3GPP TSG-RAN WG3 #114-e R3-215884

**E-meeting, 1 – 11 November 2021**

Source: CATT (moderator)

Title: Summary of CB: # 2005\_NTN\_Country\_Routing

Agenda Item: 20.2.5

Document for: Approval

# Introduction

**CB: # 2005\_NTN\_Country\_Routing**

**- Where should cross-country mobility detection be performed? In RAN? In CN? In both? And how?**

**- Assuming that cross-border mobility can be detected, which actions should be taken?**

**- Should such actions be RNA based? Or CN based? Any other solution?**

(CATT - moderator)

Summary of offline disc [R3-215884](file:///C:\Users\llopes\OneDrive%20-%20Qualcomm\Documents\3%20RAN3\RAN3%20114\Inbox\Drafts\CB%20%23%202005_NTN_Country_Routing\Inbox\R3-215884.zip)

# For the Chairman’s Notes

Agreement:

* Both gNB and 5GC are able to decide whether UE moves across a country.
* Focus on NG-RAN behaviours, add a note for AMF behavior, e.g. “NOTE: The AMF may decide to trigger UE context release if it determines that the serving PLMN is not allowed to serve the UE in its current location.”
* Remove the Editor’s note?

TP R3-21xxxx (revised from R3-215594) is agreed.

# Discussion (1st round)

In the RAN3#113e meeting, there’s an open issue on how to handle the use case “UE moves across the country and the new PLMN of the country is not supported”.

**Continue to discuss whether and how to address the use case “UE moves across the country (within the same cell) and not support the new PLMN of the country”**

**To be continued...**

On how to resolve the issue, several contributions were submitted [1][2][3][4] in RAN3#114e meeting.

**Questions 1: Where should the cross-country mobility detection be performed? And how?**

| Company | Comment |
| --- | --- |
| CATT | **Both NG-RAN and 5GC are able to decide whether UE moves across a country.**  From NG-RAN perspective:  On how to decide the cross-country mobility, it has been discussed and agreed that:   * The UE location information reported from the UE (as specified by RAN2) is accurate enough for AMF (re-)selection.   From 5GC perspective:  We assume the 5GC should also able to decide whether UE is across the country via e.g. ULI information provided by NG-RAN (as explained in [2]), or the LCS service, or some other information. |
| Ericsson | We agree with CATT: ULI already today can give this information (i.e. no additional info seems needed on top of current ULI). |
| Nokia | The gNB can detect it. The CN may also detect it based on the ULI or the LCS service, but the CN part is in SA2 scope. |
| Qualcomm | We agree with CATT |
| Thales | We agree with CATT |
| China Telecom | Agree with CATT |
| Samsung | Agree with CATT |
| ZTE | Agree with CATT |
| Huawei | We agree with CATT |
| NEC | Agree with CATT |

**Moderator’s summary:**

10 companies participated in the discussion. All of the companies agreed that both NG-RAN and 5GC are able to decide whether UE moves across a country.

Agreement: Both gNB and 5GC are able to decide whether UE moves across a country.

From all the contributions [1][2][3][4], NG-RAN behaviours should be specified. Additionally, some AMF behaviours are also proposed in [2], as below:

The information provided to the Core Network within the UE location information may be used by the AMF to determine whether the serving PLMN is allowed to serve the UE in the current location in scenarios where such detection is required. Pre-configuration e.g. of special TAC or mapped cell identifiers may be used to support this functionality.

Base on the contributions, we provide the two options:

* **Option 1:** Only NG-RAN behaviours should be specified.
* **Option 2:** Both NG-RAN and AMF behaviours for should be specified.

**Questions 2: Which option is preferred on handling of the issue identified for country mobility?**

| Company | Comment |
| --- | --- |
| CATT | We slightly prefer the option 1.  We understand the AMF behaviours proposed in [2] is correct. However, it seems not necessary to specify that in our RAN spec. |
| Nokia | Option 1. The CN part is in SA2 scope. |
| Ericsson | Option 1 is more appropriate – we don’t specify AMF behavior in our stage 2. One possibility would be to add the AMF behavior as a note in 16.x.6 of 38.300, e.g. “NOTE: The AMF may decide to trigger UE context release if it determines that the serving PLMN is not allowed to serve the UE in its current location.” |
| Qualcomm | In general we tend to agree that option 1 is more appropriate. But the intention of the text above is not so much to define AMF behaviour, but to give a hint that ULI can be used by the AMF when detecting possibility of country border crossing. This may not be obvious since a PLMN would not necessarily define mapped cell IDs in an area that it does not serve. |
| Thales | Agree with Qualcomm |
| China Telecom | We tend to agree Option 1, it seems not necessary to capture the AMF behaviour in 38.300. Ericsson's suggestion is also OK. |
| Samsung | Agree with Qualcomm. Adding a note to TS38.300 is fine to us. |
| ZTE | Option 1 is preferred. |
| Huawei | We understand the motivation of Qualcomm, either option 2 or suggestion of Ericsson can be taken. |
| NEC | Option 1. The CN part is in SA2 scope. |

**Moderator’s summary:**

10 companies participated in the discussion. Majority of companies showed preference to have the RAN behaviours only, 4-5 companies are also ok to have some simple words in RAN stage 2 spec.

