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

**Electronic meeting, August 16 – August 27, 2021**

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

**Source:** LG Electronics (Rapporteur)

**Title:** [AT115-e][501][SData] UP SDT open issues (LG)

**Document for:** Discussion and Decision

# 1. Introduction

This document is to kick-off the discussion on the UP SDT open 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 – August 19, 23:59 UTC
		- Rapporteur summary – August 20
		- Final comments on Rapporteur summary – August 23, 23:59 UTC

# 2. Discussion

## 2.1 PDCP status report

The related proposals in the submitted documents are captured below.

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| [1] Proposal 1: PDCP entity does not trigger PDCP status report when PDCP entity re-establishment of an AM DRB is triggered for small data transmission.[2] Proposal 2: PDCP status reporting is not supported for NR SDT.[4] Proposal 1 Whether to trigger PDCP status report is explicitly indicated by network, i.e., the network reconfigures the PDCP-Config for SDT DRBs in order to not allowing the SDT DRBs to trigger PDCP status report.[5] Proposal 2. PDCP status reports are not sent during PDCP re-establishment for every SDT session.[5] Proposal 3. The suppression of the PDCP status report during PDCP re-establishment for every SDT session is enabled implicitly in the specification when the UE initiates SDT procedure (i.e. without explicit indication sent by the network to allow suppression of the PDCP status report for SDT).[6] Proposal 8: The PDCP status report shall not be triggered by the PDCP entity re-establishment, in case the PDCP is suspended before the re-establishment.[10] Proposal 5: For SDT DRB, if the PDCP re-establishment is triggered due to the PDCP entity being resumed after PDCP entity suspending, the PDCP entity should omit the PDCP status report.[14] Proposal 3: PDCP status report should be disabled implicitly when the UE initiates SDT procedure.[15] Proposal 1: The UE implicitly disables PDCP status report when SDT is initiated.[18] Proposal 1: At SDT initiation, the PDCP entity triggers a PDCP status report when RRC requests a PDCP re-establishment, and the PDCP entity is configured with statusReportRequired, same as legacy.[18] Proposal 2: At SDT initiation, the RRC “autonomously” configures the PDCP entity with statusReportRequired and requests the PDCP entity to perform PDCP re-establishment. |

It is common understanding that the PDCP entity should not trigger PDCP status report at initiation of SDT procedure. The issue is whether the PDCP status report is suppressed by explicit indication (same as legacy) or by implicit operation. Even in implicit operation, there are two options, i.e. RRC implicitly de-configures statusReportRequired or PDCP entity implicitly disables PDCP status report.

**Issue 1: How to suppress PDCP status report at initiation of SDT procedure?**

**- Option 1: Network reconfigures PDCP-config (i.e. de-configure statusReportRequired) in the RRCRelease.**

**- Option 2: RRC implicitly de-configures statusReportRequired.**

**- Option 3: PDCP implicitly disables PDCP status report.**

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

|  |  |  |
| --- | --- | --- |
| Company | Preferred option | Detailed Comments |
| ASUSTeK | Option 3 |  |
| Fujitsu | Option 1 | Same as legacy. This option might be specified in RRC, if needed, in such a way that field description says that absence of the indication means no PDCP SR for SDT. |
| LG | Option 2 | The PDCP entity does not know whether a SDT procedure is initiated or not. What PDCP entity knows is whether the AM DRB is configured to send a PDCP status report and whether a request for PDCP entity re-establishment is received. We think it is better to keep this principle, i.e. PDCP entity triggers a PDCP status report based on configuration and indication, even for SDT.As RAN2 already agreed to perform PDCP re-establishment autonomously at SDT initiation, it is much cleaner and easier way to specify in RRC that RRC “autonomously” de-configures the PDCP entity with *statusReportRequired* and requests the PDCP entity to perform PDCP re-establishment when the SDT procedure is initiated. |
| Samsung | Option 2/3 |  |
| Nokia | Option 2 | However, we don’t fully understand the “implicitly”; we just write in the procedure that disable PDCP status report etc. |
| CMCC | Option 3 | If the PDCP status report is triggered during PDCP re-establishment, the content is not useful for network anymore, which will increase unnecessary overhead.  |
| ZTE | Option 3 | Option 2 would need changes to RRC spec and can also work Option 3 will need changes to PDCP specWe have a slight preference for disabling PDCP status report for all cases when the PDCP entity is suspended before the re-establishment. This then works not just for SDT but for all other cases where the redundant PDCP status report is generated (and this seems to be a known issue not just for SDT). This will be more appropriate in our view, but we are open to consider option 2 also if this is the majority preference.  |
| OPPO | Option2 | Whether to trigger PDCP status report is configured by the upper layer, i.e., RRC. We are fine with both Option1 and Option2. While it seems that Option2 is simpler since it is not necessary to reconfigure the PDCP-Config just for suppressing the PDCP status report in SDT, which actually can be considered as an optimization. |

## 2.2 ROHC continuity

The related proposals in the submitted documents are captured below.

