3GPP TSG-RAN WG2 Meeting #118-e R2-220xxxx

Electronic, 9th May – 20th May 2022

**Agenda Item: 6.10.1.1**

**Source: CMCC**

**Title:** **Report of [AT118][0XX][NTN] reply LSs to CT1 (CMCC)**

**Document for: Discussion**

# Introduction

This document aims for gathering and summarizing companies’ views for the following offline discussion:

* [AT118-e][114][NTN] Reply LSs to CT1 (CMCC)

Initial scope: Discuss whether some minimal update to 38.304 is needed related to the CT1 LS on list of PLMNs not allowed to operate at the present UE location and the need/content of a reply LS for CT1 LS about NR satellite RAT type in UE NAS

Initial intended outcome: Agreeable TP for a 38.304 CR on list of PLMNs not allowed to operate at the present UE location and reply LS to CT1 on NR satellite RAT type in UE NAS

Deadline (for companies' feedback): Tuesday 2022-05-16 12:00 UTC

Deadline (for rapporteur's summary in R2-2206206): Tuesday 2022-05-17 08:00 UTC

**Note1:** All the proposals listed in the summary will be categorized into two types:

* **Type1:** proposal for agreement, e.g. reach consensus by the majority.
* **Type2:** proposal needs further discussion.

Contact table

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# Discussion

In last meeting, CT1 had sent LS to RAN2 on LS introducing the list of PLMNs not allowed to operate at the present UE location as below:

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| CT1 is working on the support of PLMN selection for satellite NG-RAN access technology, and has introduced a list of "PLMNs not allowed to operate at the present UE location". In this list for each entry there could be information related to whether or not the PLMN is allowed within a certain area.  **To RAN2**  **ACTION:** CT1 kindly asks to RAN2 to take above information into account for their future work on this work item. |

Per the agreed CRs in CT1, the UE shall store a list of "PLMNs not allowed to operate at the present UE location" as follows:

- *the PLMN identity of the PLMN which sent a message including 5GMM cause value #78 "PLMN not allowed to operate at the present UE location" via satellite NG-RAN access technology;*

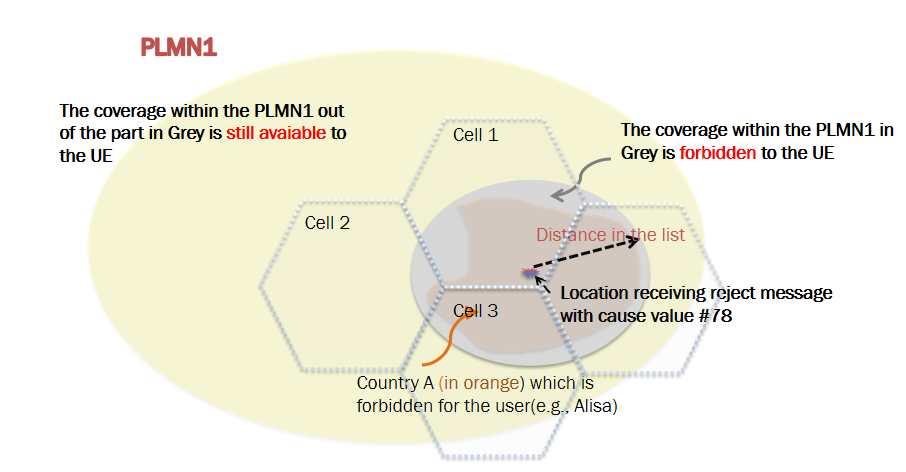
*- the geographical location, if known by the UE, where 5GMM cause value #78 was received on satellite NG-RAN access technology;*

*- the distance to the current UE location;*

*- a timer which is started upon the UE receiving an integrity protected reject message with cause value #78 "PLMNs not allowed to operate at the present UE location" from a satellite NG-RAN cell.*

Therefore, the UE’s behaviours are as follows:

* In NTN, when a UE receives an reject message with cause value #78 "PLMNs not allowed to operate at the present UE location" from a NTN cell, the UE maintains a list of "PLMNs not allowed to operate at the present UE location" in which it stores the PLMN ID of the rejecting PLMN, and the current geographical location and a timer.
* And the List can be removed when the timer associated to the entry expires or the UE successfully registers to the PLMN stored in the entry.



