**3GPP TSG-RAN WG3 #112-e R3-212700**

**17-27 May 2021**

**Online**

Agenda Item: 20.2.5

Source: Nokia (moderator)

Title: Summary of email Discussion on CB: # 81\_NTN\_CountrySpecificRouting

Document for: Approval

# Introduction

**CB: # 81\_NTN\_CountrySpecificRouting**

**- (CATT)**

**According to SA2’s CR, the new added network node selection rule for NNSF applies only for initial access. -> The sentence in the BL CR for TS 38.300 could be simplified to “For the case of initial access, the NG-RAN node implements the NAS Node Selection Function behavior specified in TS 38.410 [16].”**

**- (Nok)**

**During N2-HO to change the AMF for a UE, the gNB shall know the HO is related to an existing UE. -> In order for the “target’ gNB to know that the N2-HO is related to an existing UE, introduce a new ID in the source NG-RAN node to Target NG-RAN node transparent container.**

**- (HW)**

**acknowledge the cross-border issue for UE in RRC Connected and UE RRC Inactive in case of fixed NTN beam covering multiple countries. The solution is pending RAN2.**

**Discuss whether to apply V2X-like Zone definition is appropriated for the cross border in RRC mobility and RRC Inactive mobility. The solution is pending to RAN2. If RAN3 sees some benefit a LS could be sent to RAN2.**

**- Chair: Discuss 3 questions: 1) whether to simplify the BL st2 text? 2) whether an “existing UE” indicator is needed for the AMF change? 3) whether to acknowledge cross-border issue in case of fixed beam across countries, pending RAN2?**

(Nok - moderator)

Summary of offline disc **R3-212700**

The discussion has two phases:

Phase 1: Enhancements for NTN Registration Update and Paging

Phase 2: TBD

The deadline for Phase 1 is Wednesday, May 19th, 24:00 UTC. This allows us to have some further discussion based on the 1st round feedback and discuss intermediate stage in Thursday online session. We might be able to already achieve some agreements at this stage.

The deadline for Phase 2 is the same as for all email discussions, i.e., Tuesday, May 25th, 12:00 UTC.

# For the Chairman’s Notes

Propose the following:

**Agree following proposals:**

* **Update to TS38.300 BL CR:**

16.x.x RAN (Re)Selection of CN Entity

The NG-RAN node implements the NAS Node Selection Function specified in TS 38.410 [16].

For a RRC Connected UE, if the NG-RAN node is configured to ensure that the UE is using an AMF that serves the country in which the UE is located:

- if the NG-RAN node detects that the UE is in a different country to that served by the serving AMF, the NG-RAN should perform an NG handover to change to an appropriate AMF.

* **Country specific routing for RRC\_CONNECTED UE**
* Agree “the gNB is expected to know when the UE moves across the country border, in case the serving NTN cell serves part (or all) of more than 1 country”, and a LS to RAN2 for feedback.
* Agree WA: introduce RAN UE NGAP ID in the *Source NG-RAN Node to Target NG-RAN Node Transparent Container* IE, which enables the target gNB to know the handover is related to an existing UE.

**Continue discussion on following:**

# Discussion

## Update to TS38.300 BL CR

Contribution ([1]) propose to update the Stage-2 BL CR to clarify the first bullet applies to initial access, due to the unclear stage-2 text ““in a different country to that served by the AMF”. The proposed changed is copied as below:

/////////////////////////////////////////////////////////////////////// Proposed change /////////////////////////////////////////////////////////////////

16.x.x RAN (Re)Selection of CN Entity

If the NG-RAN node serves more than one country, the NG-RAN node may be configured to ensure that the UE is using an AMF that serves the country in which the UE is located. When so configured:

- For the case of initial access, the NG-RAN node implements the NAS Node Selection Function behavior specified in TS 38.410 [16].

- For RRC Connected, if the NG-RAN node detects that the UE is in a different country to that served by the AMF, the NG-RAN should perform an NG handover to change to an appropriate AMF.

Editor’s note: Text may need to be revised depending on RAN2/SA2/RAN3 progress.

