3GPP TSG-RAN WG3 #114bis-e R3-221218

17-26 Jan 2022

Online

Agenda Item: 24.2

Source: ZTE (moderator)

Title: Summary of Offline Discussion on CB: # SDT1\_RACHbased

Document for: Approval

# Introduction

**CB: # SDT2\_RACHbased**

**- How to enhance RNA update without UE context relocation procedure for RA-SDT without anchor relocation case?**

**- The details of SDT assistance information?**

**- How to transfer SRB via SDT?**

**- How to transfer the first SRB/DRB?**

**- Whether to include other SDT Assistance Information?**

**- LS to SA2?**

**- Capture agreements and open issues, provide TPs if agreeable**

(ZTE - moderator)

Summary of offline disc [R3-221084](file:///C%3A%5CUsers%5C10022154%5CAppData%5CLocal%5CTemp%5CTemp3_R3-221084.zip%5CInbox%5CR3-221084.zip) rev in [R3-221218](file:///C%3A%5CUsers%5C10022154%5CAppData%5CLocal%5CTemp%5CTemp3_R3-221084.zip%5CInbox%5CR3-221218.zip)

New BL CR: RA-SDT BLCR to TS 38.420 in [R3-221207](file:///C%3A%5CUsers%5C10022154%5CAppData%5CLocal%5CTemp%5CTemp3_R3-221084.zip%5CInbox%5CR3-221207.zip) Qualcomm

# For the Chairman’s Notes

**Propose the following:**

[R3-220214](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114bis-e%5CDocs%5CR3-220214.zip) is revised in R3-221204 - Agreed + Nokia, Nokia Shanghai Bell consign

[R3-220348](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114bis-e%5CDocs%5CR3-220348.zip) is revised in R3-221205 – Agreed + Nokia, Nokia Shanghai Bell consign

[R3-220568](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114bis-e%5CDocs%5CR3-220568.zip) is revised in R3-221206 – Agreed + Nokia, Nokia Shanghai Bell consign

R3-221207 for BLCR TS38.420 (CR number: 0024, QC) - Agreed

**To be continued in the next meeting:**

It is FFS that either new Class 1 message or a new Class 2 message is used to transfer SDT configuration in case of RA-SDT without anchor relocation.

It is FFS that the additional SDT assistant information includes either BSR information or single/multiple packets indication as optional IEs, and FFS on other IEs.

The following IEs in the SDT configuration (from anchor gNB to receiving gNB) are FFS

* SRB
* DRB QoS (QoS Flow Level QoS Parameters 9.2.3.5)
* S-NSSAI
* RLC Mode
* PDCP SN Length
* DL Forwarding (9.2.3.34) or Packet Data Indication (Indicates downlink data available)
* PDU Session ID

# Discussion- Second round

## Progress aftter the online discussion

**WA: Solution 2/3/4 is the basis for further work.**

**If the anchor node shall be acknowleged, a new Class 1 message shall be introduced for RA-based SDT without UE context relocation. Otherwise, two Class 2 messsages shall be considered.**

**Agree to include the SDT related UE content in TP, the details need to be further checked.** SRB is FFS. 9.2.3.XX SDT Configuration (Editor note: IE name can be refined)

This IE includes necessary configuration information to process RLC PDUs related to SDT (small data transmission)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
| SDT Configuration (old -> new) |  |  |  |  |
| > SDT DRB To Be Setup List |  | 1 |  |  |
| >> SDT DRB To Be Setup Item |  | 1,,< maxnoofDRBs > |  |  |
| >>> DRB ID | M | 9.2.3.33 |  |  |
| >>> UL TNL address | M |  | UP Transport Layer Information 9.2.3.30 |  |
| >>> RLC Bearer Configuration | M |  | OCTET STRING | RLC-BearerConfig IE defined in subclause 6.3.2 of TS 38.331 |

9.2.3.XY SDT Data Forwarding (Editor note: IE name can be refined)

This IE includes necessary data forwarding information related to SDT (small data transmission)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
| SDT Data forwarding (new -> old) |  |  |  |  |
| > SDT DRB Admitted List |  | 1 |  |  |
| >> SDT DRB Admitted Setup Item |  | 1,,< maxnoofDRBs > |  |  |
| >>> DRB ID | M | 9.2.3.33 |  |  |
| >>> DL TNL address | M |  | UP Transport Layer Information 9.2.3.30 |  |

**Extend the XnAP: RRC TRANSFER message, to forward the UL/DL SRB PDCP PDU during SDT procedure without anchor relocation between new gNB and anchor gNB**

**Transfer the first SRB/DRB transfer as the same method as the subsequent SRB/DRB transfer**

**The additional SDT assistant information is needed, but it is no need to consult with RAN2. It includes either BSR information or single/multiple packets indication as optional IEs.** FFS on others.

**It is no need to send LS to SA2/RAN2 for the issue indicated in section 4.6.1 and 4.6.2.**

**For 2nd round:**

-Check the TPs:

[R3-220214](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114bis-e%5CDocs%5CR3-220214.zip) is revised in R3-221204 (ZTE, TS 38.300)

[R3-220348](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114bis-e%5CDocs%5CR3-220348.zip) is revised in R3-221205 (E///, TS 38.423)

[R3-220568](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114bis-e%5CDocs%5CR3-220568.zip) is revised in R3-221206 (SS, TS 38.473)

R3-221207 for BLCR TS38.420 (CR number: 0024, QC)

Put FFS on those open points

-Further discussion on the open issues: Solution and Class1/2 procedures?

## Open issues: Solution and Class1/2 procedures

|  |
| --- |
| **WA: Solution 2/3/4 is the basis for further work.****If the anchor node shall be acknowleged, a new Class 1 message shall be introduced for RA-based SDT without UE context relocation. Otherwise, two Class 2 messsages shall be considered.**-Further discussion on the open issues: Solution and Class1/2 procedures? |

**Observation 1: For SDT without anchor relocation case, the RLC configuration informations sent from anchor gNB to receiving gNB are essential.**

**Question 1: Do companies agree with the Observation 1?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comment** |
| ZTE | Yes  | For SDT, we have agreed that “*SDT indicator*” IE included in the RETRIEVE UE CONTEXT message from receiving gNB to anchor gNB is essential. For the same reason, The RLC configuration informations from anchor gNB to receiving gNB are also essential. |
| Huawei | Yes |  |
| LGE | Yes |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

**Observation 2: For SDT without anchor relocation case, the anchor gNB shall be acknowledged that the RLC configuration have been successfully sent to receiving gNB.**

**Question 2: Do companies agree with the Observation 2?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comment** |
| ZTE | Yes  | For SDT, the anchor gNB shall be acknowledged that the RLC entity is established at receiving gNB and PDCP entity is kept at itself. Then a SDT procedure is starting. |
| Huawei | No | We can include the SDT context in the class 2 message with criticality reject, then in case of abstract syntax error, the new serving gNB will send Error Indication towards the last serving gNB, we do not see other potential failure case. |
| LGE | No | Agree with Huawei |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

In the first round, a bit more companies (7 vs 6) prefer to class 1 than class 2. If companies are welcomed to compromise to class 1, then we have the following WA.

**WA: A new Class message shall be introduced for RA-SDT without anchor relocation.**

**Question 3: Do companies agree with the WA?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comment** |
| ZTE | Yes  | Wish to have this WA. |
| Huawei | No | New Class message?Assuming the moderator would like to propose class 1, we do not see the necessity to having class 1 procedure, for class 1 design, the new serving gNB has to response the message as soon as possible, but in class 2 design, thereis no such burden and simply to start forward UL data upon receiving the class 2 message.As we clarified before that it is propablly in many cases (traffic model) to only have one or two UL small packets, without any downlink data, in such case the class2 design is much more slim and efficient. And even if some companies would force the new serving gNB to always provide DL address, it can be easily done by having one sentence in stage2 spec that the Xn-U Address Indication will be triggered upon receiving the SDT context. |
| LGE | No | Agree with Huawei |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

# Discussion-First round

## How to enhance RNA update without UE context relocation procedure for RA-SDT without anchor relocation case

|  |
| --- |
| **Enhance RNA update without UE context relocation procedure for RA-SDT without anchor relocation case****FFS: If agreed to enhance Periodic RNA update without UE context relocation procedure, whether it is acceptable to use the Retrieve UE context failure message to send SDT related UE context information** |

