**3GPP TSG-RAN WG2 Meeting #116bis-e R2-22XXXXX**

**E-meeting, January 17th – 25th, 2022**

**Agenda item:** 8.6.3

**Source:** Interdigital

**Title:** Summary of Rel-17 SDT contributions on Control Plane Common Aspects

**Document for:** Discussion

# Introduction

This paper aims to provide a summary of the contributions to R2#116bis-e, AI 8.6.3 on control plane common aspects (contributions: see References section).

NOTE: Since the aim of this summary is to provide the chairman with a list of the topics that seems to have the support of the majority of the companies, some proposals for easy agreements and some important proposals for the sake of progress, aspects that are raised by only one or two companies are not included in this summary.

# Contact Points

Respondents to the email discussion are kindly asked to fill in the following table.

|  |  |  |
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# Non-SDT data arrival indication

The issues of the non-SDT data arrival indication were discussed in [1] [6] [8] [10] [14], [17] [23] [24] and [27].

[1] is comprehensively covering the open issues of the non-SDT data arrival indication and so the issues are not handled in this summary.

# SDT Failure Detection Timer handling

The issue of SDT failure detection timer (SFDT) handling was discussed in [4] [6] [9] [10] [12] [13] [14] [15] [19] [23] and [28].

There are 2 options.

Option 1: SFDT has an extended duration to accommodate subsequent SDT.

Option 2: SFDT is restarted upon (re)transmission or reception of small data.

In [4] [10] [13] [14] [19] [23] [28], Option 1 was proposed, while in [6] [12] [15], Option 2 was proposed.

In addition, [9] is the summary of email discussion [Post113-e][503], which discussed SFDT handling. At that time, 13 companies supported Option 1 and 12 companies supported Option 2.

Detailed comments for Option 1:

* *Network can always fall back to CONN if UE timer running out*
* *Time bound nature avoids potential issues of long SDT duration*
  + *Smart gNB implementation an configure proper timer value*
* *SDT mechanism is short by definition, so one timer duration is sufficient*
* *A simple solution*

Detailed comments for Option 2:

* *Advantages:*
  + *Avoids SDT being time bound as timer for subsequent SDT is variable and cannot be predicted in advance*
  + *Provides flexibility*
  + *Allows failures to be detected more quickly*
* *Disadvantages:*
  + *Think new timer is maintained by RRC. If adopted frequent interaction between RRC and lower layers are required to (re)start timer*
    - *To avoid issue, timer could be in MAC layer*
  + *Timer may have issues for CG-SDT considering can have very long period*

Summary: Option 1 has majority this time. Thus, it makes sense to go for the majority view (i.e. Option 1) for the sake of time.

Q1: Do you agree that the SDT failure detection timer has an extended duration to accommodate subsequent SDT (i.e. not restarted upon user activity)? If not, please provide the technical reasoning, which hasn’t yet been raised before.

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| --- | --- | --- |
| Answers to Q1 | | |
| Company | Yes/No | Technical Arguments |
| Samsung | Yes |  |
| Apple | Yes | Our proposal in Tdoc is Option 2, but we are fine to go for majority’s preference option 1 and let RRC to control this SDT failure timer. |
| Fujitsu | Yes | As proposed in [4]. |
| ZTE | Yes | We think this is a simple solution that can work for both CG and RA-SDT and we can adopt this. |
| LGE | Yes |  |
| Sharp | Yes |  |
| Xiaomi | Yes |  |
| OPPO | Yes |  |
| NEC | Yes | We can follow the majority. |
| Sony | No | RAN1 agreed that there is no beam failure recovery mechanism and there is no beam reporting from UE. If there is a beam failure, for Option 1, it will take long time a UE to notice the failure. While Option 2 enables a fast detection of the failure. The SDT failure detection timer could be in MAC layer. |
| Ericsson | Yes |  |
| Huawei, HiSilicon | Prefer option 2 | We prefer option 2 because it is more flexible for the network to control SDT session, but we can compromise if majority prefers option 1. |
| Intel | See comment | Our preference is aligned to option 2 as explained in [6] but will accept option 1 if it is preferable by the majority of the companies. |
| China Telecom | Yes |  |
| ITRI | Yes |  |
| CATT | Yes | In addition, if option 2 is agreed and specified in MAC layer, we need to re-consider whether legacy T319 is needed or not. |
| Spreadtrum | Yes |  |
| Qualcomm | Yes |  |
| Nokia, Nokia Shanghai Bell | Yes |  |
| vivo | Yes | The SDT failure detection timer should not be restarted during an ongoing SDT procedure. |
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# Paging

The issue of the paging was discussed in [2] [5] [6] [11] [14] [15] P12 [21] and [28].

There are two options.

Option 1: UE does not monitor any paging occasion for paging while in SDT operation.

Option 2: UE monitors paging while in SDT operation.

In [2] [6] [11] [14] [15] [21] [28], Option 1 is proposed.

In [5], Option 2 is proposed.

The proponents of Option 1 basically claim the following reasoning.

* Network is aware of UE and Network can resume connection if needed during an SDT session.

The proponent of Option 2 claims that UL procedure and DL procedure are separate procedure and so UE should monitor paging even if UE performs SDT operation.

Summary: Obviously majority support Option 1 and it technically makes sense that UE doesn’t monitor paging while UE is reachable from the network so we should go for Option 1.

Q2: Do you agree that UE doesn’t need to monitor paging occasion for paging while in SDT operation? If not, please state the technical argument, which hasn’t yet been raised before.