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| [1] Proposal 6: Discuss and agree one of the following options for ROHC continuity- Option 1: drb-ContinueROHC (common for all DRBs) is signaled in RRCRelease message. The information (e.g. cell ids) to identify cells where UE can continue ROHC is also indicated in RRCRelease message.- Option 2: drb-ContinueROHC (common for all DRBs) is signaled in RRCRelease message. gNB Identity mask or gNB Identity is also signaled in RRCRelease message. UE can continue ROHC in cells of GNB identified by gNB Identity mask or gNB Identity.[5] Proposal 1. Network can control using SDT configuration (e.g. via in RRCRelease message) whether UE should continue RoHC state or not. This information could further restrict whether RoHC state can continue only in a given region (e.g. same cell where UE Inactive AS Context is stored or current configured RNA to UE).[6] Proposal 6: 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. |

It is already agreed that whether to support ROHC continuity is explicitly configured by the network. The issue is the area scope of the ROHC continuity applicability. Another issue is whether the gNB configures the area scope or not.

**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.**

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

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| --- | --- | --- |
| Company | Preferred option | Detailed Comments |
| Fujitsu | Option 1 | Same as legacy. This option might be specified in RRC, if needed, in such a way that field description says that absence of the indication means no PDCP SR for SDT. |
| LG | Option 2 or Option 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. |
| Samsung | Option 2/3 |  |
| Nokia | Option 3 | Option 2 can be implemented by the NW with Option 3. |
| CMCC | Option 2 |  |
| ZTE | Option 3 | We think defining a new cell list for this purpose is a bit of an over optimisation. So, we think option 3 is enough.  |
| OPPO | Option 3 |  |

**Issue 3: If ROHC continuity is configured, does the gNB also configure the area scope?**

**- Option 1: Yes, the gNB configures area scope.**

**- Option 2: No, the applicable area scope is specified in the specification.**

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

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| --- | --- | --- |
| Company | Preferred option | Detailed Comments |
| Fujitsu | Option 2 | The specification can describe that ROHC is continued in RNA. |
| LG | Option 2 |  |
| Sasmung | Option 1/2 | Either option works. |
| Nokia | Option 2 |  |
| ZTE | Option 2 |  |
| OPPO | Option 2 |  |
|  |  |  |

## 2.3 RLC failure

The related proposals in the submitted documents are captured below.

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| [2] Proposal 3: RLC failure handling is not supported for NR SDT.[6] Proposal 5: During the SDT, in case “RETX\_COUNT = maxRetxThreshold” is detected in RLC, RLC should indicate to upper layers that max retransmission has been reached.[18] Proposal 3: For SDT, RRC re-establishment procedure is not performed at RLC failure.[18] Proposal 4: For SDT RBs, RLC failure detection function is disabled. |

The issue is whether the RRC re-establishment is triggered by the RLC failure, same as in RRC\_CONNECTED.

**Issue 4: Does the RLC failure trigger RRC re-establishment?**

**- Option 1: Yes, RLC failure triggers a failure indication to RRC, same as in RRC\_CONNECTED.**

**- Option 2: No, RLC failure detection is disabled for SDT.**

**Rapporteur’s comment: During the online discussion on Tuesday, it is agreed to go with Option 1. No more discussion needed.**

## 2.4 Data volume criteria

The related proposals in the submitted documents are captured below.

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| [1] Proposal 4: For data volume based criteria for SDT selection, total amount of data available across all RBs for which SDT is enabled is compared against the data volume threshold.[1] Proposal 5: RLC header and MAC header are not considered in data volume computation.[2] Proposal 1: The size of MAC/RLC/PDCP/RRC overhead should be considered for data volume calculation in NR SDT.[3] Proposal 1 At SDT initiation stage, UE checks whether the resulting MAC PDU is not larger than the configured data volume threshold. It is up to UE implementation to decide the size of the MAC PDU, i.e., without specifying the contents that may result this MAC PDU.[5] Proposal 4. The data volume new threshold is defined as an upper limit on the amount of data in the buffer (for SDT RBs) to be met during the initiation of the SDT procedure. The volume calculation accounts for the headers in the same way as legacy data volume calculations are done for BSR.[6] Proposal 14: The amount of UL SDT data available for a logical channel should be determined according to the data volume calculation procedure in TS 38.323. There is no need to consider the data buffered in RLC/MAC and RLC/MAC header.[7] Proposal 3: Data volume used for SDT triggering criteria should be up to UE implementation. [7] Proposal 4: Some guidance can be added in the spec that the data volume can be calculated by predicting the PDCP data volume after resuming SDT radio bearers and re-establishing PDCP if SDT is triggered.[8] Proposal 4: The UE computes the small data volume as the total number of buffered bits for LCHs mapped to DRBs configured for small data transmission. UE computes the data volume at the time of SDT resource selection.[9] Proposal 7: The data volume can be calculated as the buffered data size of corresponding RLC/PDCP transmission entity for which the SDT is configured if the MAC layer can have visibility of data arriving before the RBs are resumed.[11] Proposal 1: Date volume computation for SDT should be based on the total sum of Buffer Sizes across SDT RBs.[12] Proposal 8 Data available in DRBs configured for SDT when SDT procedure is triggered is used for comparison to DVT threshold, i.e. no headers are considered.[14] Proposal 1: Data volume used for SDT selection criteria is calculated same as BS, i.e. PDCP data volume + RLC data volume, without considering RLC and MAC headers.[15] Proposal 2: Data volume used for SDT selection criteria is the PDCP data volume (Option 3).[18] Proposal 5: Data volume used for SDT selection criteria is calculated as the total sum of Buffer Size across SDT RBs.[19] Proposal 1: For CG/2-step RACH SDT, the data volume threshold is the uplink grant size of CG and MsgA respectively.[19] Proposal 2: For 4-step RACH SDT, the data volume threshold is configured in SIB.[19] Proposal 3: The data volume threshold for different SDT procedure can be different.[19] Proposal 4: The data volume used for SDT selection criteria includes the data of the SDT RB and the RRCResumeRequest message.[19] Proposal 5: Data volume used for SDT selection criteria is the size of MAC PDU. |