/////////////////////////////////////////////////////////////////////// End of Change ///////////////////////////////////////////////////////////////////////

**Q1: Please share your view on whether the above proposed change is agreeable.**

|  |  |
| --- | --- |
| **Company** | **Comment** |
| Nokia | Agree with the change |
| Thales | Agree in principle but we recommend that RAN3 asks SA2 about the acceptability of the following principle “The NG-RAN node takes into account UE location information, if available, when determining the AMF, and, for RRC Connected, if it detects that the UE is in a different country than is served by the AMF, it should perform an NG handover to an appropriate AMF.” |
| CATT | Agree. |
| Ericsson | Given the fact that 38.410 does not specify at which point in time/state the NNSF is applied, I propose to only provide a reference to 38.410. And reading the proposed text, it seems like the NNSF is only needed in case a gNB serves AMFs of different countries. I suggest to remove the whole NNSF sentence.  Then, for HO, first “RRC Connected” should be replace by the proper name of the RRC state (RRC\_CONNECTED), and to merge it with the first (remaining) sentence. |
| Samsung | We are fine to the change. |
| Qualcomm | In our understanding, NNSF is not just at initial access, and the process agreed at the last meeting applies not just at initial access. So while the change looks reasonable at high level, actually it seems to be re-opening a discussion from the last meeting.  Then regarding Ericsson’s suggestion, this seems reasonable to avoid further dilution, as long as (1) there is a clear reference to 38.410 and (2) the possibility of HO is preserved. This hopefully avoids reopening the same discussion. Basically no text about “initial access”.  To Thales, not clear why we would go to SA2 – this statement is derived off CRs agreed in SA2, of course we can check those CRs, but seems no need to do ping-pong with SA2. |
| ZTE | The explanation by Qualcomm should be considered. |
| Huawei | In TS 38.300 the “initial access” is a radio procedure see as example 16.3.4.3 “Following the initial access, the establishment of the RRC connection and the selection of the correct AMF, the AMF …”  This section is about the “selection of the correct AMF”, so we are bit uncomfortable with the change.  The concern from Ericsson seems coming from the fact we avoid now NNSF in TS 38.300, we could replace NNSF by “the AMF association of the UE” to align the wording with 38.410. |
| Moderator | Regarding to comments from Ericsson and Qualcomm, the NNSF reference is moved to the beginning of this section.  Also updated the RRC Connected term, and add “serving” before the 1st “AMF”. |

**Summary:**

* Most companies agree the text should be updated.

**Potential Proposal:**

**Agree to update the BL CR as below:**

16.x.x RAN (Re)Selection of CN Entity

The NG-RAN node implements the NAS Node Selection Function specified in TS 38.410 [16]. If the NG-RAN node serves more than one country, the NG-RAN node may be configured to ensure that the UE is using an AMF that serves the country in which the UE is located. When so configured:

- For a RRC\_Connected UE, if the NG-RAN node detects that the UE is in a different country to that served by the serving AMF, the NG-RAN should perform an NG handover to change to an appropriate AMF.

## Country specific routing for RRC CONNECTED UE

Contribution ([2]) propose to enhance NGAP to support the country specific routing per SA2 specification (TS 23.502) which states:

The Inter NG-RAN node N2 based handover procedure specified in clause 4.9.1.3 may also be used for intra-NG-RAN node handover.

NOTE: One use case for intra-NG-RAN handover to be performed by the Inter NG-RAN node N2 based handover procedure is when an NG-RAN node serves a satellite access system that covers more than one country. In such a situation, the UE might move from a "cell" in one country into a "cell" in another country, and the NG-RAN node may need to cause the AMF to change to an AMF serving the UE's new country.

Contribution ([3]) also proposed to discuss the issue when the UE cross the country border but remains in the same NTT Earth Fixed cell.

An example is shown as below:



Figure 1: NTN deployment example when a shared gNB connects with different AMFs

There are following issues to be addressed:

* How to determine the UE moves across the country border?

This issue may be more related to RAN2, e.g. the gNB retrieves the UE location information. According to RAN2 LS, this is possible since the AS security is setup for a RRC CONNCETED UE. How and when the gNB retrieve the UE location information is in RAN2 scope. Contribution ([3]) proposed to introduce the V2X-zone like concept. Similar contribution was also proposed in RAN2. So Moderator propose this better to be discussed in RAN2, and RAN3 can assume the gNB know when the UE moves across the country border.

* How to determine the HO is related to an existing UE considering the gNB acting as both source gNB and target gNB?

During the N2-HO, the gNB (acting as both source gNB and target gNB) need to know whether the HO is related to an existing UE. If so, the gNB can skip the admission control, resource allocation, radio parameter reconfiguration in the “target” gNB/cell, etc. Contribution ([2]) propose to introduce an IE in the source to target transparent container, which is similar to LTE *UE Context Reference at Source* IE in the *Source eNB to Target eNB Transparent Container* IE (TS36.413). Proposed change is shown as below

/////////////////////////////////////////////////////////////////////// Proposed change /////////////////////////////////////////////////////////////////

#### 9.3.1.29 Source NG-RAN Node to Target NG-RAN Node Transparent Container

This IE is produced by the source NG-RAN node and is transmitted to the target NG-RAN node. For inter-system handovers to 5G, the IE is transmitted from the external handover source to the target NG-RAN node.