The moderator would propose to consider the compromised way as Ericsson proposed, add a in 16.x.6 of 38.300, e.g. “NOTE: The AMF may decide to trigger UE context release if it determines that the serving PLMN is not allowed to serve the UE in its current location.”

Following the discussion of the Question 2, we would like to further consider the detail TP work as been proposed in the contributions.

On the RAN behaviours, it seems all of the companies are aligned that NG-RAN could release the RRC Connection when it decides the UE moved to a country where the PLMN is not allowed.

**Question 3: Comments or proposals for the TP work?**

| Company | Comment |
| --- | --- |
| CATT | **Following the discussion of Q2, suggest the TP work just focus on the RAN behaviours.**  For this use case, if the PLMN of the country is not allowed for the UE, the information should be indicated to NG-RAN in “Mobility Restriction List”. Base on the UE location reporting, NG-RAN decides the UE moves to a country where the serving PLMN is not allowed for the UE (in the same cell).  The NG-RAN should initiate UE Context Release Request procedure towards the AMF to release the UE signalling connection, the existing cause value “Handover target not allowed” could be used in this use case. The NG-RAN will release the RRC connection when it receives the UE Context Release Command from the AMF.  **Only release the RRC Connection in the Uu interface is not a complete solution, UE Context should also be released in NG-RAN and 5GC via the UE Context Release Request.**  Corresponding TP proposed for BL CR for TS 38.300:  *For a RRC\_CONNECTED UE, when 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.*  *- If the NG-RAN node detects the UE is in a country where the corresponding PLMN(s) are not supported by the UE, the NG-RAN should initiate UE Context Release Request towards the AMF.* |
| Ericsson | Agree |
| Nokia | Agree. Please use “gNB” rather “NG-RAN node” to align with the BL CR. |
| Qualcomm | First, we think we should give a try to the the general concept of ULI being used by AMF to detect out of country situation, i.e see if something can be captured (previous question).  Then in regards to RAN action, we agree with CATT that we can be specific and mention Context Release Request because it is beneficial for the AMF to be involved, and deregister the UE at NAS level , providing the new PLMN if known in the deregistration message. Simple release would trigger the NNSF action (see BL CR for 38.410) as the UE will try again, this is possible and will work, but it is not very nice.  However, the Context Release Request is currently also not complete because the cause value mentioned by CATT does not really apply (“Handover to the indicated target is not allowed”), and seems too awkward to extend in a situation where actually there is no handover. Then we should consider adding a new cause value (e.g. “UE not in PLMN serving area”) and possibly also include the PLMN serving the country where the UE is, if this is known. That would allow the AMF to deregister the UE at a NAS level and provide the UE with the new PLMN if known.  The stage 2 text above from CATT may need revision in any case as “PLMNs not supported by UE” is a bit ambiguous. What happens is that an appropriate AMF is not available due to the current mobility restrictions in the RAN…  e.g.  If the gNB detects that the UE is in a different country to that served by the serving AMF, it should   * perform an NG handover to change to an appropriate AMF, or * initiate Context Release Request towards the serving AMF with a suitable cause value (e.g. if mobility towards an appropriate target AMF cannot be initiated) |
| Thales | Agree with Qualcomm |
| China Telecom | We agree with CATT. It is reasonable for NG-RAN to initiate Context Release Request towards the serving AMF to release the UE signalling connection. |
| Samsung | Agree. Can clarify NG-RAN behaviour in TS38.300. |
| ZTE | Agree with CATT. A small wording issue could be:  *- If the NG-RAN node detects the UE is in a country where the corresponding PLMN(s) are not supported by the UE, the NG-RAN should initiate an UE Context Release Request procedure towards the AMF.* |
| Huawei | We agree with Qualcomm. |
| NEC | Agree to focus only on RAN node. |
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**Moderator’s summary:**

10 companies participated in the discussion. For the gNB behaviours, all of the companies are ok to initiate an UE Context Release Request procedure towards the AMF. Thanks Qualcomm for the refinement of the wording, it should be acceptable.

# Discussion (2nd round)

Base on the moderator’s summary in section 3, a draft TP is provided in the folder now. With the changes to section 16.x.x, the moderator assumes the Editor’s note as below could be removed.

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

Companies are invited to double check the TP for BL CR TS 38.300.

**Question 4: Do you agree the revised TP?**

| Company | Answer | Comment |
| --- | --- | --- |
| Nokia | Yes with comments | Change “*UE Context Release Request*” to “UE Context Release Request”  For the Note, please delete it. It is up to the AMF to take the action. For example, the AMF may de-register the UE. 23.501 already defines the AMF behavior (copied as below). If Company think this is not enough, please submit CR in SA2.  If the AMF determines based on the Selected PLMN ID and ULI (including Cell ID) received from the gNB that it is not allowed to operate at the present UE location the AMF should reject the request and inform the UE of the country of the UE location.  …  In the case of a handover procedure, if the (target) AMF determines that it is not allowed to operate at the current UE location, the AMF either rejects the handover, or accepts the handover and later deregisters the UE. |
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# Conclusion, recommendations

To be updated later.

# Reference

1. R3-214836 Country specific routing issue, China Telecommunication
2. R3-214902 (TP for BL CR for 38.300) Final aspects of country border crossing, Qualcomm Incorporated
3. R3-215594 (TP for BL CR for TS 38.300) On country policy handling, CATT
4. R3-215742 Further Discussion on Country-specific Routing for NTN, ZTE