**3GPP TSG-RAN2 Meeting #115-e R2-210xxxx**

**e-Meeting, 16th-27th August 2021**

**Source: email discussion Rapporteur (ZTE Corporation)**

**Title: [Post114-e][505][SData] RRC/MAC modeling and RRC running CR (ZTE): Modeling discussion**

**Agenda item:** **8.6.1**

**Document for:** **Discussion and Decision**

# Introduction

This document contains summary of email discussion to collect comments on the RRC/MAC modelling for SDT:

* [Post114-e][505][SData] RRC/MAC modeling and RRC running CR (ZTE)

**Scope:**

Phase 1: Modeling discussion for RRC/MAC Review running stage 2 CR

i. Feedback on existing modelling used by the running CRs

ii. Identify any issues with the current modelling and any potential changes

iii. Updated running CRs can be provided based on the outcome of this discussion

Phase 2: Review running RRC CR after some agreements from phase 1

**Intended outcome:** CR ready to be endorsed in RAN2115-e

**Deadline for company comments on the modelling issues:** Monday 26th July

**Discussion summary**

* TBD

# Discussion

For the triggering of SDT, a number of conditions were agreed in the previous meetings. We need to agree how to split the specification of these conditions between MAC and RRC. In the latest RRC (R2-2105927) and MAC (R2-2105032) running CRs submitted to RAN2#114-e, the following split has been implemented:

RRC determines whether the pending UL data/NAS message(s) are mapped to SDT RB(s).

MAC performs all other checks

* Data volume threshold check
* SDT RSRP threshold check
* Determining whether to use RA-SDT or CG-SDT
  + CG resource validation
  + RA resource validation

The overall modelling between MAC and RRC hance is as depicted in Figure below (reproduced from R2-2105847):



Figure : Overall modelling of MAC and RRC for determining SDT vs non-SDT (see R2-2105847)

So, according to the above modelling, once RRC determines that all the pending UL data/NAS message(s) are mapped to SDT RB(s), the remaining checks to determine the initial SDT vs non-SDT selection are performed in MAC. The first question is to check whether there are any issues with the above modelling.

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| According to the latest RRC and MAC running CRs, **once RRC determines that all the pending UL data/NAS message(s) are mapped to SDT RB(s), the remaining checks to determine the initial SDT vs non-SDT selection are performed in MAC**.  Q1: Is the above split between RRC and MAC acceptable?   * In the comments, companies can highlight any issues and provide any alternative split between RRC and MAC explaining the reasons for the change. | |
| Company | Comments on the modelling and any identified issues and provide alternative split between RRC/MAC (if there is an issue) |
| CATT | We have identified the following issues:  1. If Data volume calculation is calculated at MAC, how to estimate the data volume before transmission if PDCP/RLC MAC header are taken into account.  2. CG validation will check whether TAT is running. If TAT is defined in RRC, there will be layer interactions. This is not yet captured in the figure above.  3. When SDT condition is not satisfied, MAC should indicate to RRC. Then, RRC performs legacy RRC Resume procedure. It is not reasonable for MAC directly goes to legacy Resume procedure. Whether the legacy resume procedure is initiated or not should be decided by RRC.  4. The agreement from RAN2#112 is that “For both RACH and CG based solutions, upon initiating RESUME procedure for SDT initiation (i.e. for first SDT transmission), the UE shall re-establish at least the SDT PDCP entities and resume the SDT DRBs that are configured for small data transmission (along with the SRB1). FFS for non-SDT DRBs.”  However the flow chart above has not captured this correctly in our understanding. According to the flow chart above, MAC indicates RRC whether SDT is selected after SDT selection performed at MAC layer. Afterward, RRC will perform SDT initiation procedure including resuming SDT RBs, applying PDCP/RLC/MAC configurations and etc.  After selection of SDT, MAC should inidicate RRC and CG-SDT/RA-SDT should be performed after resuming all SDT RBs by RRC..  We have modified the figure as below to capture point 3 and 4 above. |
| Intel | In our understanding, RRC or MAC cannot determine whether there is UL data in suspended RBs. Moreover, RRC or MAC cannot differentiate whether the UL data belongs or not to SDT RBs or the amount of data on SDT RB waiting to be conveyed. If this level of operations were specified, SDAP layer is the best to determine them while UE is in RRC\_INACTIVE.  However it seemed that companies may be OK not to specify how UE detects that there is SDT or non-SDT data in the RBs, or determines if SDT operation can be used (as otherwise, lower layers of UE would need to have knowledge of data belonging to suspended RBs). Therefore all these details could be left up to UE implementation. If so, MAC specification would not introduce any new checks for SDT operation and RRC specification would only define conditions that UE needs to meet in order to start the SDT operation (but defining them as general description of the condition instead than actual new checks from modeling perspective). On summary, UE is allowed to initiate SDT procedure when the list of the different conditions captured in RRC are met.  RAN2 may need to have further considerations on this depending on CT1’s input. |
| Google | The split is acceptable to us. We think if all arriving data are mapped to SDT, RRC should indicate SDT data arrival event to MAC. The MAC should select SDT or non-SDT and indicate its selection back to RRC. If MAC selects SDT, RRC submits a resume request to MAC and starts the new T319 timer. When MAC receives data from RRC, MAC initiates its selected procedure. In Fig. 1, if MAC selects legacy resume procedure, it should indicate to RRC. |
| NEC | We understand thatone of the intention of data volume calculation performed at MAC layer is to rely on exisiting PDCP/RLC data volume calculation, however, we have the we have some concerns:   1. Since the radio bearers configured with SDT are not resumed when perform data volume calculation, we are not sure if the new data can be seen as PDCP SDUs, such that the existing PDCP data volume can be used for to calculated the new data. At RAN2 #114-e, there is some discussion on the modeling of suspended DRBs at the main session [AT114-e][002][NR15] User Plane, it seems companies may have different understanding on the behavior of suspended radio bearer. 2. There may be stored data at PDCP and RLC entities (e.g. the data which is not transmissted before UE is released to INACTIVE state), which will be discarded by PDCP/RLC re-establishment upon SDT initialization. However, if the data volume check is performed by MAC before PDCP/RLC re-establishment, how to handle these buffered data? If they are taken account, we can not obtain a correct data volume value.   In addition, we also agree with bullet 3 of CATT’s comment, which is when SDT condition is not satisfied, MAC should indicate to RRC, such that RRC can submit RRCResumeRequest message to MAC layer, and start failure detection timer (T319) for non-SDT. |

