**3GPP TSG-RAN2 #116-e R2-210xxxx**

**Electronic meeting, November 1 – November 12, 2021**

**Agenda item:**8.6.2 (NR\_SmallData\_INACTIVE-Core)

**Source:** LG Electronics (Rapporteur)

**Title:** [AT116-e][503][SData] UP SDT open issues (LG)

**Document for:** Discussion and Decision

# 1. Introduction

This document summarizes issues identified in the documents submitted to A.I. 8.6.2 User plane common aspects.

Note that not all the issues submitted to A.I. 8.6.2 are summarized in this document. Issues overlapped with other e-mail discussions and issues not related to user plane are not covered.

Deadline for providing comments:

* + - Companies inputs – November 4, 23:59 UTC
    - Rapporteur summary – November 5
    - Final comments on Rapporteur summary – November 8, 23:59 UTC

# 2. Discussion

## 2.1 PDCP status report

The related proposals in the submitted documents are captured below.

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| [6] Proposal 2 When RRCResume is received in response to SDT or RRC resume procedure after SDT, RRC determines whether or not to (re-)enalbe PDCP status report based on the radio bear configuration included in RRCResume.  [6] Proposal 3 If the statusReportRequired configuration for the corresponding SDT radio bearer is not updated in RRCResume, RRC re-configures the PDCP with statusReportRequired if it is deconfigurd for SDT.  [6] Proposal 4 If the statusReportRequired configuration for the corresponding SDT radio bearer is updated in RRCResume, RRC is subject to the latest configuration to determine whether or not to enable PDCP status report.  [7] Proposal 3: UE disables the statusReportRequired configuration autonomously when initiating the SDT procdure.  [7] Proposal 4: The PDCP status reporting is enabled according to the NW explicitly configuration.  [11] Proposal 3: PDCP status report during SDT initiation is disabled in PDCP instead of RRC.  [15] Proposal 2: NW explicitly configures PDCP status reporting for SDT DRBs for which it has been disabled during SDT proceure.  [19] Proposal 2: Agree on the text in RRC specification that “2> for each radio bearer that is configured for SDT: 3> re-establish PDCP entity for the radio bearer without triggering PDCP status report;”. |

In RAN2#115e meeting, it is agreed that at initiation of SDT procedure, the PDCP status report is not triggered even if the RB is configured with statusReportRequired. The remaining issue is whether the statusReportRquired is automatically enabled at the termination of SDT procedure or enabled by NW explicit signalling.

**Issue 1: If a RB is configured with statusReportRequired and if it is disabled at initiation of SDT procedure, how the statusReportReqruied is enabled?**

**- Option 1: The statusReportRequired is automatically enabled at termination of SDT procedure, i.e. PDCP status report is temporarily disabled during SDT procedure.**

**- Option 2: The statusReportRequired remains disabled until the network provides explicit signalling to enable it.**

**Q1: Which option do you prefer?**

|  |  |  |
| --- | --- | --- |
| Company | Preferred option | Detailed Comments |
| ZTE | Option 1 | This option is already implemented in the running CR and companies seem to be fine with this (?).  From network perspective, this means that the UE context is same with or without SDT when the UE moves to the connected state. So, the connected state configuration is not impacted by whether or not SDT was used in the past and hence this is simpler solution (please check the implementation in the running CR and comment if any changes are needed). |
| Sharp | Option 1 |  |
| OPPO | Option 1 and Option 2 | We think both UE autonomous re-enabling and signalling-based re-enabling are needed.  If SDT is terminated by the reception of RRCResume, UE shall decide whether to re-enable the PDCP status report according to the radio bear config included in RRC message. For example,  - if the configuration of SDT-RB is updated in RRC signalling, UE shall be subject to the latest configuration to determine whether or not to enable PDCP status report.  - if there is no radio bearer config for SDT-RB provided, which means that UE shall use the one stored in UE context, UE needs to re-enable PDCP status report autonomously.  For case that SDT is terminated by receiving RRCRelease, we do not think PDCP status reporting needs to be re-enabled. |
| TCL | Option 1 | It is simple to automatically resume the PDCP status report configuration, i.e. enable the *statusReportRequired*, at the termination of SDT procedure for the RB configured with *statusReportRequired*. |
| ASUSTeK | Option 1 |  |
| NEC | Option 1 | Agree with ZTE. |
| LGE | Option 1 |  |
| Intel | Option 1 | It is preferable that a UE in INACTIVE keeps same configuration before and after the SDT procedure to maintain legacy behaviour when UE in INACTIVE were to resume the connection. |
| Lenovo, Motorola Mobility | Option 1 |  |

## 2.2 ROHC continuity

The related proposals in the submitted documents are captured below.

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| [1] Proposal 1: If drb-ContinueROHC has been provided and the RRC connection is resumed on the same cell where the connection was suspended, continue the header compression protocol context for the DRB(s) of PCell configured with the header compression protocol in NR-SDT.  [2] Proposal 1: Discuss and agree one of the following options for ROHC continuity  Option 1: If the drb-ContinueROHC is configured for DRB in the stored inactive AS context and if UE is in same cell since it last received drb-ContinueROHC configuration from network, RoHC context of that DRB is continued. Otherwise, not.  Option 2: If the drb-ContinueROHC is configured for DRB in the stored inactive AS context and if UE is in same RAN notification area since it last received drb-ContinueROHC configuration from network, RoHC context of that DRB is continued. Otherwise, not.  [8] Proposal 2: If ROHC continuity is configured for SDT, the UE applies ROHC in case SDT is triggered in the same RNA as the cell from which the UE received RRCRelease with suspend.  [11] Proposal 2: the area scope of ROHC continuity specified in the specification is with the same serving cell in SDT.  [12] Proposal 5: If ROHC continuity for SDT is configured in RRCRelease message, the UE shall assume that ROHC continuity can be applied to all cells within the RNA. |

In RAN2#115e meeting, it is agreed that the area scope of ROHC continuity is specified in the specification, i.e. gNB configuration is not needed. However, the area scope of the ROHC continuity is still not decided.

In the last meeting, slight majority companies support cell level ROHC continuity (15/33). But the same question is asked again to check if companies change their opinions. We may need to go for the option with absolute majority in this meeting.

**Issue 2: If ROHC continuity is configured, what is the area scope of ROHC continuity?**

**- Option 1: Same cell.**

**- Option 2: Cells belonging to the same gNB.**

**- Option 3: Cells belonging to the same RNA.**

**- Option 4: Configurable between Option 1 and option 3 (i.e. network can configure: No ROHC, ROHC in same cell, ROHC in same RNA)**

**Q2: Which option do you prefer?**

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| --- | --- | --- |
| Company | Preferred option | Detailed Comments |
| ZTE | Option 4 | We think network configuration between RNA level ROHC and cell level ROHC as in option 4 above provides all the necessary flexibility.  We are also okay with option 3 on its own.  Option 1 on its own looks too restrictive and option 2 is probably unnecessary (Other options will require more signalling and configuration which is not really necessary in our view). |
| Samsung | Option 3 | Open to consider option 4, if that’s the majority view |
| Sharp | Option 1 |  |
| OPPO | Option 1 | For Option 3, if the ROHC protocols used by anchor gNB and target gNB are different, anchor w/o relocation shall be performed. Additional Xn signalling is needed to check this, which would involve RAN3. |
| TCL | Option 4 | Option 4 is flexible and can cover necessary cases.  To limit the ROHC continuity in the same cell in option 1 is simple, but it seems too restrictive. However, we are not object to it, for simplicity.  We are also agree with option 3. |
| ASUSTeK | Option 1 |  |
| NEC | Option 3 | If not all cells belongs the RNA supports ROHC continuity, then the gNB shall not configure ROHC continuity to the UE |
| LGE | Option 2 or 1 | In legacy, the ROHC continuity is supported in intra-gNB. It is better to follow this principle.  On the other hand, as CG resource is valid only in the same cell, it’s ok for us to support ROHC continuity only in the same cell. |
| Intel | Option 4, and  see comments | We support the suggestion from ZTE.  In addition, we are ok enabling option 1) and option 3). In our understanding for option 3), network should have the flexibility to allow or not this within the RNA (as not all RNA may be able to support ROHC continuity as it is not current requirement of that matter in network side). Therefore, network could indicate whether ROHC continuity is allowed within a configured RNA (option 3), or otherwise, ROHC continuity is only allowed in the cell where the UE AS Context is stored (option 1). |
| Lenovo, Motorola Mobility | Option 1 | Option 1 seems sufficient. However we are open to consider also Option 3 if this is the majority view. |

## 2.3 LCH Restrictions

The related proposals in the submitted documents are captured below.