Hence, in our understanding, since NOT ALL the coverage of the PLMN is forbidden, only the **partial coverage** which fulfils the conditions as depicted in 1) is not allowed to the UE, the information should be transmitted to the AS to facilitate the cell selection and re-selection. That is, during cell selection, the UE should take the list into account as **the list of “Forbidden TAs”**.

**Q1: which part is impacted by the new introduced list of "PLMNs not allowed to operate at the present UE location"?**

***A: Functional division between AS and NAS in RRC\_IDLE state and RRC\_INACTIVE state***

***B: Defintion of suitable cell***

***C: Cell selection/re-selection, e.g., description on Cells with cell reservations, access restrictions or unsuitable for normal camping***

***D: None***

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| **Company** | **Which part do you prefer** | **comments** |
| CMCC | A,B,C | From our understanding, since NOT ALL the coverage of the PLMN is forbidden, only the **partial coverage** which fulfils the conditions as depicted in 1) is not allowed to the UE, the information should be transmitted to the AS to facilitate the cell selection and re-selection. That is, during cell selection, the UE should take the list into account as **the list of “Forbidden TAs”.** |
| Apple | A or D | It seems cleaner from the spec point of view to let NAS deal with all aspects related to PLMN selection including located based aspects. |
| Lenovo | A at least, B and C optional | At least we need to indicate in 4.2 of 38.304, that it is NAS to maintain a list of “PLMNs not allowed to operate at the present UE location”. The list may need to be provided to AS if impacts are identified.  For B and C, we see some regulation requirements of forbidding UE access to a certain PLMN at certain locations, e.g. country border area. In our understanding it is about in what granularity do we need to meet the requirements. If the NTN cell coverage can align with borders or the regulation needs to be strictly complied, then B and C are reasonable to implement at cell level. Besides, as Rel-18 is considering UE location verification in NR NTN e.g. to fulfil the requirements defined in 22.926, implementation at verified location level is also an option. |
| Intel | A | For A, we agree that it’s NAS to maintain a list of “PLMNs not allowed to operate at the present UE location”.  For B and C, it’s possible that partial coverage of one cell is within this “certain area”, i.e., calculated by present UE location and “the distance to the current UE location”, and the other coverage of this cell is still ok to get access. In this case, this cell is a partial suitable cell, and UE should be allowed to access to this cell. |
| Ericsson | D (fine with A as it is more Stage 2-ish) | Our understanding is what is being introduced in NAS is that the list of the PLMNs not allowed to operate at the current location only applies when the UE is not registered. The cause code that leads to adding a PLMN to the the list can be received at initial registration reject or at network initiated deregistration. Thus the content of the list applies to prevent an attempt for initial registration to a PLMN, i.e at PLMN selection. Our understanding is thus that the AS provides to NAS the list of suitable cells including the ones possibly restricted by the list and lets NAS/PLMN selection do the further filtering taking the list into account. This means that B and C should not need to be affected.  If we are unclear about this, we can indicate this to CT1 in our response.  Note that the LS sent from CT1 to SA1 may have idle mode impact depending on what SA1 decides (R2-2204509), but for now nothing is likely to be needed. |
| Qualcomm | Exactly follow Forbidden Tracking Areas |  |
| Xiaomi | A or D | We think the UE AS will report the PLMN not allowed to operate at the present locaotion to the UE NAS, and then UE NAS will do PLMN selection based on the procedure defined in the NAS specification. |
| Nokia | A or D | D is our preference, but if there is a strong desire to capture something, then TP to 38.304 for A can be considered (although CT1 has not asked us to do it and has not shared any further details regarding the introduced mechanism).  We wonder what the AS will do, even if it is informed PLMN is not allowed to operate at present location? How will it work, will it require the UE to always have its location info available? |
| OPPO | D | We don’t think this change the AS/NAS functions. Still PLMN is selected by NAS and UE simply performs cell selection based on the selected PLMN. Anything NAS should take care on the list should be discussed and captured by CT1 spec. |
| Samsung | A | Agree with Ericsson. No need to apply the list of “PLMNs not allowed to operate at the present UE location” in cell selection/reselection since the cell falls into the forbidden area shall not considered in PLMN selection, cf. [2] “if a cell fulfils the conditions related to the list of "PLMNs not allowed to operate at the present UE location", it is not considered as candidate for PLMN selection”. A is fine. |
| Huawei, HiSilicon | A | PLMN selection is performed by NAS. Besides, the unallowed PLMNs will not be configured as equivalent PLMNs, so the current definition of suitable cell still works. |