### Candidate solutions

**Solution 1:**

**Figure 1: Solution 1 overall procedure**

**Solution 2:**



**Figure 2: Solution 2 overall procedure**

**Solution 3:**



**Figure 3: Solution 3 overall procedure**

**Solution 4:**



**Figure 4: Solution 4 overall procedure (From figure-wise, Figure 4 seems no different to Figure 2)**

###  Analysis on the candidate solutions (detail in [3])

**Analysis on Solution 1**:

1. **Impact on the following XnAP messages.**
	* + RETRIEVE UE CONTEXT FAILURE
		+ XN-U ADDRESS INDICATION
		+ UE CONTEXT RELEASE
2. **Break the original usage of legacy flow (RANAU)**
	* + RETRIEVE UE CONTEXT FAILURE has to establish UE SDT RLC context and UE associated XnAP signalling connection
		+ 🡺 **We don't agree the Solution 1 breaks the legacy. What we should honor is the original design (i.e. functionality) of a procedure. This class-1 UE Context Retrieval procedure is to support INACTIVE mobility over Xn when the UE resumes on another gNB. With this design principle being honored, it is typical that the corresponding messages carry some IEs for specific usages (that doesn’t go beyond the functionality of the procedure).**
		+ **What we should avoid is to block proposals based on argument that the messages should be limited based on the existing usages already in place. If so, then there is nothing we can do other than keep adding new procedures/messages, because everyone should stick to the existing usages already specified.**
		+ UE CONTEXT RELEASE has to be sent from anchor gNB other than receiving gNB.
		+ **🡺 Same reason: the purpose of UE CONTEXT RELEASE to release UE context in the other node. This is the legacy. So far, it has been issued from new gNB to the anchor, only when context is relocated. Enhancing it to be issued from anchor to new gNB for SDT without anchor relocation falls under this fundamental functionality and doesn't break the legacy.**

|  |
| --- |
| **TS 38.423****RETRIEVE UE CONTEXT FAILURE**If the old NG-RAN node is not able to identify the UE context by means of the UE Context ID, or if the integrity protection contained in the RETRIEVE UE CONTEXT REQUEST message is not valid, or, if it decides not to provide the UE context to the new NG-RAN node, it shall respond to the new NG-RAN node with the RETRIEVE UE CONTEXT FAILURE message.**UE CONTEXT RELEASE**The UE Context Release procedure is initiated by the new NG-RAN node. By sending the UE CONTEXT RELEASE message the new NG-RAN node informs the old NG-RAN node of RRC connection reestablishment success or RRC connection resumption success and triggers the release of resources. |

**Analysis on Solution 2**:

1. **Introduce a new Class 1 procedure**
	* + Request message (transfer SDT information Transfer- serving->anchor)
		+ Request message (transfer SDT information Transfer- serving->anchor) **🡺 BTW, why the same request message for class 1??**
2. **No impact on existing XnAP message 🡺 This is not true. The solution replaces the Xn-U ADDRESS INDICATION message which has been the fundermantal step from new gNB to anchor gNB to provide DL forwarding info during INACTIVE mobility. Moreover, like Huawei mentioned, RETRIEVE UE CONTEXT FAILURE message should be enhanced to release the established Xn association.**

**Analysis on Solution 3**:

1. **Introduce a new Class 2 procedure (**transfer SDT context and UL address from serving to anchor)
2. **Enhance Xn-U address indication message** (transfer SDT related DL address)
3. **Like Huawei mentioned, RETRIEVE UE CONTEXT FAILURE message should be enhanced to release the established Xn association.**

**Analysis on Solution 4**:

1. **Introduce a new Class 2 procedure**
	* + Transfer SDT context and UL address from anchor to serving nodes
		+ Transfer SDT related DL address from serving to anchor nodes
2. **No impact on existing XnAP message 🡺 This is not true. The solution replaces the Xn-U ADDRESS INDICATION message which has been the fundermantal step from new gNB to anchor gNB to provide DL forwarding info during INACTIVE mobility. Moreover, like Huawei mentioned, RETRIEVE UE CONTEXT FAILURE message should be enhanced to release the established Xn association.**

Additional, solution 2/3/4 use a nested procedure within XnAP UE Context Retrieval class-1 procedure.

In [17], it states that we don't know how long the SDT session would last. However, moderator does not think it is a problem. In RAN2, it is agreed that UE (via *NewSDTTimer*) shall receive RRCRelease/RRCResume message after sending RRCResumeRequest message, no matter how long the SDT session is. Similarly, the receiving gNB can keep waiting RETRIEVE UE CONTEXT FAILURE message until SDT termination by e.g., restarting timer TXnDCoverall upon handling SDT. Both RAN2 and RAN3 have the same requirement for the SDT feature.

**This argument is also not acceptable as the solutions 2/3/4 keeps making "exception" to make it work. For a class-1 procedure triggered from new gNB, it is better to always "properly" close the class-1 procedure without making "exception" to the timer handling only for SDT.**

**Observation 1: Solution 1 has more specification effort than other solutions and needs to extend the original purpose of both RETRIEVE UE CONTEXT FAILURE message and UE CONTEXT RELEASE message.**

**Observation 2: Solution 2/3/4 use a nested procedure. It is not a problem for the receiving gNB how long to wait for RETRIEVE UE CONTEXT FAILURE message until a SDT termination.**

**Proposal 1: Solution 1 shall be excluded.**

**Question 1: Do you agree with above observation 1/2 and proposal 1?**

|  |
| --- |
| **Observation 1: Solution 1 has more specification effort than other solutions and needs to extend the original purpose of both RETRIEVE UE CONTEXT FAILURE message and UE CONTEXT RELEASE message.****Observation 2: Solution 2/3/4 use a nested procedure. It is not a problem for the receiving gNB how long to wait for RETRIEVE UE CONTEXT FAILURE message until a SDT termination.****Proposal 1: Solution 1 shall be excluded** |
| **Company** | **Yes/No****(O1, O2, P1)** | **Comment** |
| ZTE | Yes for all | Sol 1 breaks the original usage of legacy signalling/procedure.Sol2/3/4 keep the original usage of the legacy signalling/procedure, and has less spec effort than sol1. |
| Huawei | Yes for P1 | Ok to exclude P1.For O1, 2, for solution 2, 3, 4, these solutions also impact the existing XnAP: RETRIEVE UE CONTEXT FAILURE message, i.e. enhance it to remove the established XnAP association, which is currently not supported. |
| Intel Corporation | No for all | From the tone and analysis above for Q1, we are sorry to say but we would like to express concerns that the moderation for Q1 is biased!First, it is not fair to say that Solution 1 breaks the legacy. What we should honor is the original design (i.e. functionality) of a procedure. This class-1 UE Context Retrieval procedure is to support INACTIVE mobility over Xn when the UE resumes on another gNB. Solution 1 falls under this functionality. With this design principle being honored, it is typical that the corresponding messages carry some IEs for specific usages (that doesn’t go beyond the functionality of the procedure). What we should avoid is to block proposals based on argument that the messages should be limited based on the existing usages already in place. If so, then there is nothing we can do other than keep adding new procedures/messages, because everyone should stick to the existing usages already specified.Moreover, one of the fundamental questions we should discuss is whether Xn-U ADDRESS INDICATION should be replaced only for SDT without anchor relocation. But please note that SDT works under INACTIVE framework. We see no reason to replace this fundamental step of Xn-U ADDRESS INDICATION message to provide DL forwarding info, by other message, only for SDT without anchor relocation. Another fundamental question we should discuss is whether SDT data handling between gNBs should be per DRB (not per PDU session), which different to the fundamental NR mobility design. The INACTIVE has been working with per PDU session basis so far. As we discussed in our paper, in fact, all the basic mobility and dual connectivity related procedure messages defined in XnAP between source and target or between MN and SN have been "per PDU session basis" from day 1. Even for SN terminated MCG bearer (or MN terminated SCG bearer), the relevant XnAP messages communicated between MN and SN carry Xn-U DL/UL forwarding TNLs "per PDU session" basis. We think there is no reason not to break this fundamental principle and make execption only for SDT without anchor relocation.  |
| Google |  | For O2, we wonder if the receiving gNB can receive the RETRIEVE UE CONTEXT FAILURE message first with RRCRelease message and send the RRCRelease message to the UE until a SDT termination |
| China Telecom | Ok for all obersvations and proposal | Techincally, all the solutions can work. But we need to downselect a solution at this stage.solution 1: The original intention of RETRIEVE UE CONTEXT FAILURE is to inform the last serving gNB that the Retrieve UE Context procedure has failed. And *RRCConnectionRelease* may be contained in this XnAP mssage, However, this solution introduces some new configuration information, i.e, RLC configuration, in this message, which need to change the orginal usage of this procedure. And the subsqeunt messages in this solution also have the same issue. Thus, we prefer to define a new class-1/class2 procedure. |
| CATT | Yes l | To be honest, all of the solutions provided are feasible with different signalling impact. To limit the changes to the legacy signallings, we prefer to go for the new defined procedure to transfer the SDT related UE context. |
| Lenovo, Motorola Mobility | Yes for all | A new procedure has less impact on the legacy behaviour and are cleaner solution. Since the RLC configurations are essential information for SDT, it would be better to define a new class 1 procedure for providing the RLC configurations. |
| Qualcomm | Yes for all | We have to move forward. We accept it is a matter of opinion, but the key point is that the failure message is today the final message on the interface – no need for release as there is no context. This really should not be changed. If we abstract up, and wanted to avoid nesting, then we would need to define a new procedure for sure, and not try to reuse anything. So I feel the proponents of soln1 should really have done that, but anyway there is nothing wrong with assuming nesting and therefore ruling out P1 at this point.  |
| E/// | Yes | There was discussion on the feasibility of solutions. We would say this is some kind of compromised way by opting out certain solution which has relatively more impact to the existing procedures.  |
| Samsung | Yes | Although we think it is matter of the preference, we are okay to move forward with this proposal.  |
| NEC | Comment | All are workable, just need to select one. For the moment all solutions are still on the table.The solution 2 with the class 1 procedure, if it will alwaays give tthe DL TNL address from the new gNB to the anchor gNB, this may be usless as in most of the SDT cases, only one shot of UL data is needed. |
| Nokia | No (same as Intel) | We think solutions 2/3/4 have two problems:1/ we share the view of Intel that we should avoid nested procedures. This is a good principle we have used in the past. 2/ we think the whole problem statement should have been split in two parts to be discussed separately:* Initiation of the DT procedure
* End of the SDT procedure