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| [2] Proposal 2: LCH restriction "allowedServingCells" is not applied during the SDT procedure.  [4] Proposal 5. RAN2 agrees on the RAN2#115e Working Assumption that “LCH restrictions can be applied, re-using existing signalling. It is up to gNB how restrictions are configured and MAC applies current specification rules”.  [5] Proposal 1: RAN2 confirms the working assumption on the support of LCP restriction for SDT procedure.  [7] Proposal 1: Confirm the LCH restriction is applicable during the SDT procedure.  [7] Proposal 2: NW can provide the SDT specific LCH restriction in the SDT configuration of the RRCRelease message.  [9] Proposal 3: RAN2 confirm that LCH restrictions can be applied for SDT.  [9] Proposal 4: It is up to network implementation to ensure no restriction for the use of CG resource for the LCH channels corresponding to SDT RBs (all CG resources for SDT are allowed for each LCH supporting SDT).  [10] Proposal 2: LCH mapping restriction configuration/behaviour is different for UL transmissions in RRC\_CONNECTED and SDT in RRC\_INACTIVE, e.g. UE may not apply LCH mapping restrictions in RRC\_INACTIVE for SDT. Details are FFS.  [15] Proposal 3: SDT DRBs that cannot be multiplexed on SDT resources available in the current SDT procedure due to LCH restrictions should be considered as non-SDT DRBs for the duration of the SDT procedure.  [16] Proposal 4: Confirm working assumption: LCP LCH selection restrictions configured in LCP in connected mode are kept and reused for SDT in Inactive state.  [18] Proposal 2: LCH restriction information can be configured by RRC with RRCRelease message.  [18] Proposal 3: LCH restriction can be applied in CG-SDT only.  [19] Proposal 3: Make the working assumption for LCH restriction as an agreement.  [19] Proposal 4: For a DRB, whether to allow SDT is configured. Separate restriction for RA-SDT and CG-SDT is not supported. |

In RAN2#115e meeting, it is agreed as a working assumption that LCH restrictions can be applied, re-using existing signalling, and it is up to gNB how restrictions are configured and MAC applies current specification rules. It is also agreed that RAN2 may revisit this issue in this meeting if any technical issues found. Thus, it should be decided first whether the working assumption in the last meeting can be confirmed.

**Issue 3: Can we confirm the working assumption (i.e. LCH restrictions can be applied, re-using existing signalling, and it is up to gNB how restrictions are configured and MAC applies current specification rules)?**

**- Option 1: Yes.**

**- Option 2: No, LCH restriction is not applied for SDT.**

**Q3: Which option do you prefer?**

|  |  |  |
| --- | --- | --- |
| Company | Preferred option | Detailed Comments |
| ZTE | Option 2 | Regarding option 1, we really don’t think LCH restrictions are needed since they duplicate the SDT and non-SDT data configuration (i.e. any LCH not suitable for SDT shall not be configured for SDT). All SDT data should be feasible to be sent during SDT session. Otherwise, we create unnecessary dependencies between CG and RA selection.  Even if we go for option 1 we think there should be no further optimisation for scenarios where SDT is initiated but LCH restrictions prevent SDT. In other words, it is up to the network to ensure LCH restrictions will allow both CG and/or RA and will not result in any further checks or restrictions in MAC. |
| Samsung | Option 2 | Given that network indicates which RBs are used for SDT, we do not see any need for further LCH restrictions during SDT. |
| Sharp | Option 2 | Considering RAN2 will focus on initial BWP for RA and CG SDT, it is not necessary to discuss applying the LCH restriction. |
| OPPO | Option 2 | We also do not see the necessity to apply LCH restriction. Suggest to make the procedure simple. |
| TCL | Option 2 | There is no need for LCH restriction, we don’t see much beneficial it brings. |
| ASUSTeK | Option 2 |  |
| NEC | Option 1, but | We don’t want to change the existing UE behaviour, but the network shall configure no restrictions for the LCH supporting SDT. |
| LGE | Option 1 | LCH restriction is needed for CG-SDT, considering that multiple CG configurations can be used for CG-SDT. One of configuredGrantType1Allowed or allowedCG-List can be configured for SDT RB to restrict the use of CG-SDT, similar to legacy. |
| Intel | Neutral  (but see comment) | We have slightly preference to confirm the WA (as per option 1) but are also ok with option 2 understanding the concerns raised and that SDT procedure should aim to be short in order to get the maximum benefit (in terms of UE’s power consumption and performance). |
| Lenovo, Motorola Mobiltiy | Option 1 | We think that at least LCH to CG restrictions may be useful/required for CG-SDT operation. Therefore having not the possibility from NW perspective to control the LCH to resource mapping seems quite restrictive in our view. However if majority favors Option 2 , we would be also fine to consider this. |

If LCH restriction is agreed for SDT, the follow-up question is whether it is applied only for CG-SDT or both for CG-SDT and RA-SDT. Though the rapporteur think it should be applied for only CG-SDT, it is good to check companies’ views and make firm agreement.

**Issue 4: If LCH restriction is applied for SDT, is it applied only for CG-SDT or both for CG-SDT and RA-SDT?**

**- Option 1: LCH restriction is applied only for CG-SDT.**

**- Option 2: LCH restriction is applied for both CG-SDT and RA-SDT.**

**Q4: Which option do you prefer?**

|  |  |  |
| --- | --- | --- |
| Company | Preferred option | Detailed Comments |
| ZTE | Option 2 (if LCH options are agreed) | But the assumption is that the LCH restrictions if applied would not result in any further restrictions within MAC (i.e. left to network implementation). |
| Samsung | Option 2 |  |
| OPPO | Option 2 |  |
| TCL | Option 2 |  |
| ASUSTeK | Option 2 |  |
| NEC | Option 2 | But we think that all CG resources for SDT are allowed for all LCHs supporting SDT (no restrictions). Otherwise, one possible situation would be that the UE select CG-SDT, but the UL data cannot be transmitted by the CG resource due to LCH restriction. |
| LGE | Option 1 | We assume configuredGrantType1Allowed or allowedCG-List can be configured for SDT RB to restrict the use of CG-SDT. But, we don’t understand how LCH restriction is configured for RA-SDT. |
| Intel | Option 2 |  |
| Lenovo, Motorola Mobility | Option 2 |  |

## 2.4 PHR

The related proposals in the submitted documents are captured below.

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| --- |
| [2] Proposal 3: So RAN2 should discuss and agree one of the following options  Option 1: SDT data is prioritized over PHR MAC CE.  Option 2: Revert/cancel the agreement “ During the SDT procedure, all the triggered PHRs are cancelled if all SDT data are included in the UL grant, if there is NO room in the MAC PDU to fit the PHR”  [3] Proposal 5 A Data volume threshold is defined to trigger PHR  [3] Proposal 6 PHR is triggered by initiation of the PHR procedure  [4] Proposal 2. The stored configuration of PHR in the UE AS Context is used during an SDT procedure.  [8] Proposal 5: Dedicated PHR configuration can be provided to the UE in RRCRelease message for both CG-SDT and RA-SDT.  [8] Proposal 6: Dedicated PHR configuration for SDT can be utilized in the cell where the UE has received the RRCRelease message while in case the UE has no dedicated configuration or reselects another cell, it would use the default configuration for both CG-SDT and RA-SDT.  [12] Proposal 3: The PHR should be configurable for SDT, and it is up to NW to determine whether PHR is needed or not in SDT.  [12] Proposal 4: Separate SDT PHR configuration should be included in SIB. If the SDT PHR configuration is not broadcasted, then the default configuration will be used  [16] Proposal 3: The default MAC configuration is used for determining the PHR parameters in INACTIVE.  [19] Proposal 1: BSR configuration and PHR configuration used for SDT could be signalled by Gnb in RRCRelease message. |

RAN2 made some progresses for PHR issue in the last meeting, and made following agreements.

- Legacy PHR triggers are applied for SDT.

- The LCP priority of PHR MAC CE in SDT is same as in RRC\_CONNECTED, i.e. the PHR MAC CE in SDT is prioritized over SDT data

- During the SDT procedure, all the triggered PHRs are cancelled if all SDT data are included in the UL grant, if there is NO room in the MAC PDU to fit the PHR.

However, Samsung [2] think that the second and third agreements are contradictory with following reasons. According to 2, LCP priority for PHR is same as in legacy i.e. PHR has higher priority than DTCH. So PHR will be included in UL grant before the SDT data. However, according to 3, it is assumed that SDT data is first included in UL grant and after including all the SDT data if there is no room in UL grant, PHR is not included and PHR is cancelled.