This issue was discussed in RAN2#113bis-e, and four options are still on the table.

**Issue 5: Which data volume should be used for SDT selection criteria?**

**- Option 1: Data volume used for SDT selection criteria is calculated same as BS, i.e. PDCP data volume + RLC data volume, without considering RLC and MAC headers.**

**- Option 2: Data volume used for SDT selection criteria is the size of MAC PDU, i.e. PDCP data volume + RLC data volume + MAC/RLC/PDCP/SDAP/RRC overhead.**

**- Option 3: Data volume used for SDT selection criteria is the PDCP data volume.**

**- Option 4: Data volume used for SDT selection criteria is left up to UE implementation.**

**Rapporteur’s comment: During the online discussion on Tuesday, it is agreed to go with Option 1. No more discussion needed.**

One more issue is whether the data volume threshold is same or different for CG-SDT and RA-SDT.

**Issue 6: Is the data volume threshold same for both CG-SDT and RA-SDT?**

**- Option 1: Yes, data volume threshold is same for both CG-SDT and RA-SDT.**

**- Option 2: No, data volume threshold is different for CG-SDT and RA-SDT.**

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

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| --- | --- | --- |
| Company | Preferred option | Detailed Comments |
| ASUSTeK | Option 1 | Since there would be subsequent transmission, it’s simple to have a general data volume threshold. |
| Fujitsu | Option 1 | We assume that the only difference of CG-SDT and RA-SDT would be whether the radio resource is CG or RACH. From the data transmission perspective, there is no difference between CG-SDT and RA-SDT, so that the same threshold would be the same. |
| LG | Option 1 | Agree with Fujitsu |
| Samsung | Option 1 | There is no need to change previous agreement(RAN2#113bise) |
| Nokia | Option 2 | We don’t see any reason to restrict NW configuring different thresholds given the SDT validity conditions are separate for CG-SDT and RA-SDT.Gnb knows exactly how many Ues are configured with CG-SDT in its cell(s) and hence can easily control the size of the grants it gives; while it does not really have knowledge about number of Ues going to perform RA-SDT so it might decide to be more conservative for RA-SDT threshold. |
| CMCC | Option 1 |  |
| ZTE | Option 1 | Note that data volume threshold is for overall data in the entire SDT session. So, this is nothing to do with the initial UL message or the first CG message. So, we think option 1 is enough and simpler.  |
| OPPO | Option 1 |  |

## 2.5 LCH Restrictions

The related proposals in the submitted documents are captured below.

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| [1] Proposal 2: LCH restrictions configured in logical channel configuration are not applied while generating MAC PDU for SDT.[2] Proposal 4: The Rel-16 LCP restriction can be supported for CG-SDT.[5] Proposal 5. Logical channel prioritization is applied during SDT mechanism with the related configurations provided for RRC\_CONNECTED are also applicable.[5] Proposal 6. Logical channel restriction is applied during SDT mechanism (except for carrier selection that is not applicable) with the related configurations are specific to SDT and can optionally be different for RA-SDT and CG-SDT.[8] Proposal 7: LCP LCH selection restrictions configured in LCP in connected mode are kept and reused for SDT in Inactive state.[9] 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.[12] Proposal 9 Multiplexing of different LCHs in an SDT MAC PDU is subject to configuration.[12] Proposal 10 LCH restrictions are separately configured for CG-SDT and RA-SDT[12] Proposal 11 LCH restrictions should be part of the validation of CG-SDT and RA-SDT at SDT procedure initialization[16] Proposal 11: Support LCH restriction in SDT.[18] Proposal 6: LCH restrictions used for SDT is explicitly indicated by the network. |

The issue is whether the LCH restrictions are applied for SDT, and, if applied, whether the LCH restrictions used for SDT is configured by the network. One more issue is whether the LCH restrictions are separately configured for CG-SDT and RA-SDT.