Here we kind of mix both issues i.e. we reuse the response message of the class 1 procedure that intiated the SDT transaction (RETRIEVE CONTEXT FAILURE) as the message which decides to close the SDT transaction. We thereby mix “initiation of SDT transaction” and “ending SDT transaction”. This looks a very poor design. Reusing the UE RETRIEVE CONTEXT FAILURE message to trigger the end the SDT transaction has following issues:1/ it prevents to set appropriate timer to close the initiation of the SDT transaction (UE CONTEXT RETRIEVE REQUEST) in a clean way, without knowing how long the trasncation will last.2/ the anchor CU CP in solutions 2/3/4 is assumed to send the RETRIEVE UE CONTEXT FAILUE message at the end fo the SDT trasbaction but how can anchor CU CP know that transaction is ending??? It is not involved in the traffic. In our view only DU can see that it is last packet and therefore the “end fo SDT procedure” should be triggered by DU to target CU CP. Then Target CU CP needs to inform anchor CU CP -> this means that you anyway need another class 1 procedure initated from target CU CP to end the SDT transaction i.e. this cannot be the UE CONEXT RETIEVE FAILURE message.In a nutshell, we believe that the story about “how an SDT transaction would end” has been completely overlooked. And this impacts this discussion which tries to mix initiation and edn of SDT in a same class 1 procedure…  |
| LGE | Yes for O1FFS for O2FFS for P1 | We think that all solutions can work with the specification impact. For downselection of potential solutions, we slightly prefer Solution 3 since this solution has less specification impact (e.g., a new class 2 message and enhancement of XN-U ADDRESS INDICATION message). But, we are also fine with Solution 1. |

Summary for Q1:

**Yes: 8** (ZTE, HW, CTC, CATT, Len, QC, SS, E///)

**No: 2** (Intel, Nokia)

[**Neutral**](http://www.baidu.com/link?url=vt1hUlOdcvRuGJA0i98YPdMiLWwvaK8vRKayLrjBRwleu0tE46XEqn3OwlWtInk9DKFI0nTqoSeL1Ub8WrGeksNkEElwA1p6YBnNQxZ1qDW)**: 3** (Google, NEC, LG)

**Morderator’s view：**All the solutions on the table are workable, since we have to move forward, majority companies (8: 2) agree to exclude solution 1.

**Proposal 1: Solution 1 shall be excluded.**

**Class 1 (sol 2) vs Class 2 (sol 3/4)**

If we are agreed to exclude Solution 1, we will further select to introduce either a new class 1 procedure (sol 2) or a new class 2 procedure (sol 3/4).

In some papers (e.g., [8], [11], they think class 2 procedure is simpler and better than class 1, because the DL data forwarding should be optional, the receiving gNB only needs to provide DL data forwarding address when the last serving gNB proposes to do it.

However, moderator wonders how the anchor gNB decide not to transfer DL SDT/DL NAS PDU when a SDT procedure starts. When the DL SDT/DL NAS PDU is sent from UPF/AMF, if no DL address provided by receiving gNB, it cannot be forwarded from anchor gNB to receiving gNB. More, it is sure that UE always needs to receive DL RLC packet for e.g., RLC acknowledge.

**Observation 3: The receiving gNB shall provide SDT DL address to the anchor gNB, because the anchor gNB cannot judge whether subsequent DL small data/DL NAS PDU comes from 5GC during a SDT period.**

In the consigned paper [3], it prefers to introduce class 1 procedure (e.g., sol 2), since the RLC configurations are essential information for SDT, the anchor gNB shall be acknowledged that the SDT RLC config is either successful or failure.

In detail, there is a “failure use case” for class 1. For example, if at the outset the new gNB had some sort of issue with Xn resources and it does not support the "no anchor relocation" scenario which requires quite different behaviours and data handling than the legacy NR INACTIVE, then prefers to go for a full context transfer / path switch. Then we could use the class 1 procedure to enable a failure message. Although it is agreed that the anchor gNB decides to either with or without anchor relocation, the anchor gNB can receive failure message from the new gNB (if not agreed with partial Context transfer), then it understands that this mode of operation is not possible, and reverts back to normal Context transfer. In fact this type of scenario (it makes sense) is a reasonable justification for nesting within the Retrieve Context Request.



**Figure 5: RA-based SDT from without UE context relocation fall back to with UE context relocation**

In conclusion, during a SDT procedure, the anchor gNB shall be acknowledged whether the SDT RLC context transfer is successful or not. If failure, the anchor gNB shall revert to RA-SDT with UE context relocation procedure (as legacy to transfer full UE context).

**Observation 4: The RLC configurations are essential information for SDT, the anchor gNB shall be acknowledged that the SDT RLC config is either successful or failure. If failure, RA-based SDT without anchor relocation shall revert to RA-based SDT with UE context relocation. Details can be further checked once the solution is chosen.**