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| Answers to Q2 | | |
| Company | Yes/No | Technical Arguments if the answer is “No” |
| Samsung | See comments | In our view, UE needs to monitor for paging until the response to initial UL transmission is received from network during the SDT procedure. During subsequent data transmission phase paging monitoring is not required.  If UE does not monitor paging until the response to initial UL transmission is received from network during the SDT procedure, the issue is that   * when the network sends the CN paging, UE will not be able to receive it until SDT procedure is completed (i.e. SDT timer expires). Network sending CN paging means that there is state mismatch and in this case network will not be able receive initial UL transmission in CG resource as it is not monitoring the CG resource. As a result network has to keep (re-)transmitting CN paging via one or more cell(s) unnecessarily and UE will keep transmitting in CG resource unnecessarily until SDT timer expires. |
| Apple | Yes | Paging reception during the initial SDT phase is up to UE implementation, since in legacy it’s up to UE implementation to receive paging during the RACH for IDLE/INACTIVE UE.  Paging reception during the subsequent SDT phase is not needed, since NW is aware of the UE and can resume the connection if needed. |
| Fujitsu | Yes | As proposed in [4]. Our proposal is that UE behaviour can be same as legacy. |
| ZTE | Yes | We agree with the rapporteur. Since anyway the UE is initiating a resume procedure for SDT, monitoring the UE specific paging (which anyway would trigger resume) would not be needed. |
| LGE | Yes |  |
| Sharp | Yes |  |
| Xiaomi | Yes |  |
| OPPO | Yes |  |
| NEC | comments | We think the main point even paging message is received, since the UE is initiating RRC Resume procedure already, the UE cannot initiate another RRC Resume procedure for this paging message. So we think it is up to UE implementation whether to monitoring paging during SDT, and the UE shall not initiate RRC Resume procedure in response to paging during SDT. |
| Sony | Yes |  |
| Ericsson | Yes |  |
| Huawei, HiSilicon | It depends | As agreed previously, the UE needs to monitor Paging for SI and PWS, so we should not change this agreement.  For mt-Data there is no need for UE to monitor and we agree with comments from Apple for this case. The UE will anyway attempt to establish a connection with the network with either RA-SDT or CG-SDT, so there is no need to react to Paging (which would also lead to UE trying to establish a connection).  Furthermore, state mismatch is a very rare case. |
| Intel | Yes |  |
| China Telecom | Yes | After initiating the RRCResume procedure for SDT, the NW is aware of the UE and can resume the connection (if needed). So, there is no need to monitor the UE specific paging. |
| ITRI | Yes |  |
| CATT | Yes | The UE is not required to monitor paging during RRC connection establishment and RRC connection resume procedure. Thus, the principle can be reused when the UE initiates the first UL transmission of SDT. |
| Spreadtrum | Yes |  |
| Qualcomm | Comments | RAN2 #114e has agreed “The UE needs to monitor paging after UE initiates SDT for system information change, PWS. FFS for other cases.” We should not revert the agreements.  If the question is to address the FFS for other cases, we are fine to not monitor as the other companies has explained that network has been aware of UE |
| Nokia, Nokia Shanghai Bell | See comments | The UE should monitor paging since there could be e.g. DL initiated emergency call. We agree with Samsung. |
| vivo | No | The paging might be CN paging in our view. |
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# SI update

The issue of SI update was discussed in [2] [3] [6] [11] [14] [19] [28].

**SI change notification and emergency notification monitoring**

In RAN2 #114, it was agreed that

* UE needs to at least monitor SI change notification and emergency notification during SDT procedure.
* **FFS for other cases**.

[2] tried to address the FFS.

In [2], the following proposals were proposed to clarify UE performs monitoring the notifications in the same way as the one in RRC\_INACTIVE state.

Proposal 1: During the SDT procedure (i.e. while SDT timer is running), UE monitors SI change indication in any paging occasion at least once per modification period.

Proposal 2: During the SDT procedure (i.e. while SDT timer is running), ETWS or CMAS capable UEs monitors PWS notification in any paging occasion at least once every *defaultPagingCycle*.

[6] implicitly proposed the same by saying "UE behaves like for a legacy UE in RRC\_INACTIVE when specification does not indicate different or SDT-specific operation (e.g. for measurements)".

Summary: Only one company tried to address the FFS but it looks reasonable to follow their proposals.

Q3: Do you agree the following proposals? If not, please provide the technical reasoning.

Proposal 1: During the SDT procedure (i.e. while SDT timer is running), UE monitors SI change indication in any paging occasion at least once per modification period.

Proposal 2: During the SDT procedure (i.e. while SDT timer is running), ETWS or CMAS capable UEs monitors PWS notification in any paging occasion at least once every *defaultPagingCycle*.

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| --- | --- | --- |
| Answers to Q3 | | |
| Company | Yes/No | Technical Arguments |
| Samsung | Yes | UE needs to at least monitor SI change notification and emergency notification during SDT procedure was already agreed. These proposals further clarify the POs/DRX cycles in which SI change notification and emergency notification are monitored during the SDT procedure. |
| Apple | No | The UE behavior can be same as legacy, i.e. monitor the indication/notification in its own paging occasion every DRX cycle.  If the SDT is applicable for eDRX UE, UE’s own cycle may be longer than the default paging cycle. |
| Fujitsu | No | UE behaviour can be same as legacy. |
| ZTE | Yes | Even in connected mode UE monitors this. So, it seems we should not change this for SDT. |
| LGE | Yes |  |
| Sharp | Yes |  |
| Xiaomi | No | We can follow the legacy UE behavior for SI change notification and emergency notification monitoring. |
| OPPO | Yes |  |
| NEC | Yes |  |
| Sony | Yes |  |
| Ericsson | Yes |  |
| Huawei, HiSilicon | Yes | We agree with those proposals, but it should be noted that they correspond to how the UE currently behaves in RRC Connected mode. But since the UE will have data session ongoing it is more reasonable to allow the UE to monitor any PO, not necessarily its own Idle mode PO. |
| Intel | Yes | We agree that UE follows legacy SI behaviour defined for a UE in RRC\_INACTIVE during an SDT session. |
| China Telecom | Yes |  |
| ITRI | Yes |  |
| CATT | Partial | Share the same view with Apple that at least proposal 1 is not applicable to eDRX UEs during SDT procedure. We can agree the two proposals for DRX UEs and further update with agreements for eDRX UEs. |
| Spreadtrum | Yes |  |
| Qualcomm | No | We prefer to keep legacy UE behavior for SI change and emergency notification in idle/inactive state. |
| Nokia, Nokia Shanghai Bell | Yes |  |
| vivo | No | We fail to see the motivation of changing the legacy behavior for IDLE/INACTIVE. |
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**On-demand SI Request**

In [14], it was proposed to select one of the following options:

* Option 1: Do not support on demand SI during SDT
* Option 2: Only support msg1 based on demand SI on the same carrier as the ongoing SDT
* Option 3: Use DedicatedSIBRequest for on demand SI (similar to RRC\_CONNECTED)

[3] [19] proposed Option 1. The reasons are as follows:

* Before initiating the SDT procedure, UE would have acquired all essential SIBs needed for operating in a camped cell.
* The SI request may lead to UL carrier switching (UL carrier selected at the time of initiation of SDT can be different from UL carrier selected at the time of SI request) or BWP switching (in case SDT is performed on non-initial BWP) which interrupts the ongoing SDT procedure.
* for the approach of SI request for RRC\_CONNECTED, it is not clear yet whether the *DedicatedSIBRequest* can be transmitted during SDT procedure. Moreover, it should also need to be discussed whether *RRCReconfiguration* message can be received in response to *DedicatedSIBRequest* during SDT procedure

[28] proposed either option 2 or 3 above.

[11] proposed Option 3 + a new DL RRC message, which carries the requested SIBs.

[11] justified the on-demand SI request during SDT procedure as follows:

The UE that is in the middle of an SDT session may need to request the network for delivery of on-demand SI. This can be useful in particular to the positioning UEs to be able to request posSIBs

Summary: There are split views. By considering the expected impacts mentioned above and the fact that SDT procedure won’t last long, it looks reasonable to go for Option 1: Do not support on demand SI during SDT.

Q4: Do you agree that on-demand SI request is not supported during SDT? If not, please provide the technical arguments.

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| --- | --- | --- |
| Answers to Q4 | | |
| Company | Yes/No | Technical Arguments |
| Samsung | Yes |  |
| Apple | Yes |  |
| Fujitsu | Yes or O2 | Option 2 can be acceptable as legacy. |
| ZTE | Yes | Considering that the SDT session is expected to be a short session, we think such optimization should not be considered. |
| LGE | Yes |  |
| Sharp | Yes |  |
| Xiaomi | Yes |  |
| OPPO | Yes |  |
| NEC | Yes | Although we think msg1 based on-demand SI request can be supported during SDT, but it is also OK to restrict that on-demand SI is not supported during SDT. |
| Ericsson | Yes |  |
| Huawei, HiSilicon | No | As we indicated in our Tdoc, this is useful, especially for positioning. We agree with points from some papers that msg1 based SI request will cause issues, but request via *DedicatedSIBRequest* does not have this issue. In order to limit the specifications impact, we could not define the DL RRC message for SIB delivery but instead rely on the network to broadcast the requested SI messages. |
| Intel | Yes |  |
| China Telecom | Yes |  |
| ITRI | Yes |  |
| CATT | - | Our preferred option in our tdoc is to re-use the UE behaviour in RRC\_IDLE/INACTIVE as much as possible, i.e. option 2. But if we are fine with option 1 if it is majority views. |
| Spreadtrum | Yes |  |
| Qualcomm | Yes |  |
| Nokia, Nokia Shanghai Bell | Yes |  |
| vivo | Yes | We think the UE can subsequently perform on-demand SI request after the ongoing SDT procedure. |
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# RNA update

The issue of RNA update was discussed in [3] [6] [10] [11] [13] [14] [15] [18] and [28].

All the companies proposed not to perform RNA update during SDT procedure.

However, there are 2 different flavors how to avoid RNAU:

Option 1: T380 is stopped upon initiation of SDT procedure, T380 is restarted upon moving back to the legacy RRC\_INACTIVE state i.e. upon reception of RRCRelease.

Option 2: T380 continues running upon SDT session initiation but RNA update is not initiated upon T380 expiry during SDT procedure.

In [3] [10] [13] [14] [15], Option 1 was proposed.

In [6] [11] [15] [28], Option 2 was proposed. Actually [6] had slightly different proposal from Option 2 but proposed:

Option 2’: T380 continues running upon SDT session initiation but RNA update is not initiated upon T380 expiry during SDT procedure unless SDT session initiation fails

The underlined text is the difference from Option 2.

In [19], it’s just proposed to avoid RNAU during SDT procedure, but it didn’t describe any further details.

Summary: All companies proposed to avoid RNA update during SDT procedure but there are 2 ways: a) [5/9] T380 is stopped upon initiation of SDT procedure, T380 is restarted upon moving back to the legacy RRC\_INACTIVE state i.e. upon reception of RRCRelease, b) [4/9] T380 continues running upon SDT session initiation but RNA update is not initiated upon T380 expiry during SDT procedure.

Q5: Do you agree that T380 is stopped upon initiation of SDT procedure, T380 is restarted upon moving back to the legacy RRC\_INACTIVE state? If not, please provide the technical argument.

