3GPP TSG-RAN WG3 Meeting #115-e R3-222454

Online, 21th Feb – 3rd Mar 2022

**Agenda item: 21.3**

**Source: Huawei (moderator)**

**Title: Summary of offline: Enhancements Based on New QoS Related Parameters**

**Document for: Discussion and Decision**

# 1 Introduction

**CB: # NRIIOT3\_NewQoS**

**- For non-HO scenarios, the gNB-DU need deliver a survival time state indicator to the gNB-CU? If agree, which message is used to include the above indicator?**

**- During handover, the downlink Survival Time assistance information is defined as Option 1 (i.e., an available survival time) and Option 4 (i.e., a survival time state indicator (activated or not))?**

**- The downlink Survival Time assistance information IE is introduced over Xn and F1 interfaces? If agree, which message is used to include the above information?**

**- Capture agreements and provide TPs if agreeable**

(HW - moderator)

Summary of offline disc

# 2 For the Chair’s Notes

**The first round summary:**

**For Xn based handover,**

**Proposal 1: Over Xn, discuss the following options as way forward.**

* **Option 1 (i.e., an available survival time) over the XnAP Handover Request message.**
* **Option 4 (i.e., a survival time state indicator (single codepoint- “activated” only)) over the SN STATUS TRANSFER message and the EARLY STATUS TRANSFER message.**
* **Postpone to future releases.**

**Proposal 2: no need to consider the following procedure texts, if option 1/4 is selected.**

* ***If the “Survival Time” is presented in the TSC Assistance Information in HANDOVER REQUEST message, the target NG-RAN node shall, if supported, consider that the “Survival State” has been activated.***

**Proposal 3: the F1 impact (via F1AP or UP frame) can be further discussed after the Xn impact is settled:**

**For NG based handover:**

**Proposal 4: No need to consider the survival time assistance information for NG based handover.**

# 3 Discussion (Phase 1)

Please provide your Round 1 views by **11:00 UTC Wednesday February 23rd**, so that comments may be taken into account during the online discussion.

At the beginning of the discussion, the moderator copies the agreements of the previous meeting for reference.

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| **For downlink transmission, the issue on survival state is not triggered on the source NG-RAN node should be discussed and solved. On top of it, Option 1 (i.e., an available survival time) and Option 4 (i.e., a survival time state indicator (activated or not)) can be further discussed.**  **There is no need to deliver uplink Survival Time assistance information during handover in R17 based on agreements in RAN2 and RAN3.** |

Also in R3-221876, some background information is provided with three observations. Since last meeting already agreed that no need to consider the UL survival time assistance information during handover, the discussion is focusing on the **DL only**.

## 3.1 XnAP on DL survival time assistance information

Contributions to this meeting seems all agree to introduce the DL survival time assistance information, but the details may be different.

Overview of RAN3 papers.

* *Nokia [R3-221876]:* 
  + *Introduce the Available Survival Time IE within the TSC Assistance Information IE transferred over Xn, to convey the survival time that remains following handover.*
* *ZTE [R3-221879]:* 
  + *It’s suggest that SN STATUS TRANSFER message is used to include downlink Survival Time assistance information over XnAP. For downlink transmission, Option 4 (i.e., a survival time state indicator (activated or not)) can be selected as the downlink Survival Time assistance information*
* *Huawei [R3-221969]:*
  + *During handover, the Source NG-RAN indicates the downlink survival time indicator to the target NG-RAN as an assistance information. For Xn based handover, the source gNB can include the DL survival time state in the SN STATUS TRANSFER message and the EARLY STATUS TRANSFER message. A single codepoint “activated” can be designed for the DL survival time state.*
* *Ericsson [R3-222039]:* 
  + *consider that when the service with “Survival Time” IE included in the TSC Assistance information, the target NG-RAN node shall, if support, consider that the “Survival State” is triggered/started already and it should be handled with higher priority than the handovers without any “Survival Time” IE.*
* *CATT [R3-222214]*
  + *Source node provides the available survival time to target node for downlink during* ***DAPS*** *handover*

In addition, about the survival time state (“deactivated” state at the source node) signalled to the target RAN node, two companies in R3-221876/ R3-222039 have concerns to indicate the “deactivated” state. And one company is fine to have only a single codepoint “activated” state. Then the moderator limit the option 4 to the “activated” state only.

