is that UE should be configured to identify and map UL traffic from tethered devices to the corresponding QoS flow and DRB |

Key Issue #9

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| (9): Enhancement for XR related network information exposure (Sol #19) | [Nokia] – See plan for new solutions below.  [LGE] - Solution#19, The AF subscription for the Alternative PDU Set QoS notification and the exposure via control plane is agreeable.  Meta:   1. We believe any solution for exposure of event for an application can only be scaled if that information is sent via inband (N6). 2. Therefore, we support the principle of Sol#19, section “6.19.3.2, Procedures of network information exposure via user plane”. 3. In this sense, Information exposure via user plane should be a generic feature that can be re-used to expose other information from network (UPF) to AS. For example, this framework can be reused to send rate throttling information from network back to AS for initial codec selection (as described in this paper – not opened [S2-2402980](https://www.3gpp.org/ftp/tsg_sa/WG2_Arch/TSGS2_161_Athens_2024-02/Docs/S2-2402980.zip)). |
| Do you plan to submit a new solution for this KI? | [Nokia] - Yes, one or more contributions (solutions) on exposure of PDU Set Loss Rate (PSLR) measurements and PDU Set Delay (PSD) measurements.  [Tencent] No  Meta: will resubmit a version of this paper ([S2-2402980](https://www.3gpp.org/ftp/tsg_sa/WG2_Arch/TSGS2_161_Athens_2024-02/Docs/S2-2402980.zip)) with the main idea to allow network information to be exposed to AS via inband. |
| What is your preferred conclusion (e.g. solution#, agreeable principles) for this KI? | [Nokia] – Exposure of PSD and PSLR measurements to the AF. Exposure from RAN via the UPF should be justified especially if control plane actions are required.  [Tencent] Right now there is only 0.5 solution captured which in general ok to us and there is EN left to be resolved as part of Sol#19. We are open to more solutions for this Key Issue and also expect to reslove the EN in as early as possible.  Meta:   1. Exposure from network to AS is done via inband (N6) 2. Protocol to be used to carry information over N6 is based on solution to be decided for KI#2. In other words, solution for KI#2 should be extensible to allow this type of information in addition to conveying the PDU set information from AS. |