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| --- | --- | --- |
| Answers to Q5 | | |
| Company | Yes/No | Technical Arguments |
| Samsung | Yes |  |
| Apple | Yes |  |
| Fujitsu | Yes |  |
| ZTE | Yes | For restarting the T380, we think there will be no change needed (i.e. it will be started upon receiving RRCRelease with suspendconfig same as today).  Some companies were wondering if T380 should be restarted if SDT session fails. However, according to current agreements, if SDT session fails, UE moves to IDLE mode. So, then, there should be no T380 anyway in this case. So, stopping T380 upon initiating SDT seems necessary and sufficient. |
| LGE | No | If we go for Option 1, there may be other proposals to stop/restart the running timer in a future. We think Option 2 is much simpler. |
| Sharp | No | We think T380 could keep running until expiry. When it expires, if SDT failure detection timer is running, RNAU is not allowed to be triggered. |
| Xiaomi | Yes |  |
| OPPO | No | We also prefer not to change the legacy running mechanism of T380, i.e.,   | Timer | Start | Stop | | --- | --- | --- | | T380 | Upon reception of t380 in RRCRelease. | Upon reception of RRCResume, RRCSetup or RRCRelease. |   For Option1, another issue is whether T380 is restarted if RRCReject is received. |
| NEC | No | In legacy RRC Resume procedure, there is the same issue: RNA triggered during RRC Resume procedure, and at RAN2 #113bis, this is discussed in the main session and the follow agreement is achieved. For SDT, we should following the same principle and no special handling.  Agreement of RAN2 #113e  [R2-2102715](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113bis-e/Docs/R2-2102715.zip) Corrections to initiation upon reception of RAN paging and T380 Expiry Samsung Electronics Co., Ltd CR Rel-15 38.331 15.13.0 2476 - F NR\_newRAT-Core  - [006] Rap: Not pursued, no spec change required  - [006] Late comment: Ericsson – think we shall consider a Note, keep open for next meeting. Rap: OK to keep open for checking.   * [006] Not pursued * [006] The UE should not start the 2nd RRC resumption procedure when there is a RRC resumption procedure ongoing |
| Ericsson | Yes | Should also be restarted if UE receives the RRCReject. |
| Huawei, HiSilicon | Yes | To avoid issues with RRCReject, we can agree that the timer is only stopped after initial SDT transmission is successful, i.e. contention resolution is done or initial CG-SDT transmissions is acknowledged. |
| Intel | No | Legacy resume operation stops T380 when UE receives *RRCResume* message. If UE stops this time upon sending RRCResumeRequest msg, there is a risk that UE and network may be out of sync e.g. UE has stops T380 upon initiating SDT but this timer expires in gNB if/when that *RRCResumeRequest* msg fails.  Our preference is the following that Periodic RNAU timer (T380) continues running upon initiating the SDT session with the following clarifications as explained in [6]:   1. T380 is always (re)started at the end of the SDT session based on legacy RRCRelease procedure. This is part of legacy RRCRelease operation and do not require any change for SDT operation. 2. If T380 expires during an ongoing SDT session, UE does not need to take any action to notify the network. However, if SDT session is not successfully initiated (i.e. UE has not received the ACK to the 1st UL SDT msg.) when T380 expires, UE shall initiate legacy RNAU instead than SDT.   In addition, it would be good to discuss the scenario when at the same time UE requires to perform RNAU and there is SDT data available. In our understanding, the UE should be allowed to initiate SDT session as the only impact to the SDT proc. is that that the *resumeCause* set to *rna-Update*. |
| China Telecom | Yes | Per TS 38.331, upon the reception of RRCRelease, the UE shall   1. stop timer T380, if running; 2. if the RRCRelease includes suspendConfig:   2> if the *t380* is included:  3> start timer T380, with the timer value set to *t380*;  As shown above, if T380 timer is stopped upon SDT initiation, it can be restarted upon receiving the RRCRelease with suspendconfig. In case the SDT fails, the UE enters into IDLE state, and there is no need to restart the T380 timer. |
| ITRI | Yes |  |
| CATT | Yes |  |
| Spreadtrum | Yes | In the case of SDT failure, UE will move to IDLE and T380 is not needed. |
| Qualcomm | Yes | Similar view with Huawei’s comments. |
| Nokia, Nokia Shanghai Bell | No | NW can respond with RRC Reject for RRC Resume Request for SDT procedure. In this case the UE stays in INACTIVE and T380 would incorrectly be not re-started. Instead, it would be better to prohibit RNAU during SDT procedure even though T380 expires. |
| vivo | No | We think the simplest way is to keep the timer running and the UE, by smart implementation, will postpone the RNA updated after the ongoing SDT procedure. |
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# RRC signalling issues

The issue of RRC signalling issue was discussed in [6] [10] [11] [15] [25] [26] and [28].

**Delta signalling**

There is one FFS in the running RRC regarding to the delta signalling.

In [6], it was proposed:

*Proposal 6. Delta signaling is supported for the SDT related configuration. This delta signaling applies across different SDT sessions and when resuming the RRC connection (i.e. SDT related configuration is released when UE enters RRC\_IDLE or when the network explicitly releases the SDT configuration).*

Companies are invited to provide their views on the delta signalling.

Q6: Do you agree the following delta signalling proposal?

Proposal: Delta signalling is supported for the SDT related configuration. This delta signaling applies across different SDT sessions and when resuming the RRC connection (i.e. SDT related configuration is released when UE enters RRC\_IDLE or when the network explicitly releases the SDT configuration).

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| --- | --- | --- |
| Answers to Q6 | | |
| Company | Yes/No | Technical Arguments |
| Samsung | - | No strong view |
| Apple |  | No strong view |
| Fujitsu | Yes | See no reason to prohibit the delta signalling. |
| ZTE | No | No strong view but we are okay with this if majority support it. It is an optimization in the end and can be supported if it is straight forward.  However, one concern is the mismatch between UE and NW caused by the expiration of CG-validity timer. In case the timer expired, the CG resource will be released. However, considering the timer is maintained in RRC layer, and the delay in RLC/MAC/PHY, there maybe some case that the timer status is mismatch between UE and NW. To avoid such mismatch, one potential solution is to have the same behaviour as the expiration of TAT that we only release the CG resource in MAC but keep the CG resource in RRC. |
| LGE | Yes |  |
| Samsung | - | No strong view |
| Xiaomi | Yes |  |
| OPPO |  | No strong view |
| NEC | Yes | We see the benefit of this. Otherwise, the network has to reconfigure SDT to the UE at the end of each SDT procedure, which is not efficient from signalling perspective. |
| Ericsson | Maybe | Delta signalling can be efficient but also has a risk if not UE and NW is always in synch. RAN2 should discuss if is it needed in Rel 17. |
| Huawei, HiSilicon | Yes | It helps to decrease the signalling overhead. It would be quite bad design if the network would need to repeat SDT configuration after each SDT session, especially for stationary UEs, which usually stay in the same cell. |
| Intel | Yes | SDT sessions aims to be frequent small data transmissions at short intervals. There will be a fair amount of configuration associated with SDT. If these have to be signalled at every SDT session, they can be a significant relative to the volume of actual data sent in the SDT session. Therefore delta signalling of legacy Suspend and SDT configuration can reduce signalling overhead compared to volume of data.  So we think delta signalling should be supported by default. If there is any concern with any specific fields, we don’t have to use delta signalling just for those fields and they can use Need R. |
| China Telecom |  | No strong view |
| ITRI |  | No strong view |
| CATT | No | If delta signalling is agreed, we need to discuss whether to transfer this between inter-nodes. To keep it simple, we prefer not to apply delta signalling, especially for these configurations other than CG configuration as the overhead in Uu is small. |
| Spreadtrum |  | No strong view. |
| Qualcomm | No | It is an optimization. |
| Nokia, Nokia Shanghai Bell |  | No strong view |
| vivo | Comments | It is signaling optimization. We can discuss it during the ASN.1 review phase. |
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**Transmissible RRC messages during SDT procedure**

In [15] [25], it was proposed to discuss what RRC and NAS messages should be allowed for the SDT procedure in case SRB1 and/or SRB2 is/are configured for SDT.