**Proposal 2: A new class 1 procedure shall be introduced for RA-based SDT without UE context relocation.**

**Question 2: Do you agree with above observation 3/4 and proposal 2? If not, do you prefer either sol 3 or sol 4?**

|  |
| --- |
| **Observation 3: The receiving gNB shall provide SDT DL address to the anchor gNB, because the anchor gNB cannot judge whether subsequent DL small data/DL NAS PDU comes from 5GC during a SDT period.****Observation 4: The RLC configurations are essential information for SDT, the anchor gNB shall be acknowledged that the SDT RLC config is either successful or failure. If failure, RA-based SDT without anchor relocation shall revert to RA-based SDT with UE context relocation. Details can be further checked once the solution is chosen.****Proposal 2: A new class 1 procedure shall be introduced for RA-based SDT without UE context relocation.** |
| **Company** | **Yes/No****(O3, O4, P2)** | **Comment** |
| ZTE | Yes for all | We prefer to class1procedure, because we can consider failure case then let SDT procedure fallback to RA-SDT with anchor relocation. However, we are also fine with Class 2 (slightly prefer 4) if it is preferred by majority companies. |
| Huawei | FFS for O3.No for O4, P2 | For Q3, similar to CIoT discussion, it is propablly in many cases (traffic model) to only have one or two UL small packets, without any downlink data, in such case the class2 design is much more slim and efficient. And even if DL address has to be provided, class2 design can also support it.We do not agree with the statements about Ob4 and P2, the SDT RLC context will be designed with criticaility reject, if the peer node does not support SDT/without anchor rellcoation, the error indication will be triggered. Do not forseen other failure case.  |
| Intel Corporation | No for all | Please see above. For the argument that the nested class-1 procedure is required because new gNB may not support no anchor relocation, we think this is not a valid argument. We don't need such post mess clean-up. The right way should be to make new gNB indicate its support (of no anchor relocation) when it sends RTRV UE CTXT REQ message from the beginning, so that the anchor can choose the right procedure to go with.  |
| Google | FFS for O3No for O4, P2 | Class 2 procedure is preferred and the Xn-U address indication message can be reused for providing the DL TNL information |
| China Telecom | Yes for all | Both class 1 and Class 2 can work. but prefer Class1As observed in above signalling flowchart, the SDT context transfer procedure/Xn address indication nested inside Retrieve UE context procedure. Class 1: upon the SDT context transfer response received, the anchor gNB could know when to send Retrieve UE context Failure message. Thus, from the perspective of anchor gNB, it clear knows about the messages delivery order. Further, the SDT context transfer response message also means the new gNB could support all configuration in SDT context transfer request message.Class 2: the Xn address indication is used to provide DL address to anchor node. As we know, this message is an optional procedure. In some cases, the serving node may not need to send this message. Since the anchor node unclear whether Xn address indication need to send, it is unclear when to send Retrieve UE context Failure message. Furthermore, as ZTE said above, we need to consider failure case for SDT context transfer procedure. Thus, Class 1 seems more appropriate.  |
| CATT | Yes for O3 and P2, FFS for O4. | We prefer to use a new class 1 procedure.In this procedure, the SDT related UE context and UL tunnel is provided from anchor to the receiving gNB, and the DL tunnel is provided in the corresponding response message.By reusing the Xn-U address indication to provide the DL tunnel, if the message is not received in the anchor, how to proceed with the pending DL data (if any) in the anchor node?Due to the failure case of the SDT context transfer, maybe we need to further check it will happen in which case. Refer to the existing context transfer procedure, there’s no failure case designed when Retrieval UE Context Response is received in the new gNB. |
| Lenovo, Motorola Mobility | Yes for all | The RLC configurations are essential information for SDT, the anchor gNB shall be acknowledged that the procedure completed or not. With successful/unsuccessful response message, the procedure is more robust.  |
| Qualcomm | OK for all, but somewhat neutral | First for these SDT specific exchanges, it is better to use entirely new procedures so we can rule out hybrid such as soln3. Then it ‘s a pure comparison of a new class 1, or 2 (or maybe 1 bidirectional) class 2 procedure(s) – solns 2 and 4. In general there are good arguments on both sides. For the RLC setup failure case: we understand this is not a capability issue but some other temporary issue. To be fair, this seems relatively unlikely, particularly if the receiving gNB offered to set up SDT – as presumably it could have chosen not to even if it receives SDT indicator from UE.Anyway we could e.g. take a WA on class 1 and work along those lines make further progress while allowing further discussion. |
| E/// | Yes to all | Either class 1 or class 2 procedure works. Since the last serving gNB needs SDT related RLC configuration to continue the operation, it might be essential by having a firm acknowledge. |
| Samsung | Yes | Same as Q1. Among several candidates, we are okay for P2.  |
| NEC | No for all | We prefer a class 2 procedure.Just want to express that, the solution 2 with the class 1 procedure, if it will alwaays give tthe DL TNL address from the new gNB to the anchor gNB, this may be usless if in most of the SDT cases, only one shot of UL data is needed. Understand that class 1 procedure will have a chance for the receiving node to feedback the failure (e.g. not suppor the non-relcation case, fail to setup RLC configuration), however how much the failure can occur is a question. If the new gNB will understand the SDT, it will need to support the non-relocation otherwise what is the pont to discuss and work in Xn to support the SDT without relocation case. |
| Nokia | No | This looks again a strange design: the target gNB should say from the beginning on the way forward (UE CONTEXT RETRIEVE REQUEST) if it deosn’t like the “without relocation” : please note that was the sense of the planned “assistance information”. Now with this class 1 we have this strange ping-pong where anchor sends the partial context that target gNB doesn’t want to see and then anchor dalls back sending the full context. What a waste of energy! |
| LGE | FFS for O3No for O4 and P2 | In SDT, the UE can send one or multiple UL data without any DL data. In this case, the DL data forwarding tunnel between two gNBs is not needed. So, we also prefer a class 2 procedure.For O4, we have same view with NEC. |

Summary for Q2:

**Class 1 message: 7** (ZTE, CTC, CATT, Len, QC, SS, E///)

**Class 2 message: 6** (HW, Intel, Google, NEC, Nokia, LG)

**Morderator’s view：**We have not achieved consensus whether RLC configuration is essential and whether the anchor node shall be acknowleged. So far, a bit more companies (7:6) suggest Class 1 message.

**WA: Assume that the anchor node shall be acknowleged, a new Class 1 message shall be introduced for RA-based SDT without UE context relocation. Otherwise, a new Class 2 messsage shall be introduced.**

**FFS: For SDT, whether SDT context transfer procedure needs to be acked by the anchor node is FFS.**

## The detailed SDT related UE context

|  |
| --- |
| **FFS: The detail information included in SDT related RLC bearer configuration to be transferred from anchor gNB to receiving gNB in case of SDT without anchor relocation.** |

According to some company’s contributions, it seems that the following IE structure can be introduced.

**IE structure for DL: The SDT configuration (from anchor gNB to receiving gNB)**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 9.2.3.XX SDT ConfigurationThis IE includes necessary configuration information to process RLC PDUs related to SDT (small data transmission)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
| SDT Configuration (old -> new) |  |  |  |  |
| > SDT DRB To Be Setup List |  | 1 |  |  |
| >> SDT DRB To Be Setup Item |  | 1,,< maxnoofDRBs > |  |  |
| >>> DRB ID | M | 9.2.3.33 |  |  |
| >>> UL TNL address | M |  | UP Transport Layer Information 9.2.3.30 |  |
| >>> RLC Bearer Configuration | M |  | OCTET STRING | RLC-BearerConfig IE defined in subclause 6.3.2 of TS 38.331 |

 |

**IE structure for UL: The SDT Data Forwarding (from receiving gNB to anchor gNB)**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 9.2.3.XY SDT Data ForwardingThis IE includes necessary data forwarding information related to SDT (small data transmission)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
| SDT Data forwarding (new -> old) |  |  |  |  |
| > SDT DRB Admitted List |  | 1 |  |  |
| >> SDT DRB Admitted Setup Item |  | 1,,< maxnoofDRBs > |  |  |
| >>> DRB ID | M | 9.2.3.33 |  |  |
| >>> DL TNL address | M |  | UP Transport Layer Information 9.2.3.30 |  |
|  |  |  |  |  |

 |

Meanwhile, some contributions also suggest to introduce the following IEs into above ***SDT configuration structure*** (from anchor gNB to receiving gNB).

**Other IEs for DL**

|  |
| --- |
| 1. DRB QoS (QoS Flow Level QoS Parameters 9.2.3.5)
2. S-NSSAI
3. RLC Mode
4. PDCP SN Length
5. DL Forwarding (9.2.3.34) or Packet Data Indication (Indicates downlink data available)
6. PDU Session ID
 |