This IE is transparent to the 5GC.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
| … |  |  |  |  |  |  |
| UE History Information from UE | O |  | 9.3.1.166 |  | YES | ignore |
| RAN UE NGAP ID | O |  | 9.3.3.2 | Allocated at the source NG-RAN node. | YES | ignore |

/////////////////////////////////////////////////////////////////////// End of Change ///////////////////////////////////////////////////////////////////////

**Q2: Please share your view on following**

* **RAN3 assume the gNB know when the UE moves across the country border, in case the serving NTN cell serves part (or all) of more than 1 country**
* **whether the above proposed Stage-3 change to NGAP is agreeable.**

|  |  |
| --- | --- |
| **Company** | **Comment** |
| Nokia | Agree the assumption and the proposed change to NGAP. |
| Thales | Agree with the assumption and proposed change, but RAN2 has to be informed explicitly (via LS) that “**the gNB is expected to know when the UE moves across the country border, in case the serving NTN cell serves part (or all) of more than 1 country**“ |
| CATT | Agree to include the RAN UE NGAP ID, but the “Source NG-RAN node” IE seems useless as the RAN node is not changed in this case.  For HO from EN-DC toward NR SA the Source to Target container doesn’t include the node ID of the S(en-)gNB. So we think here it is not necessary either.  [Moderator]: your comment makes sense. Only the RAN UE NGAP ID is needed. The Stage-3 change is updated as above. |
| Ericsson | gNB knowledge is a pre-condition of that function, right.  But, why did you copy the stage 3 parts of your contribution?  [Moderator]: The Stage-3 text is to address the 2nd question “How to determine the HO is related to an existing UE…”. |
| Samsung | Agree with CATT. |
| Qualcomm | First agree with CATT point, seems no need for source ID as this is inherent (source knows when to send this); also there is the UE history.  Then when you go across PLMNs, it is not so clear that actually you want to skip the admission control, resource allocation, radio parameter reconfiguration in the “target” gNB/cell. Maybe this should be discussed. |
| ZTE | Agree with CATT. |
| Huawei | As we explain in [3] the assumption is fine but may be resource consuming in RCC Connected mode that why we support Thales view on LS and RAN2 aspects.  Could a company clarify how this assumption is possible in RRC Inactive mode without as example this V2X-zone like concept? How the UE and the GNB could know it cross the border in this state?  [Moderator]: The RRC\_INACTIVE may be more related to RAN2. Suggest wait for RAN2.  About the NGAP proposal, we see some benefit but we would need further check lie Qualcomm as example how to maintain resource per country in the gNB. The proposal with an Editor’s Note is acceptable. |

**Summary:**

* Most companies agree that “**the gNB is expected to know when the UE moves across the country border, in case the serving NTN cell serves part (or all) of more than 1 country**”, and a LS to RAN2 for feedback.
* There is no objection to introduce RAN UE NGAP ID in the *Source NG-RAN Node to Target NG-RAN Node Transparent Container* IE to inform target gNB the HO is related to an existing UE. Some companies would like to further check. It is proposed to agree the WA, and companies can have further check in next meeting.

**Potential Proposal:**

* Agree “the gNB is expected to know when the UE moves across the country border, in case the serving NTN cell serves part (or all) of more than 1 country”, and a LS to RAN2 for feedback.
* Agree WA: introduce RAN UE NGAP ID in the *Source NG-RAN Node to Target NG-RAN Node Transparent Container* IE, which enables the target gNB to know the handover is related to an existing UE.

## Other issues/enhancements

**Q2: Please list other issues/enhancements that should be considered? Please include assessment of expected benefit, impact on specification, implementation, other WGs.**

# Part II…[if needed]

If needed

# References

1. R3-211817， (TP for BL CR for TS 38.300)Clarification on country-specific CN selection (CATT)
2. R3-211898， (TP for BL CR for TS 38.413) Country Specific Routing for an RRC CONNECTED UE (Nokia, Nokia Shanghai Bell)
3. R3-212247， Aspects Related to Country-Specific Routing, mobility for RRC Connected and RRC Inactive modes (Huawei)