**Issue 5: Do you think the previous agreements on PHR are contradictory?**

**- Option 1: Yes, the UL data should be prioritized over PHR MAC CE in LCP procedure.**

**- Option 2: No, previous agreements are fine.**

**Q5: Which option do you prefer?**

|  |  |  |
| --- | --- | --- |
| Company | Preferred option | Detailed Comments |
| ZTE | Option 2 |  |
| Samsung | Option 1 or remove the agreement “ During the SDT procedure, all the triggered PHRs are cancelled if all SDT data are included in the UL grant, if there is NO room in the MAC PDU to fit the PHR” | Previous agreements   1. The LCP priority of PHR MAC CE in SDT is same as in RRC\_CONNECTED, i.e. the PHR MAC CE in SDT is prioritized over SDT data 2. During the SDT procedure, all the triggered PHRs are cancelled if all SDT data are included in the UL grant, if there is NO room in the MAC PDU to fit the PHR.   As per agreement 1, PHR will be first included in MAC PDU and PHR is cancelled as per section 5.4.6 of TS 38.321  “   1. if the allocated UL resources can accommodate the MAC CE for PHR which the MAC entity is configured to transmit, plus its subheader, as a result of LCP as defined in clause 5.4.3.1:   :  : 2> cancel all triggered PHR(s).  “  So there is no case where the second agreement applies. |
| Sharp | Option 2 |  |
| OPPO | Option 2 |  |
| TCL | Option 2 | We are fine with the previous agreements. |
| ASUSTeK | Option 2 | In current spec, BSR MAC CE is prioritized over data from DTCH, and all the triggered BSRs may be cancelled when the UL grant(s) can accommodate all pending data available for transmission but is not sufficient to additionally accommodate BSR MAC CE plus its subheader. Similarly, there are no contradictory for the agreements of PHR MAC CE. |
| NEC | Option 2 | This is similar to BSR. BSR MAC CE has higher priority than UL data, but if the UL grant can accommodate the UL data but cannot accommodate BSR, the BSR can be cancelled. Therefore, we don’t think the previous agreements on PHR are contradictory. |
| LGE | Option 2 | This is similar to BSR cancellation, and don’t see any problem. |
| Intel | Option 2 |  |
| Lenovo, Motorola Mobility | Option 2 | We also support to remove the previous agreements “During the SDT procedure, all the triggered PHRs are cancelled if all SDT data are included in the UL grant, if there is NO room in the MAC PDU to fit the PHR”. We don’t think that any optimization for PHR is necessary for SDT |

Regarding PHR triggers, Ericsson [3] propose to discuss two issues. First one is to introduce a data volume threshold to decide inclusion of PHR MAC CE, and the second one is to introduce a new PHR trigger at initiation of SDT procedure. Companies are asked to provide their views on the two issues.

**Issue 6: Do you think a data volume threshold is needed to decide inclusion of PHR MAC CE?**

**- Option 1: Yes, the PHR is included if the data volume is above the threshold.**

**- Option 2: No.**

**Q6: Which option do you prefer?**

|  |  |  |
| --- | --- | --- |
| Company | Preferred option | Detailed Comments |
| ZTE | Option 2 | We don’t really think an additional threshold is really justified for this! |
| Samsung | Option 2 |  |
| Sharp | Option 2 |  |
| OPPO | Option 2 |  |
| TCL | Option 2 | The data volume threshold is not necessary here. |
| ASUSTeK | Option 2 |  |
| NEC | Option 2 |  |
| LGE | Option 2 |  |
| Intel | Option 2 |  |
| Lenovo, Motorola Mobility | Option 2 |  |

**Issue 7: Do you think a PHR should be triggered at initiation of SDT procedure?**

**- Option 1: Yes.**

**- Option 2: No.**

**Q7: Which option do you prefer?**

|  |  |  |
| --- | --- | --- |
| Company | Preferred option | Detailed Comments |
| ZTE | No new trigger shall be defined (i.e. Option 1) | We think legacy rules should be followed.  Per the legacy rules, the PHR will be triggered “upon configuration or reconfiguration of the power headroom reporting functionality by upper layers, which is not used to disable the function”.  If we have PHR in either RRCRelease or SIB, the RRC layer will configure PHR in case SDT is initiated, and PHR will be triggered. No extra condition is needed. |
| Samsung | No new trigger is needed | Same view as ZTE |
| Sharp | Option 1 |  |
| OPPO | Option 1 | Agree with ZTE. |
| TCL | Option 1 | PHR configuration in *RRCRelease* or SIB is sufficient. |
| ASUSTeK | Option 1 | No new trigger is needed. |
| NEC | Option 1 (no new triggering condition) | The legacy rule already enable the triggering of PHR at the initiation of SDT, i.e. when SDT is initialized, the UE applies default MAC cell group configuration, and then PHR will be triggered. |
| LGE | Option 1 (No new trigger) |  |
| Intel | No new trigger needed | Same view as ZTE |
| Lenovo, Motorola Mobility | No new trigger | Agree with ZTE |

The remaining issue is on PHR configuration. Basically, there are four options, i.e. dedicated configuration (via RRCRelease message), common configuration (via SIB), default configuration (via default MAC Cell Group configuration), and stored configuration (via stored UE AS context). Companies are asked to provide their views on this issue.

**Issue 8: How the PHR is configured?**

**- Option 1: Dedicated configuration via RRCRelease message.**

**- Option 2: Common configuration via SIB.**

**- Option 3: Default configuration via default MAC Cell Group configuration.**

**- Option 4: Stored configuration via stored UE AS context.**

**Q8: Which option do you prefer?**

|  |  |  |
| --- | --- | --- |
| Company | Preferred option | Detailed Comments |
| ZTE | Option 2 | We think SDT specific PHR configuration should be included in SIB  Option 1 doesn’t work for different cell case (unless all cells have same configuration, which is a bit odd restriction on the network). |
| Samsung | Option 3 | In our view default configuration is sufficient |
| Sharp | Option 3 |  |
| OPPO | Option 3 |  |
| TCL | Option 1 | PHR during SDT procedure is beneficial, especially for the subsequent SDT. Thus PHR dedicated for SDT may be simpler than the common PHR configuration. |
| ASUSTeK | Option 3 |  |
| NEC | Option 3 | We think default configuration via default MAC cell group configuration is sufficient. |
| LGE | Option 1 | It is too restrictive to use only one value in default configuration. |
| Intel | Option 3 |  |
| Lenovo, Motorola Mobility | Option 3 |  |

If option 1 or option 2 is chosen in Issue 8, the follow-up question is what if the PHR configuration is not provided by RRCRelease or SIB. Huawei [8] and ZTE [12] propose to use default configuration in this case, but this should be checked with other companies.

**Issue 9: If PHR configuration is not provided by RRCRelease or SIB, what is the UE behaviour?**

**- Option 1: PHR is not used.**

**- Option 2: Configure PHR according to default MAC Cell Group configuration.**

**- Option 3: Do not need to consider this case. PHR configuration is always provided.**

**Q9: Which option do you prefer?**

|  |  |  |
| --- | --- | --- |
| Company | Preferred option | Detailed Comments |
| ZTE | Option 2 | Option 2 becomes automatic if nothing else is configured. |
| Samsung | As in Q8 | In our view default configuration is sufficient |
| Sharp | Option 2 |  |
| TCL | Option 2 | Option 2 operation is simple and the default configuration is sufficient. |
| ASUSTeK | Option 2 |  |
| NEC | Option 2 |  |
| LGE | Option 1 | PHR is not a mandatory function. It should be possible to turn-off the PHR function for SDT. |
| Intel | Option 2 |  |
| Lenovo, Motorola Mobility | Option 2 |  |

## 2.5 BSR

The related proposals in the submitted documents are captured below.

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| [3] Proposal 2 The BSR parameters for SDT periodicBSR-Timer and retxBSR-Timer should be configurable via RRCRelease or SI.  [3] Proposal 3 If the BSR parameters for SDT are not configured in either RRCRelease or SI, the parameter values from the default MAC Cell Group configuration are used  [3] Proposal 4 RAN2 should discuss if a short BSR format should be supported.  [4] Proposal 1. The default/common configuration of BSR is used during an SDT procedure.  [5] Proposal 1 BSR configuration in default MAC cell group configuration is used if delaying the SR transmission is not supported in SDT, otherwise, UE-specific BSR configuration provided by Gnb is used.  [8] Proposal 7: Dedicated BSR configuration can be provided to the UE in RRCRelease message for both RA-SDT and CG-SDT.  [8] Proposal 8: Dedicated BSR configuration for SDT can be utilized in the cell where the UE has received the RRCRelease message while in case the UE has no dedicated configuration or reselects another cell, it would use the default configuration for both RA-SDT and CG-SDT.  [9] Proposal 1：During SDT, the BSR configuration in the default MAC cell group configuration is applied.  [9] Proposal 2: During SDT, the BSR calculation does not take suspended RBs into consideration.  [12] Proposal 1: The configuration of logicalChannelSR-DelayTimer should be allowed for SDT, and the UE specific logicalChannelSR-DelayTimerApplied stored for each logical channel will be used in SDT.  [12] Proposal 2: SDT specific BSR configuration should be introduced in SIB. If the SDT specific BSR configuration is broadcasted, then the broadcasted configuration will be used. Otherwise, the default configuration should be used.  [14] Proposal 10: UE applies the BSR configuration in the default MAC cell group configuration.  [15] Proposal 1: Default BSR configuration for SDT is specified where SRBs and DRBs belong to different LCG.  [16] Proposal 1: A new BSR is triggered using the existing BSR triggers upon new data arrival for SDT DRBs.  [16] Proposal 2: RRC release message can provide separate BSR MAC configuration for determining the BSR parameters in INACTIVE state.  [18] Proposal 1: BSR for SDT is configured by Gnb with RRCRelease message.  [19] Proposal 1: BSR configuration and PHR configuration used for SDT could be signalled by Gnb in RRCRelease message. |

Regarding BSR, the following agreements were made in RAN2#115e meeting.

