3GPP TSG-SA WG2#162 S2-240xxxx

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**Source: Qualcomm Incorporated**

**Title: Company feedback and way forward for FS\_XRM\_Ph2 KI#1 Application Layer FEC (AL-FEC) awareness at RAN**

**Document for: Discussion/Agreement**

**Agenda Item: 19.3**

**Work Item / Release: FS\_XRM\_Ph2 / Rel-19**

*Abstract of the contribution: This paper summarizes feedback provided by interested companies and proposes a way forward for FS\_XRM\_Ph2 KI#1 Application Layer FEC (AL-FEC) awareness at RAN at SA2#162.*

# 1. Summary of company feedback

In [1], sixteen (16) companies provided feedback on AL-FEC awareness at RAN. One (1) company commented that they plan to submit a new solution for the upcoming meeting.

NOTE: Since the feedback on new solutions applied to KI#1 overall, it was not fully clear to which sub-aspect of KI#1 companies are planning to submit solutions.

The following feedback was provided:

- Enabling AL-FEC awareness at RAN using control- or user-plane:

- Companies leaning towards a control-plane approach: Nokia, Tencent, China Telecom, CATT

- Companies leaning towards a use-plane approach: InterDigital, OPPO, vivo

- Companies that appeared to be fine with either approach or both approaches: Lenovo, Qualcomm, Xiaomi

- Open technical issues that were raised as part of the company feedback:

**-** Multiple companies indicated different views on which AL-FEC mechanisms (e.g., maximum-distance separable schemes like RaptorQ or Reed-Solomon codes, FlexFEC, etc.) need to be supported; some suggest liaising with SA4 on this.

- One company challenged whether RAN can reliably determine whether/which PDUs of a PDU Set have been successfully transferred to the UE when using an unacknowledged mode RLC bearer. Another company commented on latency issues if RLC acknowledged mode were to be used.

- One company commented that NG-RAN should only be allowed to discard obsolete AL-FEC PDUs during congestion. Others commented that the question when to discard should be discussed by RAN working groups.

- One company commented that solutions contradict the paradigm of how applications on the Internet are expected to behave, i.e., react to packet losses by reducing the rate, and that solutions lack proof of benefit.

- On the question whether feedback from NG-RAN to AF/AS is needed, the following feedback was provided:

- One company commented that the ratio of PDUs that are discarded by RAN needs to be fed back to AS in the user-plane to enable the AS to combine discard information with RTCP feedback.

- Another company commented that SA2 needs to check with SA4 to see if the application needs to distinguish RAN's intentionally dropped FEC packets from congestion related drops. The same company suggested that when packets are discarded due to congestion, feedback to the application would not be necessary (beyond what is already available in Rel-18).

- In this context, another company commented how RAN can easily make use of these information without impact on the application layer needs further collaboration with SA4/RAN2.

- One company commented that discarding based on AL-FEC information in UL direction should not be supported since the redundancy information may still be needed to cover packet loss on N6.

- Readiness to conclude on AL\_FEC awareness at RAN at SA2#162:

- Multiple companies pointed out that Editor's Notes should be addressed and that feedback from other WGs should be requested before conclusion.

# 2. Way forward

Based on the feedback provided, this paper proposes the following way forward for the upcoming SA2#162 meeting:

- pCRs should aim at resolving Editor's notes that can be addressed by SA2 (i.e., without feedback from other groups).

- Send an LSs to SA4 on at least the following aspects:

- Feedback on use of AL-FEC by XR applications and, related to that, which AL-FEC schemes (e.g., maximum-distance separable schemes like RaptorQ or Reed-Solomon, FlexFEC, etc.) to support.

- Whether static or dynamic redundancy ratios (or both) need to be supported.

- Whether an application needs to distinguish RAN's intentionally dropped FEC packets from (other) congestion related drops and if the application needs to react by reducing its send-rate to individual packet loss.

- Send an LSs to RAN2 on at least the following aspects:

- Whether and how NG-RAN can determine whether a given PDU was successfully delivered over an unacknowledged mode data bearer.

- Whether AL-FEC information can be used for discarding only during congestion or also for other scenarios.

NOTE: Other aspects may be added to the LSs during the meeting.

# 3. References

[1] Informal feedback on companies' position on XRM\_Ph2. Available at: https://www.3gpp.org/ftp/tsg\_sa/WG2\_Arch/TSGS2\_162\_Changsha\_2024-04/INBOX/DRAFTS/R19%20FS\_XRM\_Ph2/S2-240xxxx-FS\_XRM\_QA\_r22.docx