**Question 3: Do you agree to introduce above “IE structure for DL/UL”? And do you agree with full/partial “Other IEs for DL” included in the “IE structure for DL”?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No**IE structure/Other IE | **Comment** |
| ZTE | Yes for IE structure DL and IE structure for UL | We can leave “other IEs for DL” open.  |
| Huawei | Yes for all,With comments to the information provided from new serving to last serving gNB | For the information provided from the new serving gNB to the last serving gNB, DL TNL address should be provided instead of UL, and why you include “RLC Bearer Configuration”??The other IEs for DL part, (1,2,3,4) has to be provided, (5) optional, (6) is not useful, but it is ok to include (6) if Xn-U Address Indication message is used.For (1, 2, 3,4) they shall be provided, to enable the new serving gNB to setup UE context at the new serving gNB-DU via existing F1AP Context Setup procedure, otherwise the solution does not work. |
| Intel Corporation | Yes for all (including PDU session handling for both UL/DL) | Before going into details, the fundamental question we should discuss is whether SDT data handling between gNBs should be per DRB (not per PDU session), which is different to the fundamental NR mobility design. The purpose of SDT is to allow small data transfer under INACTIVE framework. We think we should not break the principle from day 1 that all the basic mobility and dual connectivity related procedure messages defined in XnAP between source and target or between MN and SN have been "per PDU session basis". |
| Google | Yes for all |  |
| China Telecom | yes | “other IEs for DL” is FFS |
| CATT | Yes with comments | For SDT configuration, except for SDT DRB, the SRB configuration should also be provided.For UL, it seems the “RLC Bearer Configuration” is not needed, only need to provide the DL tunnel info. (the DL tunnel for SDT DRB and SRB)The “others” should be FFS. |
| Lenovo, Motorola Mobility | YesComments for others | The RLC Bearer Configuration IE is not needed for UL.UL TNL Address should be DL TNL Address for UL.For other IEs:3) RLC Mode: we are wondering why it is needed. The RLC mode is already been included in the RLC-Config container.4) PDCP SN Length: it is needed for flow control i.e. support NR-U protocal. 5) DL Forwarding: we are wondering how to handle the case of DL non-SDT data arrival.6) PDU Session ID: not sure why it is needed. |
| Qualcomm | Yes | As others have mentioned, some details in the message from receiving gNB seem not right (surely it’s the DL TNL address, and also no RLC config needs to be sent up).Other IEs are ok though agree that 6) seems not essential. |
| E/// | Yes to some | Other than the obvious corrections mentioned by companies, we would suggest not limiting the whole procedure to SDT only. Instead, it could be complementary to Retrieve UE Context procedure. Thus, such procedure should be renamed to Partial UE Context for SDT or similar. For the other IEs, we are fine to keep open until the procedure is clear. |
| Samsung | Yes to some  | Structure is fine. * RLC bearer configuration is not needed in UL
* “UL TNL address” should be “DL TNL address” for UL
* RLC mode: share the view as Lenovo
* Other IEs: (1,2,4) OK, (5,6) FFS
 |
| NEC | Comment | Do we need to give a list of DRBs?May be too detaial before will will decide which solution (1, 2, 3,4) to go?  |
| Nokia | OK but | Some mistakes to be corrected: why the RLC-beraer-cofig in UL ? and why UL TNL address instead of DL TNL address?  |
| LGE | Yes for IE structure DL and IE structure for UL | For IE structure for DL/UL, we also agree the corrections commented by companies.FFS for “Other IEs for DL”. We can further discuss this at second round or next meeting. |

Summary for Q3:

Moderator’s view: The issue on the detailed SDT related UE context is not related to solution downselection. Nearly all companies agree with the IE structures.

**Proposal 2: Agree with the following for the detailed SDT related UE context**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Agree with IE structure for DL: The SDT configuration (from anchor gNB to receiving gNB)**9.2.3.XX SDT Configuration (Editor note: IE name can be refined)This IE includes necessary configuration information to process RLC PDUs related to SDT (small data transmission)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
| SDT Configuration (old -> new) |  |  |  |  |
| > SDT DRB To Be Setup List |  | 1 |  |  |
| >> SDT DRB To Be Setup Item |  | 1,,< maxnoofDRBs > |  |  |
| >>> DRB ID | M | 9.2.3.33 |  |  |
| >>> UL TNL address | M |  | UP Transport Layer Information 9.2.3.30 |  |
| >>> RLC Bearer Configuration | M |  | OCTET STRING | RLC-BearerConfig IE defined in subclause 6.3.2 of TS 38.331 |

**Agree with IE structure for UL: The SDT Data Forwarding (from receiving gNB to anchor gNB)**9.2.3.XY SDT Data Forwarding (Editor note: IE name can be refined)This IE includes necessary data forwarding information related to SDT (small data transmission)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
| SDT Data forwarding (new -> old) |  |  |  |  |
| > SDT DRB Admitted List |  | 1 |  |  |
| >> SDT DRB Admitted Setup Item |  | 1,,< maxnoofDRBs > |  |  |
| >>> DRB ID | M | 9.2.3.33 |  |  |
| >>> DL TNL address | M |  | UP Transport Layer Information 9.2.3.30 |  |

**FFS: Other IEs for DL*** DRB QoS (QoS Flow Level QoS Parameters 9.2.3.5)
* S-NSSAI
* RLC Mode
* PDCP SN Length
* DL Forwarding (9.2.3.34) or Packet Data Indication (Indicates downlink data available)
* PDU Session ID
 |

## How to transfer SRB PDCP PDU

In RAN2#113 e-meeting, working assumption on support of SRB transmission using SDT was agreed:

***Working assumption***

1. *Support configuring of SRB1 and SRB2 for small data transmission for carrying RRC and NAS messages.*
2. *Upon initiating RRC Resume procedure for SDT initiation (i.e. for first SDT transmission), the UE shall also resume SRB2 that is configured for SDT, in addition to SDT DRBs that are configured for SDT*
3. *RAN2 recommends to include SRB2 in WID*

In the last RAN3 #114 emeeting, we have the following progress.

|  |
| --- |
| **During SDT procedure, SRB PDCP PDU (FFS on the first SDT payload) shall be transferred between new gNB and anchor gNB, either via extending the XnAP RRC TRANSFER message or via defining a new XnAP class-2 procedure.** **FFS: How to transfer SDT SRB PDCP PDU****Extending the XnAP: RRC TRANSFER message or defining a new XnAP class-2 procedure** |

Based on the above progress in the last meeting, we further down-select from the following options.

* **Option 1: Extend the XnAP: RRC TRANSFER message, to forward the UL/DL SRB PDCP PDU during SDT procedure between new gNB and anchor gNB?**
* **Option 1A: Define new XnAP class-2 procedure to carry SRB PDCP-C PDU during SDT procedure between new gNB and anchor gNB.**
* **Option 2: Additionally, Extend the RETRIEVE UE CONTEXT REQUEST message, to forward the first SRB PDCP PDU from new gNB to anchor gNB**

In our view, because SRB PDCP PDU can be transmitted during the SDT procedure, solution 1/1A is always needed, so the option 2 shall be rule out.

**Proposal 3: Option 2 shall be excluded. RAN3 shall downselect either option 1 or option 1A.**

**Question 4: Do you agree with Proposal 3. If yes, do you prefer either option1 (i.e., RRC Transfer message) or option1A (i.e., new Class 2 message)?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No****(Option 1/1A)** | **Comment** |
| ZTE | Slighter prefer option 1 | Option 1A is also fine to us. |
| Huawei | Option 1 | Existing message can be easily extended, do not see the need for option 1A, but it is also acceptable to us.Disagree with option 2, see answer to question 5. |
| Intel Corporation | Option 1A | Both Option 1 and Option 1A works. Only concern for Option 1 is that RRC TRANSFER has been designed for Dual Connectivity with carrying not only SRB PDCP-C PDUs but also other RRC Container IEs and thus extending RRC TRANSFER is a bit messy. So, we prefer Option 1A which is cleaner. Option 2 can be technically feasible but we see it is not essential at this moment. Given we have a short time left, we prefer to down-prioritize it and comeback later when we have spare time. |
| Google | Option 1 | Both Option 1 and 1A work. |
| China telecom | Option 1 | Agree with huawei |
| CATT | Option 1 | Share the view with Huawei, prefer the option 1. |
| Lenovo, Motorola Mobility | Opton 1A | Extending the RRC TRANSFER message is feasible but not good. Currently, the RRC TRANSFER message is defined and used for dual connectivity for transmitting PDCP-C PDU of split SRB and RRC messages related with UE report, and fast MCG recovery between MN and SN. Reusing RRC TRANSFER may need lots of clarifications on the procedural text and IE tabular which causes the RRC TRANSFER message too complicated. It would be better to define a new dedicated procedure for carrying the SDT SRB PDCP PDU. |
| Qualcomm | No – we can have all | These are not alternatives, and so the option structure is not very fair (options 1 and 2 do not contradict each other)At least we should check forward compatibility for option 2 in rel-18.Otherwise both options 1 and 1A are feasible; slight preference for 1A. |
| E/// | Option 1 | We don’t see the benefit of having a new procedure. The legacy RRC Transfer message is used to transfer RRC message from the name we can tell. It should be not an issue by extending to have more containers, provided they are RRC info. |
| Samsung | Option 1 | Both option 1 and 1A are okay |
| NEC | Option 1 | Should try to avoid introduce too many new signaling procedure for a signall purpose, if the existing one can be easily extendeded and used. |
| Nokia | Option 1A | Both can work but slight preference for clean design for the reasons explained above. |
| LGE | Option 1 | Option 1 and 1A can work. But, our understanding is that message structure of Option 1A is very similar to that of Option 1. So, we prefer Option 1.  |

**Summary for Q4:**

**Option 1: 　9** (ZTE, HW, Google, CTC, CATT, E///, SS, NEC, LG)

**Option 1A: 3** (Intel, Len, Nokia)

**Option 2: 2** (QC)

Moderator’s view: Majority companies prefer to Option 1.