- The BSR configuration used for SDT can be different from the BSR configuration used in RRC\_CONNECTED.

- [CB] FFS Whether the BSR configuration used for SDT is configured by Gnb or used from default configuration needs further discussion. (Gnb 10 / default 11)

Similar to PHR, how the BSR is configured is major issue that needs to be resolved in this meeting. Looking through the documents, three options are on the table, i.e. dedicated configuration (via RRCRelease message), common configuration (via SIB), and default configuration (via default MAC Cell Group configuration).

**Issue 10: How the BSR is configured?**

**- Option 1: Dedicated configuration via RRCRelease message.**

**- Option 2: Common configuration via SIB.**

**- Option 3: Default configuration via default MAC Cell Group configuration.**

**Q10: Which option do you prefer?**

|  |  |  |
| --- | --- | --- |
| Company | Preferred option | Detailed Comments |
| ZTE | Option 2 |  |
| Samsung | Option 3 | In our view default configuration is sufficient. No need of further optimising as SDT is for short duration and involves only few transmissions. |
| Sharp | Option 1,3 |  |
| OPPO | Option 3 |  |
| TCL | Option 1,3 | Like PHR configuration, we prefer dedicated BSR via *RRCRelease* message. If there is not dedicated BSR configuration provided, then default BSR configuration works well too. |
| ASUSTeK | Option 3 |  |
| NEC | Option 3 | We think default configuration is sufficient. |
| LGE | Option 1 | It is too restrictive to use only one value in default configuration. |
| Intel | Option 3 |  |
| Lenovo, Motorola Mobility | Option 3 | Should be same as for PHR |

If option 1 or option 2 is chosen in Issue 10, the follow-up question is what if the BSR configuration is not provided by RRCRelease or SIB.

**Issue 11: If BSR configuration is not provided by RRCRelease or SIB, what is the UE behaviour?**

**- Option 1: BSR is not used.**

**- Option 2: Configure BSR according to default MAC Cell Group configuration.**

**- Option 3: Do not need to consider this case. BSR configuration is always provided.**

**Q11: Which option do you prefer?**

|  |  |  |
| --- | --- | --- |
| Company | Preferred option | Detailed Comments |
| ZTE | Option 2 | Option 2 becomes automatic if nothing else is configured. |
| Samsung | Option 2 | In our view default configuration is sufficient. No need of further optimising as SDT is for short duration and involves only few transmissions. |
| Sharp | Option 2 |  |
| TCL | Option 2 |  |
| ASUSTeK | Option 2 |  |
| NEC | Option 2 |  |
| LGE | Option 3 | BSR is important for subsequent transmission, and we think BSR is always configured. |
| Intel | Option 2 |  |
| Lenovo, Motorola Mobility | Option 2 |  |

In the BSR-Config, three timers are included, i.e. periodicBSR-Timer, retxBSR-Timer, and logicalChannelSR-DelayTimer. It is questioned whether the logicalChannelSR-DelayTimer is applied for SDT. Note that the logicalChannelSR-DelayTimer is not included in the default MAC Cell Group configuration.

**Issue 12: Can the logicalChannelSR-DelayTimer be applied for logical channels configured with SDT?**

**- Option 1: Yes.**

**- Option 2: No.**

**Q12: Which option do you prefer?**

|  |  |  |
| --- | --- | --- |
| Company | Preferred option | Detailed Comments |
| ZTE | Option 1 |  |
| Samsung | Option 2 | Not essential |
| Sharp | Option 2 | It is better to report the data volume as soon as possible within SDT procedure instead of delaying report. |
| OPPO | Option 2 |  |
| TCL | Option 2 | BSR for SDT can be simpler, logicalChannelSR-DelayTimer is not necessary. |
| ASUSTeK | Option 2 |  |
| NEC | Option 2 | We think default configuration in default MAC Cell group configuration is sufficient. |
| LGE | Option 2 |  |
| Intel | Option 2 | Not essential |
| Lenovo, Motorola Mobility | Option 2 |  |

One optimization is proposed by Ericsson [3] such that additional short formats could be introduced by e.g. removing the MAC subheader for the short BSR and using the R-bit in i.e. the R/F/LCID MAC subheader of the MAC SDU to signal inclusion of a short BSR. Companies are asked to provide their views on the need of BSR format enhancements for SDT.

**Issue 13: Is it worth to consider BSR format enhancements for SDT?**

**- Option 1: Yes.**

**- Option 2: No.**

**Q13: Which option do you prefer?**

|  |  |  |
| --- | --- | --- |
| Company | Preferred option | Detailed Comments |
| ZTE | Option 2 |  |
| Samsung | Option 2 |  |
| Sharp | Option 2 |  |
| OPPO | Option 2 |  |
| TCL | Option 2 | SDT is not frequent, BSR format enhancement will not bring much benefits. |
| ASUSTeK | Option 2 |  |
| NEC | Option 2 |  |
| LGE | Option 2 |  |
| Intel | Option 2 |  |
| Lenovo, Motorola Mobility | Option 2 |  |

Another issue is raised by NEC [9] whether the BSR calculation takes suspended RBs into consideration during SDT. There may be buffered PDCP and/or RLC packets for the suspended RBs (which are corresponding to non-SDT radio bearers), because the buffered UL data may not be able to be transmitted upon reception of RRCRelease message. If the suspended radio bearers are taken into consideration for BSR, and there are non-SDT RB and SDT RB belonging to the same LCG, it will be hard for the network to make decision on whether to resume RRC Connection or not. Thus, it is proposed in [9] that the BSR calculation does not take suspended RBs into consideration during SDT. But it should be noted that in RAN2#115e meeting, RAN2 confirms that the suspended RBs shall be considered for BSR calculation, and no change is required to the specifications.

**Issue 14: Should the BSR calculation take suspended RBs into consideration during SDT?**

**- Option 1: Yes.**

**- Option 2: No.**

**Q14: Which option do you prefer?**

|  |  |  |
| --- | --- | --- |
| Company | Preferred option | Detailed Comments |
| ZTE | Option 1  (based on existing specs) | Same procedure as BSR should be reused as agreed. |
| Samsung | Option 1 | Follow legacy procedure |
| Sharp | Option 1 |  |
| OPPO | Option 1 | But we are wondering whether it is a valid case that there is still data buffered in UE when RRCRelease is received as raised by [9] |
| TCL | Option 1 | Legacy design is sufficient. |
| ASUSTeK | Option 1 |  |
| NEC | Option 2 | We think SDT is a new feature, it can be different from legacy, even though we also confirmed legacy BSR calculation in the past RAN2 meetings. With regarding to whether this is a valid case, upon reception of RRC Release message, the UE would perform PDCP suspend for DRBs which including discarding of buffered PDCP PDUs. This implies that there could be buffered data at the UE upon reception of RRCRelease. For SRBs the buffered data would be discard by PDCP re-establishment later. And for RLC layers, the buffered data would be discard by RLC re-establishment later. So during SDT, it is still possible that there are buffered data at PDCP/RLC entities for the suspended RBs, since PDCP/RLC re-establishment is not performed.  If suspended RBs are taken into account, the BSR would be inaccurate, which mislead the network to decide whether to resume RRC connection for the UE. So the desirable UP handling for BSR during SDT should exclude the suspended RBs. |
| LGE | Option 1 | It is already agreed at the last meeting. |
| Intel | Option 1 |  |
| Lenovo, Motorola Mobility | Option 1 | Same as in the legacy procedure. By LCH-to LCG mapping, NW can make sure that it can distinguish between SDT/non-SDT bearer |

## 2.6 Data volume calculation

The related proposals in the submitted documents are captured below.

|  |
| --- |
| [9] Proposal 5: RAN2 discuss if we need to address the issues of data volume calculation for SDT:   If the new UL data from upper layer are considered as PDCP SDU for data volume calculation   If the buffered data in PDCP entity and RLC entity which are to be discarded upon SDT initialization are take into account for data volume calculation  [10] Proposal 4: RAN2 to clarify whether the data volume is calculated by the MAC layer before the RBs configured for SDT are resumed.  [11] Proposal 1: Data volume checking for SDT/non-SDT is modelled in RRC.  [13] Proposal 1: The PDCP header is not considered for the data volume computation.  [13] Proposal 2: The data volume used for SDT selection criteria includes the RRCResumeRequest message.  [16] Proposal 6: CCCH bits are not included in the data volume computation for SDT resource selection. |

It is agreed in RAN2#115e meeting that the Data volume used for SDT selection criteria is calculated as the total sum of Buffer Size across SDT RBs (i.e. same approach as BSR). But, there are still unclear points that need to be resolved.

