3GPP TSG-RAN WG2 Meeting #112-e R2-20xxxxx

E-meeting, …, 2020

Agenda Item: …

Source: Ericsson

**Title:** Summary of email discussion [Post111-e][926][SmallData] Context Fetch

Document for: Discussion and Decision

# Introduction

The discussion handles:

* [Post111-e][926][R17 Small Data] Context fetch (Ericsson) Henrik/Tuomas

Scope

• Discuss the RAN2 aspects of context fetch with and without anchor relocation and identify any issues that need further input (e.g. from RAN3 and/or SA3 etc)

• Can also discuss if there are any bottlenecks to support SDT without anchor relocation (i.e. the FFS point above)

Outcome: agreeable proposals and identified impacts to other groups

Deadline: Long

Companies are invited to respond to the questions below in time for the email discussion deadline.

# Context Fetch

The questions in this email discussion is based on company input in Tdocs submitted to RAN2-111e: R2-2007469, R2-2007197, R2-2007838, R2-2006583, R2-2007541, R2-2007195, R2-2007180, R2-2006714

## Background

A UE moved to RRC-INACTIVE state results in that the DU releases the stored UE context including corresponding tunnels established between DU and CU-UP. The UE remain CM-CONNECTED and both UE and CU-CP store the UE Context. When a UE moves within an RNA area configured by NG-RAN, the last serving gNB node keeps the UE context (and the UE-associated NG connection with the serving AMF and UPF).

Context relocation can be done by the RAN-based Notification Area (RNA) update procedure. The procedure may be triggered when the UE moves out of the configured RNA, or periodically. Figure 1 from 38.300 (therein Figure 9.2.2.5-1) shows the RNA update with context relocation.



Figure 1 RNA update with Context Relocation

The RNA update procedure is initiated by the UE sending an RRCResume with RNA update as cause value. Upon successful UE context retrieval, the receiving gNB would typically keep the UE to inactive and triggers a Path Switch Request. After the path switch procedure is performed, the receiving gNB triggers release of the context in the last serving gNB.

The RNA procedure may also be done without context relocation. In case the last serving gNB decides not to relocate the UE context (e.g. in case the UE is still within the RNA area), it sends a Retrieve UE Context Failure to the serving gNB. procedure and sends the UE back to RRC\_INACTIVE, or to RRC\_IDLE directly by an encapsulated *RRCRelease* message (i.e. RRC Release).

### Small Data

For NR SDT, when the UE temporarily access the NW for transmission of UL data, e.g by payload transmitted in a 2-step msgA or 4-step msg3 Random Access procedure, context handling in the NW may need to be extended to support small data transfer in RRC\_INACTIVE. As a result, both with and without anchor relocation needs to be considered.

**Q0: Do you agree with the general principles above (legacy)?**

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Following the background assumptions, part of the legacy events that may initiate a context relocation request, i.e RNA update and RRC Resume request, also SDT from RRC INACTIVE contribute to the frequency and initiation for when context relocation may be considered.

### 2.2.1 General case

It can be assumed that w.r.t SDT and RA based schemes, context relocation can be realized by the following:

The receiving gNB, after resolving the gNB identity contained in the I-RNTI, sends the Retrieve UE Context Request to the Last Serving gNB where:

1. Retrieve UE Context Failure is received at Receiving gNB and UE AS context is maintained at the Last Serving gNB. SDT data is forwarded to the Last Serving gNB where it is deciphered, sent to 5GC and DL data tunneled to the Receiving gNb by the Last Serving gNb, or
2. Retrieve UE Context Response results in that UE AS context is relocated to the (new) Receiving gNB and SDT Data is either:
   1. Stored at the Receiving gNB until UE Context is relocated where it is deciphered and sent to 5GC after context relocation
   2. SDT Data is transferred to Last serving gNB where it is deciphered and sent to 5GC, and UE Context relocation is performed subsequently.
   3. Path switch to the Receiving gNB is performed.
3. The overall options for either 1 or 2 above should remain as in legacy in that it would be the Last Serving gNB that decides on UE Context relocation.