[25] specified "The message candidates are ULInformationTransfer (including NAS message), UEAssistanceInformation and SidelinkUEInformationNR."

[6] explained that RAN1 LS R1-2102125 informed us "It is feasible from RAN1 perspective to use either a new common search space or a UE-specific search space, thus it can be up to RAN2 to make the decision. The configuration of CORESET will be further discussed, basically following the same design logic for search space" and so gNB should be able to configure the UE specific serach space prior to SDT procedure. Then in [6], it was proposed

*Proposal 9. To confirm that for SDT procedure, a UE only gets SDT related configuration/parameters via broadcast signaling (e.g., common search space and CORESET) or via RRCRelease msg. I.e., RRCReconfiguration message is never used during an ongoing SDT session.*

*Proposal 20. RRCReconfiguration* and *RRCReconfigurationComplete* are not supported during an SDT session*.*

It looks very reasonable proposal and companies may be fine to agree it.

Q7: Do you agree with the following proposal?

**Proposal: RRCReconfiguration and RRCReconfigurationComplete are not supported during an SDT session.**

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| --- | --- | --- |
| Answers to Q7 | | |
| Company | Yes/No | Technical Arguments |
| Samsung | Yes |  |
| Apple | Yes |  |
| Fujitsu | Yes |  |
| ZTE | Yes | We don’t see a need from SDT perspective. But if other Wis need this then it can be discussed and agreed |
| LGE | Yes |  |
| Sharp | Yes |  |
| Xiaomi | Yes |  |
| OPPO | Yes |  |
| NEC | Yes |  |
| Sony | Yes |  |
| Ericsson | Yes |  |
| Huawei, HiSilicon | Yes |  |
| Intel | Yes |  |
| China Telecom | Yes |  |
| ITRI | Yes |  |
| CATT | Yes |  |
| Spreadtrum | Yes |  |
| Qualcomm | Yes |  |
| Nokia, Nokia Shanghai Bell | Yes |  |
| vivo | Yes |  |
|  |  |  |

In [25], it was proposed:

*Proposal 20: The NW can configure whether UL NAS/RRC transmission is allowed over SRB1 using SDT procedure*

It seems controversial issue, which we need to address, and companies are invited to provide their views on this.

Q8: Do you agree the following proposal?

**Proposal: The NW can configure whether UL NAS/RRC transmission is allowed over SRB1 using SDT procedure**

|  |  |  |
| --- | --- | --- |
| Answers to Q8 | | |
| Company | Yes/No | Technical Arguments |
| Samsung | No | If network want UL NAS message to trigger SDT, SRB2 can be configured as SDT RB. If network does not want UL NAS message to trigger SDT, SRB2 can be configured as non SDT RB.  SRB1 is always resumed upon SDT procedure initiation. There is no need to restrict transmission of RRC/NAS message over SRB1 during SDT. Any message which is triggered during SDT procedure in RRC\_INACTIVE can be transmitted over SRB1. |
| Apple | No | NW can configure the SRB2 as the SDT-RB for the UL NAS/RRC transmission during the SDT procedure. |
| Fujitsu | No | NAS/RRC message can be transmitted over SRB2. |
| ZTE | No | SRB1 should be resumed, but NAS messages cannot be transmitted over SRB1 since SRB2 is established (this legacy behaviour should not be changed). Otherwise this will lead to a lot of other issues (such as the higher priority radio messages being blocked by lower priority NAS messages etc). We don’t allow this today for this exact reason. |
| LGE | No |  |
| Sharp | No |  |
| Xiaomi | No |  |
| OPPO | No | We share the same view that if network want to support NAS message transmission in SDT, it would configure SRB2 as SDT-RB.  For SRB1, since it will always be resumed once SDT is initiated and there is no reason to prohibit RRC message transmission over SRB1 during SDT, we suggest that network shall always configure SRB1 as a SDT-RB. |
| NEC | No | We think supporting only UL signalling over SRB2 is easier. Since DRB and SRB2 are always configured/released together, to transmit NAS signalling for positioning information during SDT, SRB2 shall be used. The only possible case is no DRB and SRB2 being configured, and the network only configure SRB1 for NAS signalling during SDT, however this is really a rare case, we prefer not supporting this. |
| Huawei, HiSilicon | No | Agree with comments from others. We see no good reason to overcomplicate by not resuming SRB2 and then allowing NAS messages to be sent over SRB1. |
| Intel | No | We share the same view as others e.g. Samsung, ZTE. |
| China Telecom | No | In RAN2 #113e working assumption, the UE is configured to resume SRB2 (configured for SDT) upon initiating the RRC Resume procedure for SDT initiation. Therefore, it is better to use the SRB2 to transmit the NAS/RRC message during the SDT procedure. |
| ITRI | No |  |
| CATT | No | NAS message can be sent via SRB2. And there is no scenario that the UE needs to send RRC message within RRC\_INACTIVE. |
| Spreadtrum | No | It was agreed that SRB2 can be configured as SDT-allowed RB. |
| Qualcomm | No | SRB2 can be configured for NAS message delivery if network configures SRB2 for SDT. SRB1 is always resumed upon initiation of SDT. |
| Nokia, Nokia Shanghai Bell | Yes |  |
| vivo | No |  |
|  |  |  |

Furthermore, there are some other proposals with regard to the transmissible RRC messages.

In [10], it was proposed to allow UE assistant information over SRB1 during SDT procedure.

In [28], it was proposed to transmit ULInformationTransfer containing CP small data in the first UL message if SRB2 is configured for SDT.