The moderator’s summary: two options are on the table over Xn.

* **Option 1 (i.e., an available survival time) over the XnAP Handover Request message.**
* **Option 4 (i.e., a survival time state indicator (single codepoint- “activated” only)) over the SN STATUS TRANSFER message and the EARLY STATUS TRANSFER message.**

Before the down-selection of the two options, the moderator first collects views about the following question.

In R3-222039, the following texts are suggested to be specified.

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| If the “Survival Time” is presented in the TSC Assistance Information in HANDOVER REQUEST message, the target NG-RAN node shall, if supported, consider that the “Survival State” has been activated. |

**Question 1: Do you agree with the above added procedure texts?**

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| **Company** | **Comments** |
| Huawei | No strong need.  Now only a single codepoint “activated” is signalled to the target NG-RAN node (also the available ST can be designed without the “deactivate” case). Then there is no issue at the target NG-RAN node, i.e., it will not happen that the target NG-RAN node receives the “deactivated” state for a DRB, but turning into the “activated” during data forwarding.  Then the target NG-RAN node can first prioritize the DRBs with “activated” state, then secondly prioritize the DRBs with mapped QoS flows with survival time in TSC assistance information, finally with normal DRBs. |
| Nokia | We don’t see the need for the procedural text – it can be left to implementation.  If the target gNB receives the *Survival Time* IE in the TSCAI without any additional assistance information, then the target gNB does not know if the previous DL packet transmission was successful or not. Therefore, a target gNB implementation could potentially always transmit the first DL packet after HO with high reliability… but this does not need to be specified. |
| ZTE | No.  In the case that the service supports ST, it will cause unnecessary resource waste to enter the ST state as soon as the handover occurs, which can be avoided with a ST state indication. |
| CATT | No, we don’t think the text is needed. We may introduce the survival time state/AST for the optimization or leave it as implementation |
| Samsung | No. We think it is not required. |
| Ericsson | Yes.  Without the above, the further enhancements as Sol 1 and Sol 4 discussed may provide false information. |
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| Moderator’s summary:   * Majority companies don’t think that the above procedure texts are needed. The concern can be addressed either with only “activated” like indication, or by the implementation of the target node.   Proposal: no need to consider the procedure texts to describe “The target NG-RAN node shall, if supported, consider that the “Survival State” has been activated if received the survival time in TSC assistance information”. | |

**Question 2: Which option is your preferred option, or any other possible views e.g. applicable for all handover cases or limited to DAPS handover only?**