**Issue 7: Are the LCH restrictions applied for SDT?**

**- Option 1: Yes, LCH restrictions are applied for SDT.**

**- Option 2: No, LCH restrictions are not applied for SDT.**

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

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| --- | --- | --- |
| Company | Preferred option | Detailed Comments |
| ASUSTeK | Option 1 |  |
| Fujitsu | Option 1 | Except for the carrier selection. There can be a case that multiple configurations are configured for CG-SDT. The LCP restriction can control the usage of CG resources by LCH(s). |
| LG | Option 1 |  |
| Samsung | Option 2 | We have agreed that RBs for which SDT is enabled is configured by gNB. So we do not see any need to applying LCH restrictions on top of that. |
| Nokia | Option 2 | Otherwise, SDT DRBs would need to be considered as non-SDT DRBs unless they are permitted to multiplex data, e.g., to CG-SDT resources while they would be only allowed over RA-SDT resources. |
| CMCC | Option 1 |  |
| ZTE | Option 2 | Agree with Nokia and Samsung. This just duplicates the already agreed mechanism to configure only some RBs for SDT. If LCH restrictions are to be processed, then we have to make an additional assumption that there will no LCH restrictions for SDT RBs to send data during SDT session.  |
| OPPO | Option 2 |  |

**Issue 8: If the LCH restrictions are applied for SDT, can the LCH restrictions used for SDT be different from the LCH restrictions used in RRC\_CONNECTED?**

**- Option 1: Yes, they can be different, and the gNB may configure LCH restrictions used for SDT via RRCRelease message.**

**- Option 2: No, they should be same. The gNB does not configure LCH restrictions used for SDT, and the LCH restrictions used in RRC\_CONNECTED are kept and reused for SDT.**

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

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| --- | --- | --- |
| Company | Preferred option | Detailed Comments |
| ASUSTeK | Option 2 |  |
| Fujitsu | Option 1 | Option 2 seems to be too restrictive. SDT procedure is only for small data transmission, so that separate configuration different from that in connected mode can be considered. |
| LG | Option 1 | Agree with Fujitsu. |
| Nokia | Option 1 | We don’t fully understand how they could be same if this is specified? |
| CMCC | Option 1 |  |
| ZTE | Option 1 | If this is needed, then RRCRelease seems correct (since otherwise we need two messages first to do the reconfiguration and then to do the RRCRelease). However, we think the network should ensure that the LCH restrictions don’t preclude data mapped to SDT RBs to transmit data during SDT session (either on RA-SDT or CG-SDT) and the rest can be left to network implementation.  |
| OPPO | Option 1 | The LCH restriction configuration may not be suitable for SDT any more since the service type/requirement are different. |

**Issue 9: If the LCH restrictions are applied for SDT and the gNB configures LCH restrictions used for SDT, are they separately configured for CG-SDT and RA-SDT?**

**- Option 1: Yes, LCH restrictions used for SDT are separately configured for CG-SDT and RA-SDT.**

**- Option 2: No, same LCH restrictions are applied for both CG-SDT and RA-SDT.**

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

|  |  |  |
| --- | --- | --- |
| Company | Preferred option | Detailed Comments |
| ASUSTeK | Option 2 | The LCH restrictions in connected mode could be reused. |
| Fujitsu | Option 1 | For RA-SDT, it seems that allowedCG-List-r16 is not needed. |
| LG | Option 2 | LCH restrictions are configured per logical channel. We don’t see the need to provide two sets of LCH restrictions for one logical channel. |
| Nokia | Unclear | We are not sure what is being asked here, is LCH restricted to use CG-SDT but not RA-SDT or vice versa? |
| CMCC | Option 2 | Agree with LG. |
| ZTE | Unclear | But eventually, we want to ensure that even if LCH restrictions are used, they will not restrict any mapping of data either to RA-SDT or CG-SDT grants for all RBs configured for SDT (for instance by signalling that the allowedCG-List is not applicable for SDT or something like that).  |
| OPPO | Option 1 | allowedCG-List-r16 is specific for CG transmission. |

## 2.6 BSR

The related proposals in the submitted documents are captured below.

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| [6] 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.[6] 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.[7] Proposal 5: During SDT, the BSR calculation does not take suspended radio bearers into consideration.[8] Proposal 2: UE can indicate to the gNB need for subsequent small data by multiplexing a small data BSR MAC CE[8] Proposal 3: A new BSR is triggered using the existing BSR triggers upon new data arrival for SDT DRBs.[9] Proposal 6: RAN2 to discuss whether the MAC layer can have visibility of data arriving before the RBs configured for SDT are resumed.[11] Proposal 2: For SDT, A short BSR information should be included in the first uplink message and if needed for the subsequent UL transmissions in INACTIVE state.[12] Proposal 4 As a baseline, BSR reporting to trigger a DCI to C-RNTI for new grant is the baseline for subsequent transmissions in SDT.[12] Proposal 5 Legacy BSR triggers are sufficient to handle arrival of new SDT data and transmission (multiplexing of BSR into the MAC PDU, when triggered).[12] Proposal 6 As a baseline, legacy BSR formats are used for SDT.[16] Proposal 12: Include C-RNTI as well as BSR in the content of MSG3/MSGA during the RA which is triggered by the BSR when new SDT data arrives during subsequent SDT.[17] Proposal 1: BSR MAC CE could be included in the first UL message and subsequent transmission(s) of the SDT procedure.[17] Proposal 2: BSR cancellation (i.e. UL grant is not sufficient to accommodate both all pending data and BSR MAC CE) is applied to the first UL message and subsequent transmission(s) of the SDT procedure. |

Though there are many proposals submitted to BSR, the rapporteur think that there are not many issues that need to be discussed. Most companies think that legacy BSR mechanism used in RRC\_CONNECTED can be applied to SDT. Whether to consider suspended RB in BSR calculation is discussed in another e-mail, and it doesn’t need to be discussed here. The only issue that may need to be discussed here is whether the SDT specific BSR configuration is introduced.