**Q2: If any part you prefer to update, please provide your text description.**

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| **Company** | **Which part do you prefer** | **comments** |
| CMCC | A,B,C | As the TP part shown in [4] |
| Apple | A | Can reuse the part of the provided TP impacting A |
| Lenoco | A at least, B and C can be accepted | As we replied to Q1, B and C is a possible option of implementing “PLMNs not allowed to operate at the present UE location”. |
| Intel | A | agree with Apple |
| Ericsson | D (fine with A) |  |
| Qualcomm | Exactly follow Forbidden Tracking Areas |  |
| Xiaomi | A |  |
| Nokia | A | Would be good to know the exact details of the solution introduced by CT1. Our concerns from Q1 also apply. |
| OPPO | D |  |
| Samsun | A |  |
| Huawei, HiSilicon | A | Agree with Apple |

Besides, in the last meeting, RAN2 received an LS from CT1 describing the NR satellite RAT type in UE NAS[1]:

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| *CT1 is discussing extending NAS supervision timers at NR satellite access based on information on RAN delay provided in a Reply LS (C1-220079 / R2-2111612) and there have been discussions in CT1 to consider whether the NAS solution should take NR satellite RAT type into account for possible differentiation of the applied NAS timer extension.*  *CT1 understands that NR satellite RAT type (LEO/MEO/GEO/OTHERSAT) is provided to the AMF from the gNB via NGAP, but is not aware of any corresponding indication available to the NAS at the UE.*  *CT1 would therefore like to know:*   * *Is indication of the NR satellite RAT type available, or planned to be made available, to the NAS at the UE?* * *If such indication is available, or will be available, can it be trusted that the UE value corresponds to the value provided to the AMF?*   *CT1 would like to make clear that there currently is no common agreement to differentiate extended NAS timers based on NR satellite RAT type even if NR satellite RAT type is available, or will be available, to the NAS at the UE.* |

For Question 1, in our understanding, UE can know the NW type implicitly through the satellite assistance information in *SIB19*, e.g. Ephemeris data, common TA parameters, koffset, validity duration for UL sync information and epoch time. However, such information is only available in AS layer. So far it seems RAN2 has not specified any solution on how to enable the NAS to be notified about this information yet.

**Q3: Do you agreed that so far RAN2 has not specified any solution on how to enable the NAS to be notified about this information yet.**

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| **Company** | **Yes/No** | **comments** |
| CMCC | agree | Currently, such information is only available in AS layer. |
| Apple | agree |  |
| Lenovo | Agree |  |
| Intel | agree |  |
| Ericsson | Agree |  |
| Qualcomm | Agree |  |
| Xiaomi | Agree |  |
| Nokia | Agree |  |
| OPPO | Agree |  |
| Samsung | Agree |  |
| Huawei, HiSilicon | Agree |  |

From the LS, it seems that the information of NR satellite RAT type is possible to facilitate the differentiation of the applied NAS timer extension.

**Q4: If you agree Q3, do you agree that such indication of the NR satellite RAT type is helpful for NAS and support to forward the NR satellite RAT type from AS to the NAS at the UE side?**