**Proposal 3: Extend the XnAP: RRC TRANSFER message, to forward the UL/DL SRB PDCP PDU during SDT procedure between new gNB and anchor gNB**

## How to transfer the first SRB/DRB

This issue shall be discussed based on the following progress in the last meeting.

|  |
| --- |
| **UL data for SDT is buffered at the receiving node in the successful context retrieval procedure. For other cases, the common understanding is that UL data may need to be buffered as well, details are pending.****During SDT procedure, SRB PDCP PDU (FFS on the first SDT payload) shall be transferred between new gNB and anchor gNB, either via extending the XnAP RRC TRANSFER message or via defining a new XnAP class-2 procedure.** **FFS: whether to allow optional transport of first DRB payload in the RETRIEVE UE CONTEXT REQUEST message.** |

For the first SRB/DRB payload conveyed on RRCresumeRequest message, if it is transferred via RETRIEVE UE CONTEXT REQUEST message, it is benefit to avoid time delay. However, this method has the following disadvantage.

1. The first SRB/DRB will be transferred to multiple candidate anchor gNBs, as well as multiple RETRIEVE UE CONTEXT REQUEST messages.
2. If the anchor gNB decides to relocate anchor node, the first SRB/DRB shall be turn back to the serving gNB.
3. SDT feature does not have latency requirement, so that the gain is not essential.

Currently, in case of RA-SDT without anchor relocation, at least for the subsequent SDT SRB/DRBs, they shall be transferred after UE verified successfully, via the established F1-C tunnel and F1-U tunnel for new gNB to the anchor gNB. It seems that additional normative effort is not needed for the first SRB/DRB transfer.

However, [14] provides a different view as below.

|  |
| --- |
| **The following view captured from the [14]****Observation 1: For the first uplink data, latency reduction can be significant (e.g. ≥ 50%) but becomes smaller in disaggregated scenarios.****Proposal 1: Further study the possible support of transport of initial data payload in the first CP message subject to the following principles:**- Feature is optional, and SDT generic flow shall not be impacted by lack of support in either anchor or serving gNB- No support for this functionality is provided in F1AP (i.e. no support if either anchor or serving gNB is disaggregated)**Observation 2: Simple additions to the signalling and behaviour in Xn-C can achieve the proposed principles, and fallback to normal operation is easy to achieve if either node does not support or does not want to proceed with data processing for any reason.****Proposal 2: To support the principles of P1, serving gNB always buffers data regardless of whether it sends it to the anchor in the first Xn-c message.****Proposal 3: To support the principles of P1, the anchor gNB can ignore and fallback to either RLC or full context relocation.** |

**Question 5: Do you prefer either to**

**Option 1：Transfer the first SRB/DRB transfer as the same method as the subsequent SRB/DRB transfer,**

**Option 2：Agree with above proposals suggested in [14]?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Option1 vs Option2** | **Comment** |
| ZTE | Option 1 | We think using the same method can decrease normative work. |
| Huawei | Option 1 | As shown in Figure 3 of R3-220424, in option 2, the last serving gNB-DU is unnecessarily involved, e.g. for the first SDT DRB, the last serving gNB-CU-CP will need to forward the received RLC PDU towards the last serving gNB-DU, and the last serving gNB-DU will proceed the packet and send PDCP PDU towards the last serving gNB-CU-UP, which is quite a complex and unexpected handling. |
| Intel Corporation | Option 1 | Agree with Huawei. Again, this is not essential and we can revisit later if the time allows.  |
| Google | Option 1 |  |
| China Telecom | Option 1 |  |
| CATT | Option 1 | With this, the SRB related RLC configuration should be provided from anchor to the receiving node, this is linked to the discussion in 4.2. |
| Lenovo, Motorola Mobility | Option 1 | If transport of first DRB/SRB payload in the RETRIEVE UE CONTEXT REQUEST message is allowed, how to handle RLC segmentation/reassembly of the first RLC SDU needs to be further clarified. |
| Qualcomm | Option 2 | To Huawei: as stated in [14], the proposal is to structure the exchange such that either node can fallback to SDT without this feature, **hence no support for F1 is needed** as either node can “pass” if not configured to support. This is the proposal for rel-17.This also addresses Lenovo’s comment, if the anchor finds that the message is not complete and requires re-assembly, it discards and falls back to normal SDT (with ot without anchor relocation).The key point in [14] is that such optionality can fairly easily be added on to the flow. |
| E/// | Option 1 |  |
| Samsung | Option 1 | Agree with Huawei |
| NEC | Option 1 | If need to choose then Option 1,  |
| Nokia | Option 1 | See reasons above. |
| LGE | Option 1 | Agree with Huawei |

**Summary for Q5:**

**Option 1: 　12** (ZTE, HW, Intel, Google, CTC, CATT, Len, E///, SS, NEC, Nokia, LG)

**Option 2: 1** (QC)

Moderator’s view: Majority companies prefer to Option 1.

**Proposal 4: Transfer the first SRB/DRB transfer as the same method as the subsequent SRB/DRB transfer**

## Additional SDT assistant information

|  |
| --- |
| **For RA-SDT, “SDT Indicator” is introduced in RETRIEVE UE CONTEXT REQUEST message, and the message may include other SDT Assistance Information.**  |

RAN2 has agreed that it is the UE to decide whether to initiate RA-SDT/CG-SDT procedure. Moreover, it is RAN3 scope that anchor gNB decides whether to relocate UE context or not relocate UE context.

Although the essential IE “SDT Indicator” has been introduced, some companies think it is not sufficient for anchor gNB to make good decision on anchor relocation, since the last serving gNB has no idea whether there are the subsequent small data transmission. It is suggested to introduce additional SDT assistant information as below.

 **(1) RRC Resume Cause**

Currently the RRC Resume Cause IE is defined as ENUMERATED (rna-Update ...), and limited to the case of RNA update. Considering that the RACH based SDT supports data delivery via DRB and via SRB (NAS PDU for Positioning), it is better to inform such difference to the last serving gNB, it may be needed to extend the RRC Resume Cause IE to include mo-data and mo-signalling.

* May extend RRC Resume Cause IE to include mo-data and mo-signalling, to be used in case of SDT.

**(2) Single or multiple packets (similar to single shot or multiple shot)**

It should be useful for the last serving gNB to know whether the UE has only one packet or multiple packets to be transmitted, and then makes the decision on with or without anchor relocation, e.g. if the number of UL packets to be transmitted are less, there is a larger possibility that the last serving gNB will anchor the SDT session using without anchor relocation procedure. Whether and how the new gNB gets such information is up to RAN2 discussion, e.g. via BSR, RAI.

* Add single/multiple packets indication or signal/multiple shot indication

**(3) Buffered Data size at new gNB**

The new gNB may also provide the buffered data size to the last serving gNB in the assistance information, especially in case of multiple packets, it could be used by the last serving gNB to estimate the data volume of the consequent packets.

* Provide buffered data size or data volume information or BSR.

**(4) Anchor relocation Preference**

Indicates that the new NG-RAN node prefers to keep the UE context in the old NG-RAN node or to relocate the context.

In [18], it states that according to RAN2, currently, once the last serving gNB decided not to relocate the context, relocation in the middle of SDT session is not allowed at least for Rel-17. So, it is better to provide the preference at the beginning of the SDT procedure. Then, there may be a case that the new gNB (capable of SDT) does not support the "no anchor relocation" scenario which requires quite different behaviors and data handling than the legacy NR INACTIVE. In this case, new gNB should be able to indicate its preference of "relocation", to prevent decision at the last serving gNB to keep the anchor role as much as possible.

On the other hand, new gNB may not want to take the anchor role for the UE, if e.g. too many UEs are under its connection management. In this case, new gNB should be able to indicate its preference of "no relocation" to be taken into account by the last serving gNB's decision. The UE who initiated SDT is generally expected to exchange only small amount of data and shortly go back to dormancy, and thus such preference of "no anchor relocation" makes perfect sense.