**Issue 10: Can the BSR configuration used for SDT be different from the BSR configuration used in RRC\_CONNECTED?**

**- Option 1: Yes, they can be different, and the gNB may configure BSR configuration used for SDT.**

**- Option 2: No, they should be same. The gNB does not configure BSR configuration used for SDT, and the BSR configuration used in RRC\_CONNECTED are kept and reused for SDT.**

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

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| --- | --- | --- |
| Company | Preferred option | Detailed Comments |
| ASUSTeK | Comment | The UE can apply the BSR configuration in the default MAC Cell group configuration. |
| Fujitsu | Option 1 | Option 2 seems to be too restrictive. SDT procedure is only for small data transmission, so that separate configuration different from that in connected mode can be considered. For example, *periodicBSR-Timer* can have a long value. |
| LG | Option 1 |  |
| Samsung | Option 2 | No special configuration specifically for SDT is needed. |
| Nokia | See comment | We think Asustek’s proposal is fine for SDT, default LCG can be set for SDT DRBs. It should be noted that the target gNB does not know the BSR config before context fetch so we see it less useful to have specific configuration on it. |
| CMCC | Option 1 |  |
| ZTE | Option 1 | We think a different configuration can be specified but this can be SDT specific configuration.  |
| OPPO | Comments | Agree with ASUSTek, it is enough to use BSR configuration in default MAC group configuration. |

**Issue 11: If the gNB configures BSR configuration used for SDT, how it is signaled?**

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

**- Option 2: via system information.**

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

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| --- | --- | --- |
| Company | Preferred option | Detailed Comments |
| ASUSTeK | Option 1 |  |
| Fujitsu | Option 1 | Dedicated RRC message is better than SIB since SDT procedure is UE-specific for which dedicated configuration would be provided. |
| LG | Option 1 |  |
| Nokia | Option 1 | If BSR configuration would be needed. Default config would not require any configuration. |
| CMCC | Option 1 |  |
| ZTE | Option 2 | It depends on whether different cell can configure different BSR configuration. An SDT specific configuration can be specified in SIB and if this is not broadcast the UE can use the default configuration.  |
| OPPO | Option 1 |  |

## 2.7 PHR

The related proposals in the submitted documents are captured below.

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| [1] Proposal 3: PHR MAC CE priority is considered lower than DTCH during the SDT procedure.[4] Proposal 2 In SDT procedure, if there are PHR(s) triggered, PHR MAC CE is multiplexed in the MAC PDU if the availialbe UL grant can not accommodate all the buffered data but can accommodate the MAC CE of PHR plus its subheaders. Otherwise, UE accommodates all the buffered data in the UL grant and cancels all the triggered PHR(s).[5] Proposal 7. PHR configuration provided in RRC\_CONNECTED is re-used during SDT unless Gnb indicates otherwise (i.e. Gnb explicitly indicates that PHR configuration provided in RRC\_CONNECTED is not applicable during SDT operation).[6] 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 .[6] 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[7] Proposal 6: During SDT, if UL grant can accommodate the data, but not sufficient to additionally accommodate for PHR plus its header, the PHR is not transmitted.[8] Proposal 5: PHR functionality can be reused and supported as is in INACTIVE state. The LCP multiplexing priority of the PHR MAC CE is not changed.[8] Proposal 6: The default MAC configuration is used for determining the PHR parameters in INACTIVE.[9] Proposal 4: The relative priority order of MAC Ces and MAC SDUs applied in connected state shall be applied to SDT when multiplexing MAC Ces and MAC SDUs in a MAC PDU.[9] Proposal 5: The PHR MAC CE is allowed to be contained in the first PUSCH message (i.e. MSG3 for 4-step RACH, MSGA payload for 2-step RACH and the CG transmission for CG).[10] Proposal 6: PHR is reported in the subsequent data phase of SDT. [10] Proposal 7: The legacy PHR MAC CE priority should be kept in SDT.[11] Proposal 3: For PHR functionality, refine the configuration parameters, reporting type and triggering conditions.[12] Proposal 7 A Data volume threshold is defined for when PHR is triggered.[13] Proposal 5: Dedicated PHR configuration can be provided to the UE in RRCRelease message. [13] 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[13] Proposal 7: For a “multi-shot” SDT procedure, PHR is triggered upon initiation of SDT procedure.[13] Proposal 8: Only single entry PHR is supported for both CG-SDT and RA-SDT.[16] Proposal 5: Single Entry PHR MAC CE is applied in SDT.[16] Proposal 6: Type 2 and MPE P-MPR report are not supported in SDT.[16] Proposal 7: Send LS to RAN1 to check whether SRS is supported in SDT and then decide whether Type 3 power headroom is supported in SDT.[16] Proposal 8: PHR can be triggered when:- phr-ProhibitTimer and phr-PeriodicTimer expires;- path loss has changed more phr-Tx-PowerFactorChange Db;- default PHR configuration is applied to the UE during SDT initiation.[16] Proposal 9 Current PHR triggering procedure can be reused in SDT.[16] Proposal 10: Current logical channel prioritization procedure can be reused in SDT.[17] Proposal 3: PHR MAC CE could be included in the first UL message and subsequent transmission(s) of the SDT procedure.[17] Proposal 4: PHR cancellation (i.e. UL grant is not sufficient to accommodate both all pending data and PHR MAC CE) is applied to the first UL message and subsequent transmission(s) of the SDT procedure.[18] Proposal 9: During the subsequent SDT procedure, the UE includes PHR MAC CE in the MAC PDU if there are remaining space in the UL grant after including UL data.[20] Proposal: The SDT data is prioritized over the PHR during the SDT procedure. |