In the current RRC/MAC running CRs, it is modelled that the data volume checking is done in MAC before resuming SDT RBs in RRC. It means that the MAC has visibility of upper layer data before the SDT RBs are resumed. This is possible if upper layer data arrives at PDCP layer of SDT RB even if the SDT RB is suspended. However, it has to be discussed whether the upper layer data can arrive at PDCP layer of suspended RB. Companies are asked to provide their views on this issue.

**Issue 15: Do you think the NAS data can arrive at PDCP layer of suspended RBs?**

**- Option 1: Yes.**

**- Option 2: No.**

**Q15: Which option do you prefer?**

|  |  |  |
| --- | --- | --- |
| Company | Preferred option | Detailed Comments |
| ZTE | Yes | This issue has already been discussed and we agreed that this modelling is the baseline. Similar to EDT, we have to assume this behaviour and current running CRs are based on this. We don’t think we should rediscuss this framework unless there is something that precludes this according to the existing specs. |
| Samsung | Yes | Same view as ZTE |
| Sharp | Option 1 Yes |  |
| OPPO | Not sure | We have not a spec to capture this. No matter whether companies think NAS data can arrive at AS, it maybe up to UE implementation to calculate the data volume. |
| TCL | Yes |  |
| ASUSTeK |  | It could be up to UE implementation. |
| NEC | Not sure | We don’t think this is similar to EDT. In EDT, it is up to UE implementation how to calculate data volume, but for SDT we agree that we reuse BSR calculation mechanism for data volume calculation. In our understanding, whether NAS data can arrive at PDCP layer is up to implementation. |
| LGE | Option 2 | When the non-SDT data is generated in NAS, the NAS provides indication to RRC to request making RRC connection. The NAS will submit the non-SDT data only after it receives an indication from RRC that suspended RRC connection is resumed. The RRC provides this indication to NAS when RRCResume message is received. Thus, until the RRCResume message is received, the non-SDT data is stored in NAS. |
| Intel | Yes | We understand that RAN2 could assume this although actual details are not specified and are left up to UE implementation. |
| Lenovo, Motorola Mobility | Option 1 |  |

If it is agreed that NAS data can arrive at PDCP layer of suspended RBs, the implementation should be cautious that the NAS data is just stored in the PDCP SDU buffer without further processing. This is because if the NAS data is processed into PDCP PDU or RLC SDU/PDU, they will be discarded at SDT procedure initiation due to PDCP/RLC re-establishment.

**Issue 16: If NAS data can arrive at PDCP layer of suspended RBs, do you agree that the NAS data should be just stored in PDCP SDU buffer without further processing?**

**- Option 1: Yes.**

**- Option 2: No.**

**Q16: Which option do you prefer?**

|  |  |  |
| --- | --- | --- |
| Company | Preferred option | Detailed Comments |
| ZTE | Option 1 | But no specification work is needed for this. The details can be left to UE implementation (similar to how it was done for EDT). |
| Samsung | Option 1 | Same view as ZTE |
| Sharp | Option 1 |  |
| OPPO | Option 1 |  |
| TCL | Option 1 | Prefer to reuse EDT like design. |
| ASUSTeK | Option 1 |  |
| NEC | Option 1 |  |
| LGE | Option 1 | A NOTE may be needed in PDCP specification to prohibit processing of PDCP SDUs. |
| Intel | Option 1 | Same view as ZTE |
| Lenovo, Motorola Mobility | Option 1 |  |

If it is agreed that the NAS data is just stored in PDCP SDU buffer without further processing, there would be no constructed PDCP PDU, and thus PDCP header is not considered in SDT data volume calculation. This issue is raised by Xiaomi [13].

**Issue 17: If NAS data can arrive at PDCP layer of suspended RBs, do you agree that PDCP header is not considered for the SDT data volume calculation?**

**- Option 1: Yes.**

**- Option 2: No.**

**Q17: Which option do you prefer?**

|  |  |  |
| --- | --- | --- |
| Company | Preferred option | Detailed Comments |
| ZTE | Option 1  (same as BSR) | No optimisation is needed (i.e. we can reuse BSR like mechanism). Similar approach is also used for EDT. So, we don’t see much difference here. |
| Samsung | Option 1 | Same view as ZTE |
| Sharp | Option 1 |  |
| OPPO | Option 1 |  |
| TCL | Option 1 |  |
| ASUSTeK | Option 1 |  |
| NEC | Option 1 | We prefer that this is aligned with BSR. |
| LGE | Option 1 | As PDCP SDU is not processed, it is natural consequence that PDCP header is not considered for SDT data volume calculation. As it is natural consequence, MAC spec change is not needed. |
| Intel | Option 1 | Same view as ZTE |
| Lenovo, Motorola Mobility | Option 1 |  |

On the other hand, if it is agreed that NAS data cannot arrive at PDCP layer of suspended RBs, the SDT data volume calculation in MAC should be done by UE implementation. That is, the MAC should check the upper layer data volume via UE internal coordination. The calculated SDT data volume is the virtual PDCP SDU size of NAS data.

**Issue 18: If NAS data cannot arrive at PDCP layer of suspended RBs, do you agree that the MAC calculates the NAS data volume by UE internal coordination?**

**- Option 1: Yes.**

**- Option 2: No.**

**Q18: Which option do you prefer?**

|  |  |  |
| --- | --- | --- |
| Company | Preferred option | Detailed Comments |
| ZTE | Not needed | The AS has to have visibility of upper layer data we think the details need not be discussed on how this is visible (similar to how it has been specified for EDT). |
| Samsung | Not needed | Same view as ZTE |
| Sharp | Option 1 | It could be UE implementation. |
| OPPO | Option 1 | Up to UE implementation. No internal coordination needs to be defined. |
| TCL |  | Agree with ZTE. |
| ASUSTeK | Option 2 |  |
| NEC | Option 1 | We are OK that the MAC layer can consider the upper layer data as PDCP SDU when calculate data volume. |
| LGE | Option 1 | This is the only way to consider upper layer data in SDT data volume calculation. |
| Intel | Not needed | Same view as ZTE based on current RAN2 agreements. |
| Lenovo, Motorola Mobility | Option1 | UE implementation |

If it is agreed that the MAC calculates the NAS data volume by UE internal coordination, the MAC can reflect the NAS data into the SDT data volume calculation (as a virtual PDCP SDU) in principle. Thus, NEC [9] raise a question whether the upper layer data is regarded as PDCP SDU for SDT data volume calculation.

**Issue 19: If the MAC calculates the NAS data volume by UE internal coordination, do you think the NAS data should be regarded as PDCP SDU?**

**- Option 1: Yes.**

**- Option 2: No.**

**Q19: Which option do you prefer?**

|  |  |  |
| --- | --- | --- |
| Company | Preferred option | Detailed Comments |
| ZTE | Same as above | We again think the BSR mechanism can be reused. So, it is not clear what is missing (e.g. from section 5.6 of PDCP spec). |
| Samsung | Same view as ZTE |  |
| Sharp | Option 1 |  |
| OPPO | - | Either PDCP PDU or MAC PDU is fine for us. |
| TCL | Same as above |  |
| ASUSTeK | Option 1 |  |
| NEC | Option 1 | Same as above |
| LGE | Option 1 | This is the only way to consider upper layer data in SDT data volume calculation. |
| Intel | Same view as ZTE |  |
| Lenovo, Motorola Mobility |  | Same view as ZTE |

NEC [9] raise another issue of whether the buffered data in PDCP/RLC entities are considered in SDT data volume calculation. The PDCP re-establishment and RLC re-establishment are not performed when SDT data volume calculation is performed, and there may be buffered packets at PDCP and/or RLC entities, which will be discarded upon SDT initialization due to PDCP/RLC re-establishment. If they are counted in SDT data volume calculation, SDT criteria may not be met.