* Provide anchor relocation Preference indication (e.g., (no relocation, relocation, …)

**Question 6: Do you agree to add additional assistant information? If yes, which one or more IEs as above do you prefer?**

|  |
| --- |
| **Candidate IE 1:** Extend RRC Resume Cause IE**Candidate IE 2:** Add single/multiple packets indication or signal/multiple shot indication**Candidate IE 3:** Add buffered data size or data volume information or BSR**Candidate IE 4:** anchor relocation Preference indication**Candidate IE 5:** other if any |
| **Company** | **Yes/No** | **Comment** |
| ZTE | No.  | We think none is essential. But if majority companies prefer to introduce assistant information for anchor gNB to make a good decision, we slightly prefer IE3 (i.e., BSR) as optional IE. |
| Huawei | Yes for 1, 2, 3 | We think IE1, 2, 3 are helpful for the anchor gNB to makes decision at the begininig or during SDT. |
| Intel Corporation | Yes for 4. Others, no strong preference | SDT without anchor relocation requires new special data handling from both new gNB and anchor gNB. Therefore, whether new gNB supports or not is critical in making SDT feature successful, so it should be indicated to the anchor as a preference so that anchor can choose the right procedure to go with.  |
| Google | OK for 2. No strong preference for others. |  |
| China Telecom | Yes for 1,3,4 | We don’t think the new gNB could know this uplink tranmssion is one-shot or multi-shot. The new gNB could not derive the traffic characterise according to buffered MAC data. Instead, the anchor node has the DRB configuration. So IE2 is no need.  |
| CATT | No | For 1, no difference with the SDT indication as we agreed, For 2, the receiving node should initiate the Context Retrieval procedure immediately when it receives the 1st UL SDT packet, how it could know the total number of packets? For 3, similar issue with 2.For 4, how to set the preference indication in the receiving node? We discussed a lot during Inactive support in Rel-15, and the principle is whether to relocate the anchor is fully decided by the anchor.  |
| Lenovo, Motorola Mobility | Yes for 3 | the ‘SDT Indicator’ are not sufficient, since the last serving gNB has no idea whether there are the sequent data transmission. For example, if there are more sequent data transmission, it would be better to send the UE into RRC\_CONNECTED. If sending the UE into RRC\_CONNECTED is needed, the anchor relocation should be performed. From this point of view, besides the ‘SDT indication’, it is also beneficial to have ‘data volume information’ for assisting the last serving gNB decides whether anchor relocation is needed. The receiving gNB can get the ‘data volume information’ from UE by BSR or other information (e.g., Data volume indication MAC CE). |
| Qualcomm | Yes for 2/3, others FFS | We assume that this assistance information has to come from the UE and therefore anyway confirm with RAN2 what can be provided. So 2/3 are more like examples of the things we could ask for. In any case such information seems useful, as the anchor gNB has several decisions to make including relocation, moving to connected etc.Regarding 1, it is unclear how this differs from the SDT Indication, but maybe it replaces it ??Regarding 4, this is slightly separate discussion as based on the receiving gNB, rather than UE traffic aspects – seems like the most important case is no support of the “no relocation” case – e.g. no RLC only handling. We need to decide if this use case needs to be supported because it would not be a preference in case of no support, more a feature support issue. In this case, the anchor has no decision to make. |
| E/// | Yes for 2, open for 3 | We still foresee one indicator with single-shot, multipe-shot will be the easiest way when anchor gNB has to make the decision whether relocate the anchor. For 4, we have concluded that anchor gNB makes the decision. Such preference may not work. |
| Samsung | Yes for 2 and 3 | We also think these can be assistive deciding anchor relocation. |
| NEC | Yes for 1 and 2 | By the assistance information, it will ease the anchor gNB to have the decision whether to do the relocation or not.. |
| Nokia | Yes for 2/3 and 4 | 1 seems not needed because SDT indicator is good enough.Information on either 2 or 3 is useful to help anchor gNB make decision based on data traffic expected.For 4/ Intel has a point that we cannot mandate for target gNB that “without anchor relocation” is always supported. This measn we should at least have the “required relocation” codepoint.  |
| LGE | Yes for 1, 2, and 3 | For 1/2/3, these information is helpful for anchor gNB to decide whether to relocate the UE context to new gNB.  |

**Summary for Q6:**

**Need additional assistant information?** Yes (11), No (2)

**Candidate IE 1: 4** (HW, CTC, NEC, LG)

**Candidate IE 2: 8** (HW, Google, QC, E///, SS, NEC, Nokia, LG)

**Candidate IE 3: 8** (ZTE, HW, CTC, Len, QC, SS, Nokia, LG)

**Candidate IE 4: 3** (Intle, CTC, Nokia)

**Moderator’s view:** Majority companies prefer to IE 2 and IE 3, it is no need to consider other IEs.

**Proposal 5: The additional SDT assistant information is needed, but it is no need to consult with RAN2. It includes single/multiple packet/shot indication or BSR information,** **other IE is not needed.**

## Sending LS to other groups

### Sending LS to SA2

In [13], it states that we understand that whether a bearer can be considered as a SDT bearer or not depends on the traffic feature. Considering the SDT bearer may aggregate multiple QoS flows, the SDT bearer determination should consider the QoS flow feature. Since the QoS information of each QoS flow comes from core network, it is better to let AMF determines whether a QoS flow can be applicable for SDT or not, and then the gNB can determine the SDT bearer. However, at this moment, we are open for discussion on this issue.

Thus, it proposes that RAN3 discusses whether AMF needs to indicate a QoS flow which is applicable for SDT.

RAN2 has already agreed that

5 SDT is transparent to NAS layer (i.e. NAS generates one of the existing resume causes and AS decides SDT vs non-SDT access)

### Sending LS to RAN2

In the draft LS [16], it request RAN2 to define a RRC container to include the RLC bearer configuration for SDT SRB/DRB(s). If any other information should be included in the RRC container is pending to RAN2.

**Question 7: Do you think RAN3 needs to send LS to SA2/RAN2? If yes, which content (e.g., [13], [16]) shall be included in the LS out?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comment** |
| ZTE | No LS to SA2Maybe LS to RAN2 | We wonder whether AMF needs to be involved into SDT procedure, or it is up to RAN to determine whether a DRB is applicable to SDT or not.We think whether LS to RAN2 is needed, depending on the progress on section 4.2. |
| Huawei | FFS | Can be futhter discussed. |
| Intel Corporation | LS to SA2: YesLS to RAN2: No | For how gNB determines which bearer can be considered as a SDT bearer, we think it is worth getting consultation from SA2. For LS to RAN2, we see no reason. *CellGroupConfig* IE has been the RRC container to transfer lower layer configurations between nodes and the anchor can always include necessary ones (SRB1 RLC + SDT DRB RLCs) for SDT without anchor relocation.  |
| Google | FFS LS to SA2 No LS to RAN2 | Generally agree with Intel for the LS to RAN2 |
| China Telecom | FFS | Can be further discussed |
| CATT | Prefer to send the LS to RAN2. | As been discussed in section 4.2, it mentioned that the SDT related RLC configuration could use the definition of *RLC-BearerConfig IE defined in subclause 6.3.2 of TS 38.331.* It’s better to send the LS to RAN2 to confirm/further check if any other info is needed for the receiving gNB for RLC handling. |
| Lenovo, Motorola Mobility | Yes for both | It is worth to consulting with SA2 and RAN2 as early as possible |
| Qualcomm | FFS | For SA2, the rationale seems weak, but can be further discussed.For RAN2, if we think that any assistance data may be required from the UE, then we should check feasibility. |
| E/// | No for both now | AMF gives the QoS preference, but does not determine which can be used for SDT. We prefer to keep the discussion in RAN domain.For the LS to RAN2, RAN2 has defined the related configuration, what RAN3 needs to do is to add reference. We don’t see the point of asking RAN2 anything for now unless there is clear clue what additional info is required in the container. |
| Samsung | LS to SA2: YesLS to RAN2: Depending | We think SA2 consultation is beneficial on how to determine a SDT traffic. LS to RAN2 depends on the progress of Section 4.2 |
| NEC | May be yes | If it will help to progress our work. |
| Nokia | LS to SA2: noLS to RAN2: FFS | For SA2 LS: This kind of things is RAN domain; for example RAN is specifying the flow-DRB mapping (SDAP).For RAN2 LS depends on progress. |
| LGE | No for LS to SA2FFS for LS to RAN2 | For LS to SA2, we have same view with ZTE. We think that based on additional information (e.g., UE traffic pattern), it is pending to RAN to determine whether a DRB is applicable to SDT or not.For LS to RAN2, it depends on the progress of Question 3 and 6. If we agree the IE structure for DL / UL in Question 3, there is no need to send a LS to RAN2. Also, if we agree additional information IE 1/2/3 in Question 6, we need to inform this agreement to RAN2. |

**Summary for Q7:**

**LS to SA2: 4** (Intel, Len, SS. NEC)

**LS to RAN2: 3** (CATT, Len, NEC)

**Moderator’s view:** 13 companies input their views, but 4 companies support to send LS to SA2 and 3 companies support to send LS to RAN2.