It seems that majority companies support to configure PHR specific to SDT. But there are diverged views on details of PHR operation in SDT. Main issues of PHR are summarized below.

**Issue 12: Is the LCP priority of PHR MAC CE in SDT same as in RRC\_CONNECTED?**

**- Option 1: Yes, PHR MAC CE in SDT should be prioritized over SDT data, same as in RRC\_CONNECTED.**

**- Option 2: No, SDT data should be prioritized over PHR MAC CE.**

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

|  |  |  |
| --- | --- | --- |
| Company | Preferred option | Detailed Comments |
| ASUSTeK | Option 1 | It is beneficial to let network determine proper scheduling for subsequent transmission with PHR. |
| Fujitsu | Option 1 | PHR information by MAC CE is one of key factors to control the radio performance by the Gnb. The legacy procedure is better to be kept. |
| LG | Option 2 | The time required for SDT procedure is short, and the amount of data transmitted by SDT is small. Thus, there is no reason to tightly control UL transmission power like in RRC\_CONNECTED. It might be sufficient to include PHR MAC CE only when there is remaining space in UL grant after including SDT data. |
| Samsung | Option 2 |  |
| Nokia | Option 1 | However, PHR is only useful if subsequent data is expected after the initial SDT transmission. |
| CMCC | Option 2 |  |
| ZTE | Option 2 |  |
| OPPO | Option 1 |  |

**Issue 13: Are the PHR triggers in SDT same as in RRC\_CONNECTED?**

**- Option 1: Yes, legacy PHR triggers should be applied for SDT.**

**- Option 2: No, PHR triggers for SDT should be different from legacy PHR triggers (e.g. new PHR triggers should be defined or some of legacy PHR triggers should not be applied).**

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

|  |  |  |
| --- | --- | --- |
| Company | Preferred option | Detailed Comments |
| ASUSTeK | Option 1 |  |
| Fujitsu | Option 1 | The PHR trigger has been designed to keep the radio performance good. Keeping the legacy triggers would be the baseline. |
| LG | Option 2 | Most of the existing PHR triggers are not applicable/needed for SDT, as shown below.- pathloss change: the path loss would not change much during the SDT procedure - phr-PeriodicTimer: SDT does not last long, so periodic trigger is not needed.- upon configuration or reconfiguration of the power headroom reporting functionality by upper layers: PHR is not reconfigured in RRC\_INACTIVE.- activation of an SCell: SCell is not activated in RRC\_INACTIVE.- addition of the PSCell: PSCell is not added in RRC\_INACTIVE.- power backoff: Power backoff is not applicable for SDT.- upon switching of activated BWP from dormant BWP to non-dormant DL BWP: Dormant BWP is not applicable for SDT.- mpe-Reporting-FR2: MPE is not applicable for SDT.Thus, we think very simple PHR trigger (e.g. only when there is remaining space in UL grant after including SDT data) is enough for SDT. |
| Samsung | Option 1 | No new trigger is needed. |
| Nokia | Option 2 | In case subsequent data after initial SDT transmission is expected, PHR is triggered. |
| CMCC | Option 1  |  |
| ZTE | Option 1 |  |
| OPPO | Option 2 | Agree with Nokia |

**Issue 14: During the SDT procedure, should the triggered PHR be cancelled if all SDT data are included in the UL grant?**

**- Option 1: Yes, all the triggered PHRs should be cancelled.**

**- Option 2: No, triggered PHR should be transmitted.**

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

|  |  |  |
| --- | --- | --- |
| Company | Preferred option | Detailed Comments |
| ASUSTeK | Option 1 | The PHR is not required if there is no more UL data for subsequent transmission. |
| Fujitsu | Option 1 | See Q13. |
| LG | Option 1 |  |
| Samsung | - | Follow legacy behaviour |
| Nokia | Depends | This does not mean there would not be subsequent data (e.g., in DL). So if there is more data expected, PHR should be transmitted. |
| CMCC | Option 1 |  |
| ZTE | - | Follow legacy behaviour |
| OPPO | Option 1 |  |

## 2.8 TAT

The related proposals in the submitted documents are captured below.

|  |
| --- |
| [6] Proposal 10: Discuss and determine which TAT timer will be used in RA-SDT.- Alt1: Normal TAT timer- Alt2: TAT-SDT timer[6] Proposal 11: 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).[9] Proposal 8: The new TAT for CG based SDT is reused for the subsequent data transmission of RACH based SDT. |

RAN2 already agreed to introduce a new TAT-SDT for CG-SDT. The issue is which TAT should be used for RA-SDT.