Summary: Companies expected to clarify what RRC messages can be sent during SDT procedure. There is no clear majority for each RRC message and so RAN2 should discuss what RRC messages should be allowed to transmit during the SDT procedure.

Q9: Do you agree with the following proposals?

ULInformationTransfer (including NAS message) over SRB2 configured for SDT, UEAssistanceInformation and SidelinkUEInformationNR can be allowed to send during SDT procedure

|  |  |  |
| --- | --- | --- |
| Answers to Q9 | | |
| Company | Yes/No | Technical Arguments |
| Samsung | See comments | UEAssistanceInformation and SidelinkUEInformationNR are not triggered during RRC\_INACTIVE. Since the SDT procedure takes place in RRC\_INACTIVE, we do not see need to trigger these messages during SDT procedure. |
| Apple | See comments | ULInformationTransfer (including NAS message) and UEAssistanceInformation should be allowed.  For the SidelinkUEInformationNR, the scenario is not clear to us, and we have no strong view. |
| Fujitsu | Yes | What UL messages are transmitted can be up to UE. |
| ZTE | Yes for ULInformationTransfer | For other messages, we don’t see a need for supporting over SRB1 during SDT. |
| LGE | Yes for ULInformationTransfer |  |
| Sharp | Yes for ULInformationTransfer |  |
| Xiaomi | Yes for ULInformationTransfer |  |
| OPPO | Comments | We agree ULInformationTransfer (including NAS message) over SRB2 can be transmitted if it is configured as SDT.  For SRB1, we think any RRC message over SRB1 as specified in 38.331 can be transmitted if it is generated for the procedure allowed during SDT. |
| NEC | Yes for ULInformationTransfer |  |
| Ericsson | Yes for ULInformationTransfer | IF configured |
| Huawei, HiSilicon |  | UL and DL Information Transfer should of course be allowed. Similarly, we think at least some of the information in UEAssistanceInformation would be useful, in particular ReleasePreferenceIndicator can be used to indicate the UE does not expect any more data and that SDT session can be ended.  We are not sure SidelinkUEInformationNR is useful as we are not sure what the network could do after receiving from the UE in RRC INACTIVE state.  Other than those messages, we also think UE should be allowed to send DedicatedSIBRequest as indicated in section 6. |
| Intel | Yes for ULInformationTransfer | It does not seem essential to support *UEAssistanceInformation* and *SidelinkUEInformationNR* during an SDT session which aims to be a short data transmission. However, we support that UE provides its preference about the CG-SDT related configuration while UE is in RRC\_CONNECTED. |
| China Telecom | Yes for ULInformationTransfer |  |
| ITRI | Yes | It should be up to UE. |
| CATT | - | We need to confirm that ULInformationTransfer (including NAS message) over SRB2 is allowed to be sent during SDT procedure.  But currently UEAssistanceInformation and SidelinkUEInformationNR are not allowed to be triggered during RRC\_INACTIVE. |
| Spreadtrum | Yes for ULInformationTransfer | Other scenario is not clear. |
| Qualcomm | Yes | ULInformationTransfer (including NAS message) over SRB2 and at least UEAssistanceInformation should be allowed over SRB1 during SDT. |
| Nokia, Nokia Shanghai Bell | Yes | NW should be able to configure whether these UL RRC messages are allowed to be transmitted using SDT procedure. |
| vivo | Yes for ULInformationTransfer | We understand the other mentioned messages cannot be generated during RRC INACTIVE. |
|  |  |  |

**Response RRC messages to SDT access attempt**

In [11] [26], it was proposed to allow RRCSetup to be transmitted in response to SDT access attempt so that RRC connection can be re-established from scratch.

In [15] [26], it was proposed to allow responding with RRCReject to RRCResumeRequest for SDT.

In [26], it was proposed that Network can respond with RRCRelease w/wo suspendConfig to RRCResumeRequest for SDT so that Network can refuse the SDT procedure and let UE move back to RRC\_INACTIVE or RRC\_IDLE respectively

Summary: ~~RRCReject part has already been covered by [1] and so it should be handled as part of [1].~~ The questions remain for RRCSetup and RRCRelease.

The legacy UE behaviour for each response message would be a baseline.

Q10: Do you agree with the following proposals? Please explain the expected UE behaviour upon reception of the response message if you think any special handling is required.

Proposal: Network can respond with RRCSetup to RRCResumeRequest for SDT.

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| --- | --- | --- |
| Answers to Q10 | | |
| Company | Yes/No | Technical Arguments |
| Samsung | Yes |  |
| Apple | Yes | UE behaviour upon receiving the RRCSetup message is same as legacy. |
| Fujitsu | Yes | UE behaviour can be same as legacy. |
| ZTE | Yes |  |
| Sharp | Yes |  |
| Xiaomi | Yes |  |
| LGE | Yes |  |
| OPPO | Yes |  |
| NEC | Yes |  |
| Sony | Yes |  |
| Ericsson | Yes |  |
| Huawei, HiSilicon | Yes | No special UE behaviour is required. |
| Intel | Yes |  |
| China Telecom | Yes |  |
| ITRI | Yes | UE behaviour should be same as legacy. |
| CATT | Yes |  |
| Spreadtrum | Yes |  |
| Qualcomm | Yes | As legacy |
| Nokia, Nokia Shanghai Bell | Yes |  |
| vivo | Yes | It is the same as legacy. |
|  |  |  |

Q11: Do you agree with the following proposal? Please explain the expected UE behaviour upon reception of the response message if you think any special handling is required.