**Issue 20: Do you think that the buffered packets in PDCP/RLC entities should be counted in SDT data volume calculation?**

**- Option 1: Yes.**

**- Option 2: No.**

**Q20: Which option do you prefer?**

|  |  |  |
| --- | --- | --- |
| Company | Preferred option | Detailed Comments |
| ZTE | Option 1 | Again, same as BSR. But in this case, there will be no packets in RLC anyway. |
| Samsung | Option 1 | Same view as ZTE |
| Sharp | Option 1 |  |
| OPPO | Option 1 | we are not sure the case is valid. |
| TCL | Option 1 |  |
| ASUSTeK | Option 1 |  |
| NEC | Option 2 | With regarding to whether this is a valid case, upon reception of RRCRelease message, the UE would perform PDCP suspend for DRBs which including discarding of buffered data. This implies that there could be buffered data at the UE upon reception of RRCRelease. Otherwise, why would we need packet discarding in PDCP suspend? For SRB, the buffered PDCP data would be discard by PDCP re-establishment later. And for RLC layers, the buffered data would be discard by RLC re-establishment later. So it is possible that there are buffered data at PDCP entity (for SRB) and RLC entities (for both SRB and DRB), which to be discarded later after the triggering of SDT.  If we take them into consideration, we cannot get an accurate value. |
| LGE | Option 1 |  |
| Intel | Option 1 | Same view as ZTE |
| Lenovo, Motorola Mobility | Option 1 |  |

The last issue is whether the CCCH message (i.e. RRCResumeRequest) is considered in SDT data volume calculation. This issue is remained as FFS in current MAC running CR. On one hand, it is thought that CCCH message cannot be considered in SDT data volume calculation because RRCResumeRequest message is constructed only after SDT data volume check is performed (InterDigital [16]). On the other hand, if it is agreed that NAS data volume can be calculated by UE internal coordination, it is also thought possible to consider CCCH message into SDT data volume calculation (Xiaomi [13]). Companies are asked to provide their views on this issue.

**Issue 21: Do you think the size of CCCH message should be considered in SDT data volume calculation?**

**- Option 1: Yes.**

**- Option 2: No.**

**Q21: Which option do you prefer?**

|  |  |  |
| --- | --- | --- |
| Company | Preferred option | Detailed Comments |
| ZTE | Option 2 | The CCCH message size is constant. If we reuse the BSR mechanism then CCCH size is not included. However, since the CCCH size is constant and known to the network, it can take it into account when configuring the data volume threshold. So, there is no need for the UE to add this in the calculation then (i.e. network can implicitly include this in the threshold). |
| Samsung | Option 2 |  |
| Sharp | Option 2 |  |
| OPPO | Option 1 | No strong view. If it can not be confirmed that NAS data can arrive at AS, we think it is acceptable to take all the data into account since the data volume check is more likely based on estimation. |
| TCL | Option 2 |  |
| ASUSTeK | Option 2 |  |
| NEC | No strong view | Both ways will work, while it is straightforward to consider only UP data when evaluating the SDT initiation at UE and the network can configure the threshold based on this rule. We slightly prefer the Option 2. |
| LGE | Option 2 | The network can configure data volume threshold considering the potential CCCH message size. Then, it is enough for the UE to consider only UP data in data volume comparison. |
| Intel | Option 2 |  |
| Lenovo, Motorola Mobility | Option 1 |  |

## 2.7 TAT

The related proposals in the submitted documents are captured below.

|  |
| --- |
| [2] Proposal 4: timeAlignmentTimer as in leagcy is used for RA-SDT.  [3] Proposal 7 The legacy TAT is reused for RA-SDT  [3] Proposal 8 A separate CG-SDT TAT is used for CG-SDT  [4] Proposal 3. Normal (i.e. legacy) TAT is applicable to both CG-SDT and RA-SDT.  [4] Proposal 4. Upon expiry of the normal (or legacy) TAT during an SDT procedure, UE behaves similarly as in RRC\_CONNECTED, i.e. UE suspends all UL transmissions and triggers RACH if any UL transmission is still needed.  [5] Proposal 2: SDT-TAT would be also applied to RA-SDT.  [7] Proposal 5: The cell specific TAT configuration in the SIB1 of the current camping cell is used for the RA-SDT procedure.  [12] Proposal 6: For CG-SDT, TAT-SDT will be used for both CG resource validity verification and TA maintenance during CG-SDT subsequent data transmission  [12] Proposal 7: TAT-SDT is used in both RA-SDT and CG-SDT, and TAT-SDT will be used for CG resource verification and TA maintenance in subsequent SDT transmission.  [12] Proposal 8: Once the RRC resume message is received during SDT, the UE should start normal TAT and stop TAT-SDT. FFS whether an initial value is needed for the normal TAT timer, taking the value of TAT-SDT into account (e.g. set the initial value of TAT to current value of TAT-SDT).  [14] Proposal 4: RAN2 should discuss which TAT timer, i.e., either TAT-SDT timer or normal TAT timer, is used in RA-SDT and the normal RACH switched from CG-SDT.  [14] Proposal 5: TAT-SDT timer is used for the whole CG-SDT session including the first UL transmission and subsequent data phase, unless UE switch to normal RACH procedure.  [14] Proposal 6: UE maintains only one NTA value during the SDT session no matter in which SDT phase. The value of NTA can be updated by the reception of TA command (as legacy), then the TA timer will be re-started.  [14] Proposal 7: UE should use normal TA timer for RA-SDT.  [14] Proposal 8: After UE switch to normal RACH from CG-SDT, UE applies TA command and update NTA value after contention resolution is considered successful. The normal TA timer (re)starts and TAT-SDT timer stops if running.  [14] Proposal 9: When UE receives the RRC resume message in SDT, TAT-SDT timer stops, and normal TA timer starts. The existing NTA value is applied unless UE receives the new TA command.  [17] Proposal 1. Legacy TAT starts/restarts when RAR TAC and TAC MAC CE is received in RA-SDT and CG-SDT, as in legacy NR.  [17] Proposal 2. CG-SDT-TAT starts when CG-SDT is configured via RRCRelease and restarts upon the reception of TAC MAC CE in the subsequent transmission of CG-SDT.  [17] Proposal 3. Both CG-SDT-TAT value and TA value are provided when CG-SDT is configured via RRCRelease message.  [20] Proposal 5: The TAC in Msg2/MsgB of the RACH procedure does not restart the CG-SDT TAT. |

Regarding TAT issue, RAN2 already made agreements as followings:

- A new TA timer for TA maintenance specified for configured grant based small data transfer in RRC\_INACTIVE should be introduced. The TA timer is configured together with the CG configuration in the RRCRelease message.

- This new timer i.e. TAT-SDT is started upon receiving the TAT-SDT configuration from gNB, i.e. RRCrelease message, and can be (re)started upon reception of TA command

From the agreement, it is clear that TAT-SDT is used for UL timing maintenance during CG-SDT procedure. And it is of no question that the legacy TAT (i.e. timeAlignmentTimerCommon in SIB) is used for UL timing maintenance during legacy RA procedure.

The issue is which TAT should be used for UL timing maintenance during RA-SDT procedure.

**Issue 22: Which TAT should be used for UL timing maintenance during RA-SDT procedure?**

**- Option 1: Legacy TAT (i.e. timeAlignmentTimerCommon in SIB).**

**- Option 2: TAT-SDT.**

**- Option 3: Any of legacy TAT or TAT-SDT.**

**Q22: Which option do you prefer?**

|  |  |  |
| --- | --- | --- |
| Company | Preferred option | Detailed Comments |
| ZTE | We think single TAT could be simpler (i.e. option 2), but Option 3 is also okay | Basically, it seems legacy TAT is used for TA maintenance whilst TAT-SDT is used for TA maintenance as well as maintenance of CG-resource.  The main question is whether the initial value of these two timers will be the same or not. If the initial value can be assumed to be the same, then we think we can reuse single timer and simplify the framework. If not then we can maintain both timers for different purposes. |
| Samsung | Option 1 | Same timer and handling as in legacy RA procedure |
| Sharp | Option 1 |  |
| OPPO | Option 1 |  |
| TCL | Option 1 | Legacy TAT is sufficient and no optimization is needed. |
| ASUSTeK | Option 1 |  |
| NEC | Option 1 | We think the TAT-SDT timer is only used for CG-SDT. |
| LGE | Option 1 |  |
| Intel | Option 1 | Legacy TAT timer seems enough. Moreover, this same timer can also be used for CG-SDT procedure. |
| Lenovo, Motorola Mobility | Option 1 |  |

Regarding TAT behaviour, it seems that all companies agree that legacy TAT starts/restarts when RAR TAC or TAC MAC CE is received, regardless of SDT procedure. It is good to confirm this assumption.