**Issue 15: Which TAT should be used for RA-SDT?**

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

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

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

|  |  |  |
| --- | --- | --- |
| Company | Preferred option | Detailed Comments |
| ASUSTeK | Option 1 | The UE would not always have the TAT-SDT since it’s configured with CG-SDT. |
| Fujitsu | Option 2 | TAT-SDT is better than TAT since SDT procedure is UE-specific for which dedicated value would be provided. |
| LG | Option 2 | We think a new TAT-SDT governs all UE behaviors in RRC\_INACTIVE. |
| Samsung | Option 1 | TAT-SDT is for CG-SDT and not applied for RA-SDT. |
| Nokia | Neutral/Option 1 | We think legacy TAT should cover most of the cases intended for SDT. |
| CMCC | Option 1 | Normal TAT can be used for RA-SDT; TAT-SDT is configured for CG-SDT.  |
| ZTE | Option 2 | We also think option 1 works, but it seems we already agreed to have TAT-SDT (at least for CG) and hence it seems we can reuse this.  |
| OPPO | Option 1 | TAT-SDT is configured for CG-SDT as in previous agreement, which is used to maintain the TA validation even when the procedure is not initiated. While We think the TAT used in RA-SDT more likes the Normal TAT. |

## 2.9 BFD and BFR

The related proposals in the submitted documents are captured below.

|  |
| --- |
| [11] Proposal 5: RAN2 to send an LS to RAN1 to investigate how to address the beam failure detection (BFD) and beam failure recovery (BFR) for SDT.[18] Proposal 7: Whether to support BFD for SDT is up to RAN1 decision.[18] Proposal 8: If BFD for SDT is supported, SDT failure handling procedure is triggered when BFD is indicated by PHY. |

During the e-mail discussion in [AT113bis-e][501], majority companies think that BFD and BFR issues can be left up to RAN1 decision. But, if RAN1 agree to introduce BFD, RAN2 needs to discuss whether BFR procedure should be performed in case when BFD is indicated by PHY.

**Issue 16: If BFD is indicated by PHY, which procedure should be performed?**

**- Option 1: RA procedure, same as legacy.**

**- Option 2: General SDT failure handling procedure.**

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

|  |  |  |
| --- | --- | --- |
| Company | Preferred option | Detailed Comments |
| ASUSTeK | Option 2 | BFD could be considered as SDT failure. It’s simple to follow general SDT failure handling procedure. |
| Fujitsu | Option 1 | Same as legacy, but as discussed online, it is better to ask RAN1. |
| LG | Option 2 | According to current specification, when a beam failure is detected, the UE shall initiate a RA procedure b.ecause there is only one cell configured for the UE in RRC\_INACTIVE. However, unless UE performs SDT procedure, beam failure recovery is not needed. If there is no UL data available for transmission in RRC\_INACTIVE, triggering RA procedure for BFR is useless and should be avoided. We think it would be better to handle the BFD as a SDT failure rather than BFR. |
| Samsung | Option 1 | As in legacy. |
| Nokia | Option 1 | Rather simple given we agreed to perform RA for other triggers during SDT as well (e.g., TAT expiry). |
| CMCC | Option 1 | Same as legacy. |
| ZTE | Postpone the discussion until RAN1 feedback is received | Option 1 requires the configuration of BFR search space. We are not sure whether the BFR search space is available for RA-SDT. We can leave this (procedure of BFR) to RAN1 |
| OPPO | Option 1 |  |

## 2.10 DL SPS

The related proposals in the submitted documents are captured below.

|  |
| --- |
| [2] Proposal 7: DL SPS configuration cannot be configured for NR SDT. |

**Issue 17: Should the DL SPS be supported for SDT?**

**- Option 1: Yes.**

**- Option 2: No.**

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

|  |  |  |
| --- | --- | --- |
| Company | Preferred option | Detailed Comments |
| ASUSTeK | Option 2 |  |
| Fujitsu | Option 1 | The SDT procedure is UL procedure. There is no need to configure SPS since it is DL-specific procedure.[ZTE] seems the answer and the comment don’t match?? Do you mean to say option 2? |
| LG | Option 2 |  |
| Samsung | Option 2 |  |
| Nokia | Option 2 | This can be looked in a future release. |
| CMCC | Option 2 |  |
| ZTE | Option 2 | This is excluded by the WID!! We should not even discuss this.  |
| OPPO | Option 2 |  |

## 2.11 Data inactivity timer

The related proposals in the submitted documents are captured below.