Proposal: Network can respond with RRCRelease with/without suspendConfig to RRCResumeRequest for SDT.

|  |  |  |
| --- | --- | --- |
| Answers to Q11 | | |
| Company | Yes/No | Technical Arguments |
| Samsung | Yes |  |
| Apple | Yes | UE behaviour is same as legacy. |
| Fujitsu | Yes | UE behaviour can be same as legacy. |
| ZTE | Yes |  |
| Sharp | Yes |  |
| Xiaomi | Yes |  |
| LGE | Yes |  |
| OPPO | Yes |  |
| NEC | Yes |  |
| Sony | Yes |  |
| Ericsson | Yes |  |
| Huawei, HiSilicon | Yes | No special UE behaviour is required. |
| Intel | Yes |  |
| China Telecom | Yes |  |
| ITRI | Yes | UE behaviour should be same as legacy. |
| CATT | Yes |  |
| Spreadtrum | Yes |  |
| Qualcomm | Yes |  |
| Nokia, Nokia Shanghai Bell | Yes |  |
| vivo | Yes | The legacy behavior can be reused. |
|  |  |  |

**RRC response messages to the RRC message for non-SDT data arrival indication**

[1] includes the discussion whether RRCReject can be sent as a response to the RRC message for non-SDT data arrival indication or not. Furthermore, in [1], some companies proposed to support the responses, RRCReject, RRCSetup and RRCRelease to the RRC message for non-SDT data arrival indication.

The legacy UE behaviour for each response message would be a baseline.

Q12: Do you agree with the following proposals? Please explain the expected UE behaviour upon reception of the response message if you think any special handling is required.

Proposal: Network can respond with RRCReject to the RRC message for non-SDT data arrival indication.

|  |  |  |
| --- | --- | --- |
| Answers to Q12 | | |
| Company | Yes/No | Technical Arguments |
| Samsung | Yes |  |
| Apple | Yes | UE behaviour upon receiving RRCReject shall suspend all the resumed SDT-RBs. |
| Fujitsu | Yes | UE behaviour can be same as legacy. |
| ZTE | Unclear | There can be RRCReject, but the response message is for RRCResumeRequest sent by the UE not for the non-SDT data arrival indication. It is enough to capture that the network can respond with RRCReject to RRCResumeRequest for SDT (i.e. similar to the above proposals).  We propose to capture a single agreement as follows:  *The network can respond with the following for RRCResumeRequest for SDT:*   * *RRCResume* * *RRCSetup* * *RRCRelease with and without suspendConfig* * *RRCReject*   Questions 12 to 14 are not needed since the response is not for the non-SDT data arrival indication.  Of course, CCCH camp think that the non-SDT arrival is another RRCResumeRequest, but the DCCH camp think that the non-SDT data arrival is just an indication from UE to the network and the network response is counted as the response to the original RRCResumeRequest message. #Since we have not concluded CCCH vs DCCH issue, we don’t need to discuss this secondary response here. |
| Sharp | Yes |  |
| Xiaomi |  | Agree with ZTE. |
| LGE | Yes |  |
| OPPO | Comments | RRCReject is one of the responses to RRCResumeRequest/RRCSetupRequest. If the RRC message refers to DCCH solution, RRCReject as a response shall not be supported. |
| NEC | Depends | For CCCH option, network can respond RRCReject to UE. For DCCH option, if the network cannot accept the non-SDT data, it can just respond nothing. |
| Sony | Yes |  |
| Ericsson | Yes | It is of course true that non-SDT data arrival is part of another Resume Request. |
| Huawei, HiSilicon | Yes | If the network is not able to serve the UE, e.g. due to overload, then it may use RRCReject message. When receiving the RRCReject message, the UE shall suspend all the RBs/PDCP entities that are configured for SDT and re-establish corresponding RLC entities (which is a new behaviour that is needed for SDT). RRCReject should be allowed as a response to non-SDT data indication as the NW may be able to serve SDT data, but not able to serve SDT data for UE in RRC Connected. |
| Intel | No | *RRCReject* is sent over SRB0 and is used only when UE requests the resume or establishment. Therefore it should not be used afterwards i.e. when network has already acknowledge the 1st UL SDT and there is an ongoing SDT session (in which new/subsequent data/signaling may be sent over RBs configured for SDT operation). In our understanding, *RRCReject* msg can only be sent as immediate response to *RRCResumeRequest* msg  Network suffering congestion during an ongoing SDT session we think is a corner case as SDT sessions are short and change in congestion during this short session is unlikely and normally handled by throttling new connections rather than releasing existing connections. If at all some action is needed, legacy operation is sufficient as it is allowed for the network to send *waitTime* as part of *RRCRelease* message includes suspendConfig. |
| China Telecom | Yes | In case the network has not retrieved the UE context before receiving the RRC message, the NW may reject the request. In addition, when the network is overloaded, it can also send the RRCReject message. On the other hand, the RRC message is transmitted as SDT data, and the NW can respond with RRCReject to the SDT procedure. Therefore, the NW can send RRCReject message after receiving the non-SDT indication |
| ITRI | Yes |  |
| CATT | No | For normal RRC connection resume procedure, the network can only respond with RRCReject message when it doesn’t verify the UE with received resumeMAC-I. If the network has already verified the UE with received resumeMAC-I, it needs to response with RRCRelease/RRCSetup/RRCResume message to the UE, but is not allowed to send RRCReject message to the UE. This is SA3’s requirement to avoid the same I-RNTI/the same security key to be used twice. The principle can be applied to SDT too.  Furthermore, based on SA3 reply on SDT (R2-2109065), it was mentioned:  *SA3 would like to state its preference for not reusing the same I-RNTI/resumeMAC-I for same cell and NCC/I-RNTI for new SDT in different cell.*  If the network receives RRC message for non-SDT data arrival indication, it means that the NW has already used the I-RNTI/resumeMAC-I to find the UE context and verify the UE. If network can respond with RRCReject in this case, it is contrary with previous discussion for normal RRC Resume procedure and SA3 reply on SDT. |
| Spreadtrum | Yes |  |
| Qualcomm | Comments | The question is unclear. Network can respond the RRCReject message. But it should be clear such response message is to RRCResumeRequest sent via the first UL message.  We have the same view with ZTE. |
| Nokia, Nokia Shanghai Bell | Yes |  |
| vivo | Comments | RRCReject can be responded, it is NW implementation (e.g. due to high load). |
|  |  |  |

Q13: Do you agree with the following proposals? Please explain the expected UE behaviour upon reception of the response message if you think any special handling is required.