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| **Company** | **Comments** |
| Huawei | Option 4.  For option 1, first to signal the ST available time in the XnAP Handover Request message is a bit early due to the fact that the data transmission is ongoing (for normal handover and DAPS handover). Then this leads to the error cases of the ST available time. Second, the ST available time is not fully accurate considering the ST is typical at the a few milliseconds and handover interruption time, as well as the signalling delay etc.  And we think this can be applicable for all handover cases. |
| Nokia | Regarding Option 4, firstly we observe that:   * There is no definition of DL Survival Time State, e.g. no company has described how it is triggered or what actions the gNB may take. * It appears to be something monitored at the MAC layer, and if triggered, actions are also taken at the MAC layer (or within the DU).   The above is fine since it essentially leaves fulfilment of DL survival time requirement to gNB-DU implementation.  However, if RAN3 attempts to introduce the signalling of DL Survival Time State over RAN interfaces (F1, Xn), then it requires RAN3 to specify a particular DL survival time solution (similar to how RAN2 defined a particular UL survival time solution). But our view is that in Rel-17, RAN3 should not consider mobility enhancements that assume a particular DL survival time solution, since DL survival time solutions have not been discussed by RAN3.  Therefore, we prefer either:   1. Option 1, which is simple extension of the Survival Time concept to include a timer; or 2. Postpone mobility enhancements to a future release, if/when RAN3 discusses specific mechanisms for gNB to fulfil the DL survival time requirement   [HW2]: about the definition of the DL survival time state, we think the issue would be same for both option 1 and option 4 (i.e. the NG-RAN node needs to determine when the UE enters into the DL ST state). We copy the RAN2 agreements below:   * *RAN2 confirms that specification enhancement for survival time support may only needed for uplink. Downlink is addressed by implementation and no specification impacts*   So for DL, our thinking is that when the gNB detects the UE enters into the DL ST state (based on the UE HARQ feedback), then the gNB can guarantee the DL performance based on its implementation. |
| ZTE | Agree with Huawei.  Furthermore, since only DU(e.g. MAC entity) can know the transmission failure and HARQ retransimission which may trigger to start ST Timer, but CU decides to perform PDCP duplication and HO, the DU need to notify CU.  For Option 1, if the source gNB sends an available survival time to the target gNB, the source gNB-CU needs to get the available survival time from the source gNB-DU. Furthermore, in order that the target gNB-DU to continue survival time monitoring, the target gNB-DU needs to obtain the available survival time from the target gNB-CU. Therefore, the method of Option 1 involves at least the following four changes during handover procedure.  **Change 1:** the source gNB-CU requests the available survival time from the source gNB-DU**.**  **Change 2:** the source gNB-DU sends the available survival time to the source gNB-CU**.**  **Change 3:** the source gNB-CU sends the available survival time to the target gNB-CU**.**  **Change 4:** the target gNB-CU sends the available survival time to the target gNB-DU**.**  For Option 4, since the source gNB-CU need always know the survival time state, based on which to activate/deactivate PDCP Duplication, it is only necessary that the source gNB-DU sends the available survival state indicator to the source gNB-CU, and the source gNB-CU should deliver the survival time state indicator to the target gNB-CU. Therefore, the method of Option 4 involves only the following two changes during handover procedure.  **Change 2:** the source gNB-DU sends the available survival state indicator to the source gNB-CU**.**  **Change 3:** the source gNB-CU should deliver the survival time state indicator to the target gNB-CU.  Therefore, for both option 1 and option 4, the following two specification changes are necessary:   * The source gNB-CU sends the survival time state information to the target gNB-CU * For HO scenario, the source gNB-CU sends the survival time state information to the target gNB-CU.   And the following 2 specification changes are only necessary for option1:  **Change 1:** the source gNB-CU requests the available survival time from the source gNB-DU**.**  **Change 4:** the target gNB-CU sends the available survival time to the target gNB-DU**.** |
| CATT | Consider the survival just few in milliseconds and handover interruption time, so for the normal handover, the survival time state/AST is not useful for target node during handover |
| Samsung | We slightly prefer option 1. But we’re ok with not supporting it in Rel.17. |
| Ericsson | Option 4, without the solution related to Question 1, is not correct. Because the Handover procedure takes time, and there is no guarantee that when the “survival state is not activated in the source NG-RAN before the handover, it is therefor not activated after the handover”.  Option 1, for the same reason, the available survival time might not be accurate.  If no complete solution can be defined, agree to postpone to a future release. |
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| Moderator’s summary:   * Two companies support option 4, two companies support option 1, three companies are fine to postpone to future release. * One company thinks that these options are useful only for DAPS handover.   See the proposal to be discussed online in the first round. | |

## 3.2 F1AP/User-plane on DL survival time assistance information

Overview of RAN3 papers.

* ZTE [R3-221879]:
  + *For non-HO scenarios and HO scenario: the MAC layer of gNB needs to notify the PDCP layer of gNB to activate PDCP duplication through a survival time state indicator.*
  + *For the gNB-CU/gNB-DU split case, the gNB-DU should deliver a survival time state indicator to the gNB-CU by* ***NOTIFY*** *message.*
* Huawei [R3-221969]:
  + *in order to allow the source gNB-CU to be aware of the survival time state, the source gNB-DU needs to notify such information to the source gNB-CU, when it receives the* ***Step 5 (UE context modification request)*** *in the figure wherein.*
  + *Over F1, the source DU sends the downlink survival time state to the source CU via DL DATA DELIVERY STATUS Frame.*
  + *Over F1, the target CU can send the downlink survival time state to the target DU via DL USER DATA.*

Though both companies are proposing the survival time state, the terminology Survival Time Assistance Information is used below.

The moderator’s summary: two options are on the table:

* **Option 1**: F1AP Notify
* **Option 2**: User plane frame via DL DATA DELIVERY STATUS Frame from source DU to source CU, and DL USER DATA from target CU to target DU.