One further aspect of the modelling is when to resume the RBs configured for SDT. As per the latest RRC running CR (see R2-2105927), the RBs configured for SDT are only resumed after MAC layer performs the data volume check and other relavent checks for SDT vs non-SDT selection and selects the SDT transmission. Companies are invited to comment on whether such modelling is acceptable.

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| According to the latest RRC and MAC running CRs, **the radio bearers configured for SDT are resumed only after the MAC layer performs the data volume check and other relavent checks for SDT vs non-SDT selection and SDT transmission is selected**.  Q2: Is the above modelling of the resumption of SDT RBs acceptable?   * In the comments, companies can highlight any issues and provide any alternative implementation for the resumption of SDT RBs. | |
| Company | Comments on when SDT RBs should be resumed in RRC and any alternative proposals (if there is any issue with the current modelling) |
| CATT | Same as our issue1 in Q1. If DRB is not resumed, how to estimate the data volume if the data volume is calculated at MAC layer taken into account PDCP/RLC/MAC headers? |
| Intel | See our related views provided in previous question Q1 in relation to how the running CR is done. Based on that, RRC would only capture a single statement with the SDT conditions met and then all SDT RBs could be resumed. In addition, MAC would address the CG/RA and carrier. |
| Google | In MAC, because data volume information is available for resumed DRBs, RRC should resume SDT DRBs before MAC uses the information. Otherwise, MAC have no data volume information to select SDT or non-SDT. |
| NEC | We are OK that the SDT radio bearers should be resumsed after the SDT conditions are fulfilled. |
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Finally, companies are invited to provide any other comments on the modelling aspects between RRC and MAC (apart from Q1/Q2) above in the table below.

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| Q3: Are there any other comments/questions on modelling aspects between RRC and MAC (not covered by the scope of Q1/Q2 above)? | |
| Company | Comments on any other issues |
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# Conclusion and proposals

# References

1. [R2-2105032](file:///C:\\Users\\panidx\\OneDrive%20-%20InterDigital%20Communications,%20Inc\\Documents\\3GPP%20RAN\\TSGR2_114-e\\Docs\\R2-2105032.zip) Runnning MAC CR for small data Huawei, HiSilicon

1. [R2-2105927](file:///C:\\Users\\panidx\\OneDrive%20-%20InterDigital%20Communications,%20Inc\\Documents\\3GPP%20RAN\\TSGR2_114-e\\Docs\\R2-2105927.zip) RRC Running CR for SDT ZTE Corporation (rapporteur)
2. [R2-2105847](file:///C:\evutukuri\work\5G\RAN2\docs\R2-2105847.zip) Discussion on the spec modeling for Small Data Huawei, HiSilicon, ZTE corporation, Sanechips

# Annex (contact details for email discussions)

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