**Issue 23: Do you agree that the legacy TAT (i.e. timeAlignmentTimerCommon in SIB1) starts/restarts when RAR TAC or TAC MAC CE is received, regardless of SDT procedure, i.e. no change to the current behaviour?**

**- Option 1: Yes.**

**- Option 2: No.**

**Q23: Which option do you prefer?**

|  |  |  |
| --- | --- | --- |
| Company | Preferred option | Detailed Comments |
| ZTE | Option 1 |  |
| Samsung | Option 1 |  |
| Sharp | Option 1 |  |
| OPPO | Option 1 |  |
| TCL | Option 1 |  |
| ASUSTeK | Option 1 |  |
| NEC | Option 1 |  |
| LGE | Option 1 |  |
| Intel | Option 1 | Same as legacy operation of TAT |
| Lenovo, Motorola Mobility | Option 1 |  |

For the TAT-SDT, it is agreed that the TAT-SDT starts upon reception of CG-SDT configuration in the RRCRelease message, and restarts upon reception of TAC. The rapporteur think that the TAT-SDT restart upon TAC reception is only for CG-SDT procedure, and it is not clear whether the TAT-SDT starts/restarts when RAR TAC (i.e. Msg2 or MsgB) or TAC MAC CE is received during legacy RA procedure and RA-SDT procedure. It is good to clarify this point.

**Issue 24: Does the TAT-SDT start/restart when RAR TAC is received during legacy RA procedure?**

**- Option 1: Yes.**

**- Option 2: No.**

**Q24: Which option do you prefer?**

|  |  |  |
| --- | --- | --- |
| Company | Preferred option | Detailed Comments |
| ZTE | Option 1 | We think TAT-SDT can be restarted since it is used for CG configuration maintenance which is somehow implicitly related to TA. We already agreed this, right??.  RAN2#113e: “TAT-SDT is started upon receiving the TAT-SDT configuration from Gnb, i.e. RRCrelease message, and can be (re)started upon reception of TA command.” |
| Samsung | See comments | TAT-SDT start/restart upon completion of RA procedure. It is not started/restarted upon reception of RAR TAC. Note that it is possible that after RAR reception, RA procedure is not completed |
| Sharp | Option 1 for restart | TAT-SDT could be restarted if it is running. However, we think TAT-SDT could only be started when RRC release is received |
| OPPO | See comments | Depends on whether RA is completed successfully. But we are not sure whether the CG-SDT resources are released when RACH/RA-SDT is triggered. |
| TCL | Option 1 | TAT-SDT may (re)started when *RRCRelease* message is received, when transited from connected state to inactive state, or the termination of RA-SDT procedure. |
| ASUSTeK | Option 2 | As LTE PUR, TAT-SDT could start/restart upon completion of RA procedure. |
| NEC | Option 1 |  |
| LGE | Option 2 | During legacy RA procedure, the uplink timing is managed by legacy TAT. At the end of legacy RA procedure, if the UE receives RRCRelease message, the the UE will start TAT-SDT based on the TAT-SDT configuration. If the UE receives RRCResume or RRCSetup message, the UE will transit to RRC\_CONNECTED, and the legacy TAT will be used. Thus, there is no need to start/restart TAT-SDT during legacy RA procedure. |
| Intel | Option 1 | We would like to confirm that TAT-SDT (i.e. CG-specific TAT) is only applicable to CG-SDT procedure but indeed an RA-SDT proc or legacy RA proc can happened while TAT-SDT (i.e. CG-specific TAT). If RAN2 agrees that TAT-SDT is specific to CG (dependent on companies’ responses in Q22), we would prefer to use update the name to avoid confusions that is may apply to RA-SDT. |
| Lenovo, Motorola Mobility |  | Agree with Samsung. Regarding Oppo’s comment: We think CG-SDT resources are not release when RACH/RA-SDT is triggered. |

**Issue 25: Does the TAT-SDT start/restart when RAR TAC is received during RA-SDT procedure?**

**- Option 1: Yes.**

**- Option 2: No.**

**Q25: Which option do you prefer?**

|  |  |  |
| --- | --- | --- |
| Company | Preferred option | Detailed Comments |
| ZTE | Option 1 | Per the current agreement… |
| Samsung | See comments | TAT-SDT start/restart upon completion of RA procedure. It is not started/restarted upon reception of RAR TAC. Note that it is possible that after RAR reception, RA procedure is not completed |
| Sharp | Option 1 for restart | Same comments as Q24 |
| OPPO | See comments | Same view as Q24 |
| TCL | Option 1 | Same comments as Q24 |
| ASUSTeK | Option 2 | Same as Q24. |
| NEC | Option 1 |  |
| LGE | Option 2 | Similar to legacy RA procedure case, there is no need to start/restart TAT-SDT during RA-SDT procedure. |
| Intel | Option 1 | Same comments as Q24 |
| Lenovo, Motorola Mobility |  | Same as for previous question. The criteria for restarting the timer is the successful contention resolution. |

**Issue 26: Does the TAT-SDT start/restart when TAC MAC CE is received during subsequent RA-SDT procedure?**

**- Option 1: Yes.**

**- Option 2: No.**

**Q26: Which option do you prefer?**

|  |  |  |
| --- | --- | --- |
| Company | Preferred option | Detailed Comments |
| ZTE | Option 1 |  |
| Samsung | Option 1 |  |
| Sharp | Option 1 for restart | Same comments as Q24 |
| OPPO | See comments | Further discussion may be needed on whether CG-SDT resources are kept when RA-SDT is triggered. |
| TCL | Option 1 |  |
| ASUSTeK | Option 1 |  |
| NEC | Option 1 |  |
| LGE | Option 2 | During RA-SDT procedure, the UE will not perform CG-SDT procedure. At the end of RA-SDT procedure, the UE will (re)start the TAT-SDT if RRCRelease is received. Thus, there is no need to (re)start TAT-SDT during RA-SDT procedure. |
| Intel | See comments in Q25 |  |
| Lenovo, Motorola Mobility | Option 1 |  |

Last issue is whether the CG-SDT resource should be released at the expiry of legacy TAT, raised by Intel [4]. However, it is not clear when this case can happen, because the legacy TAT, even if it is started during SDT procedure upon reception of RAR TAC or TAC MAC CE, would be considered as expired at the end of the SDT procedure (i.e. MAC is reset upon reception of RRCRelease message). Thus, the rapporteur want to check whether this is realistic scenario that the legacy TAT expires while the UE is in RRC\_INACTIVE.

**Issue 27: Do you think the legacy TAT can expire while the UE is in RRC\_INACTIVE?**

**- Option 1: Yes.**

**- Option 2: No.**

**Q27: Which option do you prefer?**

|  |  |  |
| --- | --- | --- |
| Company | Preferred option | Detailed Comments |
| ZTE | Option 1 |  |
| Samsung | Option 1 |  |
| Sharp | Option 2 |  |
| OPPO | Option 1 |  |
| TCL | Option 1 |  |
| ASUSTeK | Option 1 |  |
| NEC | Option 1 |  |
| LGE | Option 2 | Could someone explain in which case the legacy TAT expire in RRC\_INACTIVE? |
| Intel | Option 1 | We understand this timer can expire while UE is in RRC\_INACTIVE and has an SDT procedure ongoing. Current question can be misleading as it only refers to a UE in INACTIVE without any reference to the SDT procedure. |
| Lenovo, Motorola Mobility | Option 1 |  |

If it is agreed that the legacy TAT can expire in RRC\_INACTIVE, it should be discussed whether the CG-SDT resource should be released at the expiry of legacy TAT.

**Issue 28: If the legacy TAT can expire while the UE is in RRC\_INACTIVE, should the CG-SDT resource be released at the expiry of legacy TAT?**

**- Option 1: Yes.**

**- Option 2: No.**

**Q28: Which option do you prefer?**

|  |  |  |
| --- | --- | --- |
| Company | Preferred option | Detailed Comments |
| ZTE | Option 2 | We should stick to current behaviour. i.e. as below:   1. when a *timeAlignmentTimer* expires: 2. clear any configured downlink assignments and configured uplink grants;   This means that the resource will be cleared in MAC, but the RRC configuration will not be released. The CG configuration will only be released when the CG-SDT timer expires (assuming we will have two separate timers for this). |
| Samsung | Option 2 | CG-SDT resources are released when TAT-SDT expires, |
| Sharp | Option 2 |  |
| OPPO | Option 2 |  |
| TCL | Option 2 | When the TAT expired, the CG-SDT resources become invalid and should be released. |
| ASUSTeK | Option 2 |  |
| NEC | Option 2 | We think the expiry of legacy TAT timer cannot control the release of CG-SDT resource. |
| LGE | Option 2 |  |
| Intel | Option 2  (but see comment) | We understand that legacy TAT should run during CG-SDT but being used for same purpose of legacy operation. In addition, TAT-SDT also be used for CG-SDT operation in relation to the validity of the CG resources as explained in CG TDoc R2-2109623 with the proposal “*Proposal 7: During an ongoing SDT session, if CG-specific TAT expires (or is not running) or TA criterion for RSRP-delta threshold is not met, the SDT session can still continue using DG (understanding that CG-SDT configuration is released upon CG-specific TAT expiry and is considered invalid when TA criterion for RSRP-delta is not met)*”.  On summary for CG-SDT operation, our understanding is that both timer legacy TAT and CG-specific TAT are used aiming for different purposes. |
| Lenovo, Motorola Mobility | Option 2 |  |

## 2.8 Token bucket

The related proposals in the submitted documents are captured below.

|  |
| --- |
| [10] Proposal 3: RAN2 to discuss the handling of token bucket for SDT in RRC\_INACTIVE. |

Lenovo [10] ask whether the token bucket is used for SDT. The token bucket mechanism is used in RRC\_CONNECTED in order to avoid the starvation of low priority LCHs. However, there may be no starvation issue for uplink transmissions in RRC\_INACTIVE, and this mechanism is not needed for SDT. Companies are asked to provide their views on this issue.