**Q1: Do companies agree with the above general assumption 1-3.**

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### 2.2.2 Assistance Information

The decision for Context Relocation w.r.t SDT may be based on evaluating signaling load and signaling latency or other. For example, if subsequent SDT data is expected without moving UE to CONNECTED (pending agreements), context relocation may be beneficial compared to subsequent tunneling of SDT data and initiation of Context relocation procedures without path switch and context relocation. The signaling and data forwarding to the anchor CU-CP/CU-UP is expected to involve potentially increased signaling than what is the case for legacy RNAU procedure.

On the other hand; depending on if INACTIVE UEs for the most cases are not expected to connect to a Serving gNB other than the Last Serving gNB (i.e Anchor gNB), optimizations may not be as useful. For example, if a UE in most cases anyway have performed RNAU due to e.g. timer expiry and as a result, context relocation may not specifically benefit from optimizations related to SDT in particular. The RNAU timer (T380) has the possible value range 5min to 720min currently.

To aid the last serving gNb in the decision to relocate context, assistance information may be useful. However, the need for this should be balanced to the need for optimizations for this case.

Example of assistance information is traffic pattern information, BSR or other (see Q3).

**Q2: For subsequent SDT, is it beneficial for the Last Serving gNB (anchor eNB) to know if the UE needs more UL resources for subsequent data transmission after the initial small data transmission?**

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If assistance data is seen beneficial, there are a number of options foreseen. For example, the Retrieve UE Context Request message may contain a small data request indication or message for informing the Last Serving gNB of subsequent data transmission for uplink small data transmission. Such assistance information would seemingly fit naturally into the context relocation procedure itself as part of what impacts the context relocation decision.

Alternatively, the addition of a BSR or other indication may be present in the data forwarded by the Serving gNB in the SDT payload. However, limiting to BSR or similar UE indication may omit other node specific or system specific information. However, this information may be useful in general for the decision on how to handle particular UEs and their scheduling.

Note that it can be expected that the actual procedures and message exchange on Xn and other interfaces are discussed and defined in RAN3, although also based on informed assumptions of alternatives discussed in RAN2 for useful information exchange w.r.t SDT.

**Q3: Is there benefit of extending the Retrieve UE Context Request message to also contain assistance info e.g. requesting subsequent data transmission for uplink small data transmission?**

**Clarify and expand if other mechanism would be of interest if applicable.**

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### 2.2.3 UE DRB Configuration

Which RLC and PDCP DRB configuration is to be used by UE in RRC\_INACTIVE for SDT may have impact on the context relocation procedure as it may impact data forwarding and tunneling specified in RAN3. For example, if a UE specific RLC configuration is used, this needs to be provided to Receiving gNB. Alternatively, a default/common configuration may be used. Note here that similarly to RLC, the UE PDCP configuration may need consideration. The DRB configuration needs to consider both with and without context relocation.

**Q4a: What RLC configuration should be used and why for user data in SDT considering that context relocation may be performed?**

1. **The RLC configuration stored in UE Context, or**
2. **a default/common RLC configuration**
3. **other variant or combination**

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**Q4b: Assuming that a UE PDCP configuration is dependent on the UE AS security context, along with DRB specific QoS, is a UE specific PDCP configuration to be assumed?**

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### 2.2.4 DL Data

SDT may in many cases result in DL data being sent as a result of the UE transmission. Since the data from UPF could be traversed through the Last Serving gNB (anchor node) and tunneled to the Receiving gNB before transmitted to the UE, additional delay may be introduced. In such cases it could be valuable to extend the time to release the UE, for example by extending T319 (timer started upon sending RRC Resume Request) in order to support transmission of DL data related to SDT. The maximum value currently is 2000ms.

**Q5: Is there benefit of that T319 should be extended for uplink small data transmission in RRC\_INACTIVE.?**

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### 2.2.5 Other

For comprehensive understanding, there may be outstanding issues that may need input from other groups, or additional issues in this discussion that may need attention. Companies are invited to add those here. Please limit the input to issues that have been discussed or submitted to RAN2 -111e.

**Q5: Other issues relevant to this discussion?**

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# Summary and Conclusion

TBD