**Question 3: Which option is your preferred option, and your views whether this is applicable to the non-handover, and/or handover scenario?**

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| **Company** | **Comments** |
| Huawei | Option 2 is preferred.  As discussed in the R3-221969, for handover case, the DDDS can be triggered when the source DU receives the UE CONTEXT MODIFICATION REQUEST message indicating to **stop** the data transmission to the UE so as to inform the gNB-CU about the unsuccessfully transmitted downlink data to the UE. Then the DDDS can be used to include the ST state naturally.  For non-handover case, we are open to indicate ST state to the CU. But it seems that the UP frame “ASSISTANCE INFORMATION DATA” can indicate the assistance information for DL duplication, which seems sufficient.  For option 1, this should be clarified under which conditions the F1AP notify is triggered, even for non-handover case. And it is a little strange to indicate the UP packet transmission state over application protocol message. |
| Nokia | As we indicated in Question 2, we are not clear what is “DL survival time state”. Also, it is not clear what node takes action based on “DL survival time state” (i.e. DU-only, CU-only, or both DU and CU). |
| ZTE | We prefer Option1.  For NR-U, since the USER PLAIN FRAME is used in multiple specification, e.g., X2AP, XnAP, E1AP and F1AP, the survival time information does not impact X2AP and E1AP, so we do not prefer NR-U to carry the downlink Survival Time assistance information.  Furthermore, to emphasize that providing the survival time state from DU to CU is also necessary for non-HO scenarios. In other words, for non-HO scenarios, the MAC layer of gNB needs to notify the PDCP layer of gNB to activate PDCP duplication through a survival time state indicator. Otherwise, the DL survival time can not be supported in the gNB-DU and gNB-CU split case. |
| CATT | No strong opinion, if the information need to be transferred, both CP and UP solution can solve this issue |
| Ericsson | This question is coupled with Question 2, should not be discussed as stand alone. |
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| Moderator’s summary:   * One company supports option 2, one company supports option 1, one company is fine with both. Two companies may have further questions.   Proposal: the F1 impact can be further discussed after the Xn impact is settled. | |

## 3.3 NGAP on DL survival time assistance information

In R3-221969, it is proposed that:

* *For NG based handover, the source gNB can include the survival time state in the Uplink RAN Status Transfer message and the Downlink RAN Status Transfer message.*

**Question 4: Your view to introduce the DL survival time assistance information for NG based handover?**

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| **Company** | **Comments** |
| Huawei | Yes to introduce it for NG, to align with Xn. |
| Nokia | No, the use case for survival time + NG handover is not clear. |
| ZTE | No. Since the delay and data interruption in NG based HO are too large and is not suitable for service with ST requirement, we think it is not necessary to introduce the DL survival time assistance information for NG based handover. |
| CATT | No. as we answer in Q2, the handover interruption is too larger for the ST usage |
| Samsung | No. |
| Ericsson | Handover over NG takes longer time than Xn HO, thus the benefit is even limited. |
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| Moderator’s summary:   * Majority companies don’t agree to introduce the DL survival time assistance information for NG based handover.   Proposal: No need to consider the ST assistance information for NG based handover. | |

## 3.4 Potential way forward for the 2nd round or other aspects

**Question: Your suggestions of the way forward on the 2nd round, or any issues that are not covered by above**

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| **Company** | **Comments** |
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# 4 Discussion (Phase 2)

TBD

# 5 Conclusions, Recommendations

TBD

# References

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| [R3-221876](file:///C:\Users\h00364927\Documents\Docs\R3-221876.zip) | (TP for NR\_IIOT\_URLLC\_enh BL CR for TS 38.423) Resolution of open issues for Survival Time (Nokia, Nokia Shanghai Bell) | other |
| [R3-221879](file:///C:\Users\h00364927\Documents\Docs\R3-221879.zip) | (TP for Introduction of Enhanced IIoT support over Xn and F1) Remaining issues on New QoS Related parameters (ZTE) | other |
| [R3-221969](file:///C:\Users\h00364927\Documents\Docs\R3-221969.zip) | (TP for eIIOT BLCR for TS 38.423 and TS 38.425) Survival time remaining issues (Huawei) | other |
| [R3-222039](file:///C:\Users\h00364927\Documents\Docs\R3-222039.zip) | On survival time (Ericsson) | other |
| [R3-222214](file:///C:\Users\h00364927\Documents\Docs\R3-222214.zip) | Discussion on new QoS related parameters (CATT) | discussion |