**Issue 29: Is the token bucket mechanism applied for SDT?**

**- Option 1: Yes.**

**- Option 2: No.**

**Q29: Which option do you prefer?**

|  |  |  |
| --- | --- | --- |
| Company | Preferred option | Detailed Comments |
| ZTE | Yes | No change is needed to support this in MAC. The logical channel configuration stored in the UE context will be reused for this anyway. |
| Samsung | Yes |  |
| Sharp | Option 1 |  |
| OPPO | Option 2 |  |
| TCL | Option 1 |  |
| ASUSTeK | Option 1 |  |
| NEC | Option 1 | No specification change. |
| LGE | Option 1 |  |
| Intel | Yes | Same view as ZTE |
| Lenovo, Motorola | Option 2 | We don’t see a need for using the token bucket mechanism for SDT, since there will be no starvation issue in RRC-INACTIVE (SDT) as in RRC-Connected. Similar to the discussion about whether to apply LCH restrictions for RRC\_INACTIVE we would prefer here some simplification for the UE. However we don’t have a strong opinion here. But for Option 1 we would need to clarify whether Bj is maintained when moving from RRC\_CONNECTED to RRC\_INACITVE and not initialize the value or initialized to zero. According to the current spec, Bj is initialized to zero when LCH is established. |

## 2.9 PUSCH skipping

The related proposals in the submitted documents are captured below.

|  |
| --- |
| [1] Proposal 2: The Rel-16 PUSCH skipping feature is supported for CG-SDT. |

Given that the realistic traffic pattern is difficult to precisely predict, the UE may not have any available uplink data at beginning of the transmission occasion of CG PUSCH. Thus, vivo [1] propose to support PUSCH skipping for CG-SDT.

**Issue 30: Is the PUSCH skipping mechanism supported for CG-SDT?**

**- Option 1: Yes.**

**- Option 2: No.**

**Q30: Which option do you prefer?**

|  |  |  |
| --- | --- | --- |
| Company | Preferred option | Detailed Comments |
| ZTE | Option 1 | No change is needed to support this in MAC. The logical channel configuration stored in the UE context will be reused for this anyway. |
| Samsung | Option 1 |  |
| Sharp | Option 1 |  |
| OPPO | Option 1 |  |
| TCL | Option 1 |  |
| ASUSTeK | Option 1 |  |
| NEC | Option 1 | No specification change. |
| LGE | Option 1 |  |
| Intel | Option 1 | Same view as ZTE |
| Lenovo, Motorola Mobilty | Option 1 | We think that this is some important functionality for SDT |

## 2.10 TA validation

RAN1 has further discussed the remaining issues on the SSB subset determination for RSRP based TA validation, but still companies cannot reach consensus to select one from the following options. Thus, RAN1 ask RAN2 to down-select a solution below [21]. RAN1 kindly asks if the down-selection can be done in RAN2. Note that in RAN1#105-e meeting RAN1 has agreed that the SSB subset for RSRP based TA validation is determined at least based on a configured absolute RSRP threshold.

|  |
| --- |
| The SSB subset for RSRP based TA validation is determined as   * Option 1: Within a set of SSBs configured per CG configuration * Option 2: Within a set of SSBs configured for all CG configurations * Option 3: Within a set of all SSBs actually transmitted as indicated in SIB1 * Option 4: Highest N SSBs of all SSBs actually transmitted as indicated in SIB1 |

**Issue 31: Which SSB subset should be used for RSRP based TA validation?**

**- Option 1: Within a set of SSBs configured per CG configuration.**

**- Option 2: Within a set of SSBs configured for all CG configurations.**

**- Option 3: Within a set of all SSBs actually transmitted as indicated in SIB1.**

**- Option 4: Highest N SSBs of all SSBs actually transmitted as indicated in SIB1.**

**Q31: Which option do you prefer?**

|  |  |  |
| --- | --- | --- |
| Company | Preferred option | Detailed Comments |
| ZTE | Option 4 | We have no strong view on this, but we think the important thing to ensure is that there is only one TA maintained per cell. So, the actual criterion should be per cell (not per CG configuration). So, it is not clear what option 1 exactly means.  Option 2 could work, but we are not sure if the actual TA of the cell is based on the SSBs on which CG resource is configured.  So, we think options 3 and 4 are independent of the CG configuration and may be one of them is sufficient.  Option 4 is similar to cell selection criterion. So, we thought this could be simply reused. |
| Samsung | Option 3/4 | TA is per cell and not per CG configuration. So either option 3 or option 4 is sufficient. |
| Sharp | Option 4 | Share the same view with ZTE. |
| OPPO | Option 4 | In our understanding, whether TA is valid depends on the location of UE, regardless of whether CG resources are configured. We are fine with Option4 which is similar as the criteria of cell reselection. |
| TCL | Option 3/4 | Agree with Samsung |
| ASUSTeK | Option 1 or 2 | It is weird to evaluate TA validity of CG-SDT based on SSBs not for CG-SDT. Whether the TA is valid should be based on SSBs in the CG configuration(s) which are actually used for CG-SDT. |
| NEC | Option 3 or 4 | We do not have strong view for Option 3 or 4, while as ZTE points out, it would be reasonable to consider per cell evaluation |
| LGE | Option 1 or 2 | In legacy, TA maintenance is per TAG not per cell.  For TAT-SDT, it is used to check the validity of CG-SDT resource, and thus it is related to CG. We slightly prefer Option 1 over Option 2. |
| Intel | Option 1 (1st preference), or option 2 | Our understanding is that CG-SDT procedure should be relatively short and the UE is assumed with a relatively stationary or low mobility conditions (e.g. UE’s CG-SDT configuration is provided in previous RRCRelease msg). Given that a suitable set of SSBs for CG-PUSCH association can be flexibly controlled by the gNB, we do not think we need separate SSB set for TA validation and CG-PUSCH association. Therefore option 1 and 2 seems sufficient |
| Lenovo, Motorola Mobility | Option 4 | We have the same understanding that TA is maintained per cell. We understand that Option 1 refers to the case where UE has selected an CG configuration based on SSB RSRP and then UE checks criteria for TA validation among the SSBs configured for the selected CG config. |

# 3. Conclusions

To be filled later..

# 4 Contact Information

|  |  |
| --- | --- |
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# References

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[2] R2-2109524 User Plane Common Aspects of RACH and CG based SDT Samsung

[3] R2-2109593 Common aspects for SDT Ericsson

[4] R2-2109621 User plane leftover issues for SDT procedure Intel

[5] R2-2109711 Remaining UP open issues Fujitsu

[6] R2-2109768 Discussion on user plane issues of SDT OPPO

[7] R2-2110030 User plane aspects of SDT Apple

[8] R2-2110182 User plane common aspects for SDT Huawei, HiSilicon

[9] R2-2110255 Remaining user plane aspects of SDT NEC

[10] R2-2110328 The UP common issues for small data transmissions Lenovo, Motorola Mobility

[11] R2-2110397 Consideration on UP remaining issues of SDT? CATT

[12] R2-2110575 User plane common aspects for SDT ZTE Corporation, Sanechips

[13] R2-2110667 Clarification on the data volume computation Xiaomi

[14] R2-2110752 Remaining issues on UP aspects of SDT Qualcomm

[15] R2-2110809 UP aspects for SDT Nokia, Nokia Shanghai Bell

[16] R2-2110915 User plane aspects of small data transmission InterDigital

[17] R2-2110983 Handling of legacy TAT and CG-SDT-TAT LG Electronics Inc.

[18] R2-2111039 Leftover UP common issues of SDT CMCC

[19] R2-2111124 Remaining UP issues in SDT LG Electronics Inc.

[20] R2-2110671 Remaining issues of CG SDT in RAN2 Xiaomi

[21] R2-2109330 LS on the TA validation and mapping details for CG-SDT ZTE