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| **Company** | **Yes/No** | **comments** |
| CMCC | agree | From the LS, it seems that the information of NR satellite RAT type is possible to facilitate the differentiation of the applied NAS timer extension. And maybe there are other benefits, anyway, the identification of the benefit is CT1/SA2’s scope. Hence, we support to forward the NR satellite RAT type to the NAS at the UE. |
| Apple | Disagree | It is for CT1 to decide whether this information is needed in NAS or not. |
| Lenovo | Agree | We are OK to ask in LS if NR satellite RAT type is needed at NAS. |
| Intel | agree |  |
| Ericsson | Agree that the indication can be done | We do not think that this is quite what they are asking from us. They are essentially asking if there is an indication of the satellite type that can be made available to the NAS, which we believe it can. Whether it is helpful completely depends on what they decide upon. |
| Qualcomm | May be | It may be sufficient for NAS just to know the UE-gNB RTT value according to which NAS can determine the NAS timers.  But we just need to focus on the response to the LS. They are asking, lets just reply them that UE should be able to determine the RAT type from the satellite information.  It is up to CT1 how it wants to make use of it. |
| Xiaomi | Agree | We can just inform the CT1 that UE AS has the NR satellite RAT type information, whether it is needed or not is up to CT1. |
| Nokia | Disagree | We see not such request from CT1 side. They are just asking if such indication is available or will be available. We expect the usefulness of such information at NAS shall be decided in CT1, not in RAN2. |
| OPPO | Disagree | This should be based on request from CT1, which is not there for now. |
| Samsung | Maybe | Up to CT1 whether this information is helpful/needed, if they ask, RAN2 should support to forward the information. |
| Huawei, HiSIlicon | Disagree | CT1 is not asking to provide an indication to NAS but to know if there is any specified in RAN2 TS. We only need to inform CT1 of RAN2 status (as in Q3). |

For Question 2 in the LS, since the AS layer in UE side indentify the NR satellite RAT type (LEO/MEO/GEO/OTHERSAT) implicitly through the satellite assistance information in *SIB19* broadcasted by gN*B*, e.g. Ephemeris data, common TA parameters, koffset, validity duration for UL sync information and epoch time. In principle, it will be align with the value gNB provided to the AMF. However, whether there are some uncertain error during type deriving depends on the UE implemention.

**Q5: Do you agree that since the AS layer in UE side derive the NR satellite RAT type (LEO/MEO/GEO/OTHERSAT) implicitly through the satellite assistance information in *SIB19* broadcasted by gN*B*. In principle, it will be align with the value gNB provided to the AMF. However, whether there are some uncertain error during type deriving depends on the UE implemention.**

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| **Company** | **Yes/No** | **comments** |
| CMCC | agree |  |
| Apple | Disagree | We expect all UEs will use the information broadcast in SIB19 to reach the same determination abour satellite NR type |
| Lenovo | Agree with comments | We think the UE-derived result shall align with the value gNB provided to the AMF. Therefore the last sentence may not be necessary. |
| Intel | agree |  |
| Ericsson | Agree with comments | We are a bit uncertain about the part “**However, whether there are some uncertain error during type deriving depends on the UE implemention.**”. Using the satellite ephemeris parameters, the UE should be able to determine the satellite position precisely to do uplink synchronization thus determining the satellite altitude and by extension whether it is LEO/MEO/GEO should not be a problem, unless there is some ambiguity as to what is considered LEO/MEO. |
| Qualcomm | Yes |  |
| Xiaomi | Yes with comments | For the “**However, whether there are some uncertain error during type deriving depends on the UE implemention.**”, we think UE and gNB will have the same understanding on the NR satellite RAT type based on the SIB19. |
| Nokia | Disagree | We are of the same opinion as Apple. It is difficult to imagine two UEs will interpret differently some typical parameters for e.g. LEO and GEO systems (which are largely different). |
| OPPO | Not ok with the “however” part |  |
| Samsung | Agree with comments | Share same view as above |
| Huawei, HiSilicon | Agree with comments | The last sentence is not needed. |

**Q6: Do you agree that a reply LS is needed for the LS (C1-222098)?**

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| **Company** | **Yes/No** | **comments** |
| CMCC | agree | The reply is needed for at least for the the NAS solution of differentiation of the applied NAS timer extension. |
| Apple | Agree | We should simply inform CT1 that satellite type information is available at the AS layer |
| Lenovo | Agree |  |
| Intel | agree |  |
| Ericsson | Agree |  |
| Qualcomm | Yes |  |
| Xiaomi | Agree |  |
| Nokia | OK to send the LS |  |
| OPPO | Agree |  |
| Samsung | Agree |  |
| Huawei, HiSilicon | Agree |  |