Proposal: Network can respond with RRCSetup to the RRC message for non-SDT data arrival indication.

|  |  |  |
| --- | --- | --- |
| Answers to Q13 | | |
| Company | Yes/No | Technical Arguments |
| Samsung | Yes |  |
| Apple | Yes |  |
| Fujitsu | Yes | It can be up to NW implementation. |
| ZTE | - | See above |
| Sharp | Yes |  |
| Xiaomi |  | See above |
| LGE | Yes |  |
| OPPO | Yes |  |
| NEC | Yes |  |
| Sony | Yes |  |
| Ericsson | Yes |  |
| Huawei, HiSilicon | Not sure | RRCSetup is used in case the network cannot retrieve the UE context during RRC Resume. It is unclear why the network would send RRCSetup in reply to non-SDT data arrival message. |
| Intel | No | *RRCSetup* msg is an SRB0 message. As explained in Q13, a message sent over SRB0 should not be sent when UE has an ongoing SDT session. In our understanding, *RRCSetup* msg can only be sent as immediate response to *RRCResumeRequest* msg if the network cannot locate the UE context. Otherwise, it is more optimal to use other messages. If the network cannot transition a UE from SDT to RRC\_CONNECTED (by sending *RRCResume* msg), it should send *RRCRelease* msg to transition the UE into IDLE or INACTIVE (w/ or w/o SDT config). |
| China Telecom | Yes |  |
| ITRI | Yes |  |
| CATT | Yes |  |
| Spreadtrum | Yes |  |
| Qualcomm | - | See above |
| Nokia, Nokia Shanghai Bell | Yes |  |
| vivo | Comments | RRCSetup can be responded, it is NW implementation (e.g. due to context fetch failure). |
|  |  |  |

Q14: Do you agree with the following proposals? Please explain the expected UE behaviour upon reception of the response message if you think any special handling is required.

Proposal: Network can respond with RRCRelease to the RRC message for non-SDT data arrival indication.

|  |  |  |
| --- | --- | --- |
| Answers to Q14 | | |
| Company | Yes/No | Technical Arguments |
| Samsung | Yes |  |
| Apple | Yes |  |
| Fujitsu | Yes | It can be up to NW implementation. |
| ZTE |  | See above |
| Sharp | Yes |  |
| Xiaomi |  | See above |
| LGE | Yes |  |
| OPPO | Yes |  |
| NEC | Yes |  |
| Sony | Yes |  |
| Ericsson | Yes |  |
| Huawei, HiSilicon | Yes | To avoid calculating data stored in RLC buffer for next SDT sessions conditions evaluation, the UE should re-establish the SDT RLC entities upon receiving the RRCRelease with suspend message. Otherwise, this data will be calculated but then anyway discarded when SDT is triggered. |
| Intel | Yes | In our understanding the RRC message for non-SDT data arrival indication could be respond by the network with *RRCResume* msg (if/when moving the UE into RRC\_CONNECTED) or with *RRCRelease* msg (if/when moving the UE into RRC\_INACTIVE or RRC\_IDLE) as explained in previous related questions. |
| China Telecom | Yes |  |
| ITRI | Yes |  |
| CATT | Yes | In addition, the procedure for DL non-SDT data arrival without anchor relocation is a bit different from UL non-SDT data arrival case, UE needs to resume to the network by an indication for DL data arrival. |
| Spreadtrum | Yes |  |
| Qualcomm | - | See above |
| Nokia, Nokia Shanghai Bell | Yes |  |
| vivo | Comments | RRCSetup can be responded, it is NW implementation. |
|  |  |  |

# References

|  |  |  |  |
| --- | --- | --- | --- |
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| [2] | R2-2200201 | Paging Monitoring during SDT procedure | Samsung Electronics Co., Ltd |
| [3] | R2-2200202 | RNA update and SI request handling during SDT procedure | Samsung Electronics Co., Ltd |
| [4] | R2-2200312 | Handling of SDTF detection timer | Fujitsu |
| [5] | R2-2200313 | RAN paging reception and response during SDT | Fujitsu |
| [6] | R2-2200505 | Control Plane leftover issues on SDT procedure | Intel Corporation |
| [7] | R2-2200574 | Remaining control plane aspects of SDT | NEC |
| [8] | R2-2200663 | Emergency call in the middle of SDT operation | InterDigital, Europe, Ltd. Rakuten Mobile Inc. |
| [9] | R2-2200696 | Handling of SDT failure timer | InterDigital, Europe, Ltd. |
| [10] | R2-2200727 | Remaining issues on CP aspects of SDT | Qualcomm Incorporated |
| [11] | R2-2200811 | Control plane common aspects for SDT | Huawei, HiSilicon |
| [12] | R2-2200919 | Subsequent SDT failure detection timer | Sony |
| [13] | R2-2200986 | CP aspects for SDT | Ericsson |
| [14] | R2-2201029 | CP open issues for SDT | ZTE corporation, Sanechips |
| [15] | R2-2201125 | Control plane aspects of SDT | Apple |
| [16] | R2-2201126 | Power Saving for SDT | Apple |
| [17] | R2-2201174 | DCCH-based indication of non-SDT data arrival | Intel Corporation, ZTE Corporation, Sanechips, Samsung, Xiaomi, MediaTek, Radisys and Reliance JIO, Qualcomm, CMCC, OPPO, Lenovo, Sony, Apple |
| [18] | R2-2201217 | RNA Update during SDT | Sharp |
| [19] | R2-2201358 | Remaining issues on Control Plane Aspects for SDT | LG Electronics Inc. |
| [20] | R2-2201376 | Clarification on the area configured for ROHC continuity | Xiaomi Communications |
| [21] | R2-2201377 | Paging reception during SDT | Xiaomi Communications |
| [22] | R2-2201378 | RACH failure in subsequent data transmission phase | Xiaomi Communications |
| [23] | R2-2201440 | Remaining Issues on RRC-Controlled SDT procedure | vivo |
| [24] | R2-2201441 | Further Consideration on the Handling of non-SDT Data Arrival | vivo |
| [25] | R2-2201495 | SDT control plane aspects | Nokia, Nokia Shanghai Bell |
| [26] | R2-2201496 | RRC procedure for SDT | Nokia, Nokia Shanghai Bell |
| [27] | R2-2201535 | Remaining issues for non-SDT data arrival | China Telecommunications |
| [28] | R2-2201571 | Consideration on some CP issues | CATT |