**Proposal 6: It is no need to send LS to SA2/RAN2 for the issue indicated in section 4.6.1 and 4.6.2**

## Other cases

### Case 1: Termination of the RA-SDT procedure

In [1], it states that when DU detects that no more packet is to be sent, the DU can send the F1 Inactivity Notification to target CU CP. Then for target CU CP to inform over XnAP the anchor CU CP there are two possible options:

* **Option A:** target CU CP sends a Retrieve UE Context Request message including a “last packet” indication to anchor CU CP, the anchor CU CP includes the RRC Release in the Retrieve UE Context Failure message. The RRC Release is sent to the UE.
* **Option B:** introduce a new Xn message for target CU CP to send the “last packet” indication message to anchor CU CP. Then Anchor CU CP sends an Xn Release message as a reply which includes an RRC Release message.

### Case 2: Cell reselection during SDT procedure

In [6], it states that in this case, the UE context is possibly lost due to context relocation to another gNB, while the new RRCResumeRequest message is routed to the old anchor gNB. The scenario will be that the context which is originally stored in the last serving gNB, now is relocated to the cell where the UE starts its SDT procedure, i.e., cell A, by sending RRCResumeRequest message. If the UE does a cell re-selection, i.e., to cell B before the SDT procedure is completed, it may start a new SDT procedure in the new cell. Then the new SDT procedure will try to fetch the UE context from the last serving cell, but at this point the context has been relocated to cell-A, and the fetch procedure and hence the SDT procedure will fail. We need to figure out a way to store the UE context properly when the UE is kept in the INACTIVE state. Figure 2 gives an example on the procedure.

Then, it proposals RAN3 to consider above procedure for cell reselection during ongoing SDT if time allows.

### Case 3: Enhancement on TS38.425

In [9], TS38.425 is suggested to be enhanced. It states that apart from the initial SDT stage, we consider if the data volume of the SDT RB become quite larger during the SDT procedure, it’d better timely end the SDT session from point of transmission efficiency. Then, it proposes to add available data volume from UE in the NR UP: ASSISTANCE INFORMATION DATA (PDU Type 2).

**Question 8: Do you think RAN3 shall study one or more cases as above?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No****(Case 1/2/3)** | **Comment** |
| ZTE | No | We think these cases are not essential, we wonder if RAN3 has time to study them in Rel-17. But we can follow majority company’s view. |
| Huawei | Yes for 3 | 3 can be used by the last serving gNB to determine whether to end the ongoing SDT without anchor relocation.  |
| Intel Corporation | Yes for 1 | For SDT without anchor relocation, how new gNB initiates termination of SDT looks essential and is worth investigating in the next meeting. There could be other options than the listed.Other enhancements don't seem critical at this stage. We can revisit if time permits later.  |
| Google | FFS for 1 | Suggest finishing fundamental functions first |
| China Telecom | No | Agree with ZTE |
| CATT | None | Case 1 could be left to implementation.Case 2 and 3 should be considered in RAN2 firstly. |
| Lenovo, Motorola Mobility | FFS for 1&3 | Case 2 seems have been excluded by RAN2.We are open to discussion case 1&3.**There would be another issue to be addressed: how to handle RLF during SDT without anchor relocation procedure. If RLF occurs in the serving gNB, it makes sens the serving gNB informs RLF information the anchor gNB**. |
| Qualcomm | No for 2FFS for 1 and 3 | But these should be low priority, and not to be treated in parallel (e.g. maybe not in next meeting). Perhaps they could be considered in May on a simple yes/no basis. |
| E/// | No for 1 and 3 now, can be FFS for 2 | For 2 we think the scenario is valid. It can be discussed in RAN2 as well, but RAN3 would be able to confirm the signaling aspects. We are fine to keep all of them for later, currently need to focus on the basic functions. |
| Samsung | Yes for 2FFS for 3 | 2 seems valid scenario. Additional RAN3 perspective signalling may be needed. For 3, we are open to discuss it further.  |
| NEC | FFS | Slightly feel for the moment not so critical for the basic SDT to work properly. But may be for 1, need more checking. |
| Nokia | No for 2OK for 1 or 3 | As discussed previously at the beginning, it seems that the ending of SDT procedure was overlooked. But it is important e.g. to decide which procedure to use for the Q1 (see answer to question Q1 on the initiation case). Indeed if solutions 2/3/4 are used for Q1 it means that UE CTXT RETRIEVE FAILURE response message of the SDT initiation is used for ending the SDT transaction which is weird because anchor CU CP cannot know when the transaction should end! |
| LGE | FFS for 1No for 2 and 3 | For case 1 and 3, we think that these issues are not critical to support SDT. So, if we have time to study something before closing this WI, we can further discuss these issues.For case 2, we think that it should be discussed in RAN2 firstly. |

**Summary for Q8:**

**Case 1: 2** (Intel, Nokia)

**Case 2: 1** (SS)

**Case 3: 3** (HW, Nokia)

**Proposal 7: It is no need to discuss the cases indicated in section 4.7.**

# Conclusion, Recommendations [if needed]

If needed

# References

1. [R3-220203](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114bis-e%5CDocs%5CR3-220203.zip) (TP for TS 38.423) Support of RACH-based SDT (Nokia, Nokia Shanghai Bell)
2. [R3-220204](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114bis-e%5CDocs%5CR3-220204.zip) (TP for TS 38.473) Support of RACH-based SDT (Nokia, Nokia Shanghai Bell)
3. [R3-220214](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114bis-e%5CDocs%5CR3-220214.zip) (TP for RA-SDT BLCR to TS 38.300) Overall procedure for RA-SDT without anchor relocation case (ZTE, Samsung, Ericsson, Lenovo, China Telecom, CATT, Qualcomm Incorporated)
4. [R3-220215](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114bis-e%5CDocs%5CR3-220215.zip) (TP for RA-SDT BLCR to TS 38.423) Support of RA-SDT (ZTE, China Telecom)
5. [R3-220248](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114bis-e%5CDocs%5CR3-220248.zip) RACH based SDT discussion (NEC)
6. [R3-220347](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114bis-e%5CDocs%5CR3-220347.zip) Further discussion on RACH-based SDT (Ericsson)
7. [R3-220348](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114bis-e%5CDocs%5CR3-220348.zip) (TP for RA-SDT BLCR to TS 38.423) Support of RACH-based SDT (Ericsson)
8. [R3-220424](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114bis-e%5CDocs%5CR3-220424.zip) (TPs to RA-SDT BL CRs of TS 38.300, 38.420) RACH based SDT without anchor relocation (Huawei)
9. [R3-220425](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114bis-e%5CDocs%5CR3-220425.zip) (TPs to RA-SDT BL CRs of TS 38.423, 38.425) RACH based SDT without anchor relocation (Huawei)
10. [R3-220497](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114bis-e%5CDocs%5CR3-220497.zip) On RACH based SDT (Lenovo, Motorola Mobility)
11. [R3-220550](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114bis-e%5CDocs%5CR3-220550.zip) Discussion on support of RA-SDT (LG Electronics)
12. [R3-220551](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114bis-e%5CDocs%5CR3-220551.zip) (TP for RA-SDT BL CR for TS 38.423) Support of RA-SDT (LG Electronics)
13. [R3-220568](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114bis-e%5CDocs%5CR3-220568.zip) (TP to RA-SDT BL CR of TS38.473) Discussion on SDT bearer awareness and SDT configurations (Samsung)
14. [R3-220612](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114bis-e%5CDocs%5CR3-220612.zip) Handling of first UL data in RA-SDT without anchor relocation (Qualcomm Incorporated)
15. [R3-220720](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114bis-e%5CDocs%5CR3-220720.zip) Discussion on open issues of RA-SDT without anchor relocation (CATT)
16. [R3-220721](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114bis-e%5CDocs%5CR3-220721.zip) Draft LS on define a RRC container for SDT related RLC bearer config (CATT) LS out To: RAN2 CC:
17. [R3-220839](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114bis-e%5CDocs%5CR3-220839.zip) (TP for RA-SDT BL CR for TS 38.423) Discussion on RACH based SDT (Intel Corporation)
18. [R3-220840](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114bis-e%5CDocs%5CR3-220840.zip) (TP for RA-SDT BL CR for TS 38.423) Assistance Information from New gNB for RACH based SDT (Intel Corporation)
19. [R3-220841](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114bis-e%5CDocs%5CR3-220841.zip) (TP for RA-SDT BL CR for TS 38.300) (Intel Corporation)
20. [R3-220956](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114bis-e%5CDocs%5CR3-220956.zip) Discussion on SDT Assistance Information (Samsung)