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| --- |
| [6] Proposal 9: DataInactivityTimer is not applicable to SDT. |

**Issue 18: Should the DataInactivityTimer be supported for SDT?**

**- Option 1: Yes.**

**- Option 2: No.**

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

|  |  |  |
| --- | --- | --- |
| Company | Preferred option | Detailed Comments |
| ASUSTeK | Option 2 | We agree with the proposal in [6]. The new T319 in inactive state can handle the similar purpose to DataInactivityTimer in connected state. |
| Fujitsu | Option 1 | DataInactivityTimer was introduced for other purpose. There is no need to configure this timer. |
| LG | Option 2 |  |
| Samsung | Option 2 |  |
| Nokia | Option 2 | We have agreed T319-like timer to dictate the SDT procedure already. |
| CMCC | Option 2 |  |
| ZTE | Option 2 |  |
| OPPO | Option 2 | We have agreed that connected DRX function is not supported in SDT. DataInactivityTimer is used in connected mode DRX. |

## 2.12 RLC polling

The related proposals in the submitted documents are captured below.

|  |
| --- |
| [2] Proposal 5: For NR SDT, RAN2 confirms RRC will defer actions 60 ms from the moment the RRCRelease message was received or optionally when lower layers indicate that the receipt of the RRCRelease message has been successfully acknowledged (i.e. same action as in legacy NR).[2] Proposal 6: For NR SDT, RAN2 confirms polling bit can be set in the RLC PDU including RRCRelease message (i.e. same action as in legacy NR). |

**Issue 19: Should the RLC polling be supported for SDT?**

**- Option 1: Yes.**

**- Option 2: No.**

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

|  |  |  |
| --- | --- | --- |
| Company | Preferred option | Detailed Comments |
| ASUSTeK | Option 1 |  |
| Fujitsu | Option 1 | Same as RLC failure, existing function would be kept. |
| LG | Option 2 | RLC polling is used to avoid window stalling. However, not many data will be transmitted in SDT. Then, there is no need to send the poll. The UE can just rely on HARQ feedback. |
| Samsung | Option 1 |  |
| Nokia | Option 1 | It would be more specification work to disable this – we don’t see no harm to having the polling given it is anyway triggered based on NW configuration. |
| CMCC | Option 1 |  |
| ZTE | Option 1 | Agree, no need to disable anything explicitly (needs more work to do this) |
| OPPO | Option 1 |  |

## 2.13 RLC re-establishment

The related proposals in the submitted documents are captured below.

|  |
| --- |
| [7] Proposal 1: UE performs RLC re-establishment implicitly, i.e. without explicit indication for RLC re-establishment, when the UE initiates SDT procedure.[7] Proposal 2: If RRCResume is sent by the network during SDT, the baseline is network only configures reestablishPDCP and reestablishRLC for the non-SDT radio bearers. |

It was agreed that UE performs PDCP re-establishment implicitly at initiation of SDT procedure. However, when and how to perform RLC re-establishment is not discussed yet.

**Issue 20: Should the RLC re-establishment be performed implicitly at initiation of SDT procedure, similar to PDCP re-establishment?**

**- Option 1: Yes.**

**- Option 2: No.**

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

|  |  |  |
| --- | --- | --- |
| Company | Preferred option | Detailed Comments |
| ASUSTeK | Option 1 |  |
| Fujitsu | Option 1 | Same as PDCP re-establishment. |
| LG | Option 1 | We think this is missing part of previous agreement. |
| Samsung | Option 1 |  |
| Nokia | Option 1 | Implicit seems wrong word, RRC procedure orders to trigger RLC re-establishment. |
| CMCC | Option 1 |  |
| ZTE | Option 1 | But agree with Nokia observation, RRC will request this anyway (as is the case in the current running CR) |
| OPPO | Option 1 |  |

# 3. Conclusions

To be filled later..

# 4 Contact Information

|  |  |
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# References

[1] R2-2107002 User Plane Common Aspects of RACH and CG based SDT Samsung Electronics Co., Ltd

[2] R2-2107053 Further Discussion on User Plane Aspect for Small Data Transmission vivo

[3] R2-2107245 Discussion on the remianing issues of SDT modelling OPPO

[4] R2-2107246 Discussion on user plane issues of SDT OPPO

[5] R2-2107295 User Plane leftover issues on SDT mechanism Intel Corporation

[6] R2-2107487 Common aspects for UP for SDT ZTE Corporation, Sanechips

[7] R2-2107778 User plane aspects of SDT NEC

[8] R2-2107844 User plane aspects of small data transmission InterDigital, Europe, Ltd.

[9] R2-2107898 The UP common issues for small data transmissions Lenovo, Motorola Mobility

[10] R2-2107991 UP common aspects of SDT Qualcomm Incorporated

[11] R2-2108055 User Plane aspects of SDT in NR Sony

[12] R2-2108087 Common aspects for SDT Ericsson

[13] R2-2108200 User plane common aspects for SDT Huawei, HiSilicon

[14] R2-2108508 UP common issues of SDT CMCC

[15] R2-2108680 Consideration on PDCP protocol in SDT CATT

[16] R2-2108681 Consideration on UP common aspects of SDT CATT

[17] R2-2108710 BSR and PHR for SDT procedure ASUSTeK

[18] R2-2108730 Remaining UP issues in SDT LG Electronics Inc.

[19] R2-2108788 Discussion on the data volume computation Xiaomi Communications

[20] R2-2108789 Handling of MAC CE Xiaomi Communications