**Q7: If you agree to send a reply LS to CT1, which point would you like to mentioned in the LS?**

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| **Company** | **comments** |
| CMCC | 1: For Question 1, the information of NR satellite RAT type is only available in AS layer. Per that the information is possible to facilitate the differentiation of the applied NAS timer extension indicated in the LS from CT1, RAN2 is planning to support forwarding the NR satellite RAT type to the NAS at the UE.  2: For Question 2, since the AS layer in UE side derive the NR satellite RAT type (LEO/MEO/GEO/OTHERSAT) implicitly through the satellite assistance information in SIB19 broadcasted by gNB. In principle, it will be align with the value gNB provided to the AMF. However, whether there are some uncertain error during the type deriving depends on the UE implemention. |
| Apple | 1. We should inform CT1 that satellite type information is available at the AS layer. Whether CT1 decides to use the information or not should have no impact on our specs.  2. We should say RAN2 expects that the satellite type provided by UE should align with the type provided by the gNB to the AMF. |
| Lenovo | 1. Availability of satellite type information at AS, which could be helpful for NAS.  2. UE-derived RAT type aligns with the value provided to the AMF by gNB. |
| Intel | agree with CMCC |
| Ericsson | Agree with Apple points, remember they are just asking us for information. |
| Qualcomm | Just simply yes to the answers. Ok with Apple’s suggestion. |
| Xiaomi | Agree with Apple. |
| Nokia | Availability of satellite type information and the way it is derived (implicitly inferred from the parameters). Agree with Apple. |
| OPPO | Agree with Apple. |
| Samsung | Agree with Apple |
| Huawei, HiSilicon | Apple’s suggestions with some revisions:  1. We should inform CT1 that satellite type information is available at the AS layer. Whether CT1 decides to use the information or not should have no impact on our specs.  2. We should say RAN2 expects that the satellite type provided implicitly to the UE should align with the type provided by the gNB to the AMF. |

# Summary

# References

1. [R2-2204450](file:///C:\\Data\\3GPP\\Extracts\\R2-2204450_C1-222096.doc" \o "C:Data3GPPExtractsR2-2204450_C1-222096.doc) LS on introducing the list of PLMNs not allowed to operate at the present UE location (C1-222096; contact: CMCC) CT1 LS in Rel-17 5GSAT\_ARCH-CT To:RAN2
2. 23122\_CR0741r7\_(Rel-17)\_C1-221824-was-C1-221056\_23122\_cause78\_forbidn\_geo\_area\_05
3. 24501\_CR3975r1\_(Rel-17)\_C1-221744-was-C1-221073\_24501\_cond\_78\_list\_06

1. [R2-2205158](file:///C:\\Data\\3GPP\\Extracts\\R2-2205158%20Impact%20on%20Cell%20selection%20re-selection%20by%20the%20new%20PLMN%20list%20from%20CT1.docx" \o "C:Data3GPPExtractsR2-2205158 Impact on Cell selection re-selection by the new PLMN list from CT1.docx) Impact on Cell selection/re-selection by the new PLMN list from CT1 CMCC discussion Rel-17 NR\_NTN\_solutions-Core
2. [R2-2205159](file:///C:\Data\3GPP\Extracts\R2-2205159%20draft%20Reply%20LS%20on%20introducing%20the%20list%20of%20PLMNs%20not%20allowed%20to%20operate%20at%20the%20present%20UE%20location.docx) draft Reply LS on introducing the list of PLMNs not allowed to operate at the present UE location CMCC LS out Rel-17 NR\_NTN\_solutions-Core To:CT1
3. R2-2204070 NR satellite RAT type in UE NAS (C1-222098; contact: Ericsson) CT1 LS in Rel-17 To:RAN2 Cc:RAN3, SA2
4. [R2-2205027](file:///C:\Data\3GPP\Extracts\R2-2205027%20Discussion%20on%20CT1%20LS%20about%20NR%20satellite%20RAT%20type%20in%20UE%20NAS.docx) Discussion on CT1 LS about NR satellite RAT type in UE NAS CMCC discussion Rel-17 NR\_NTN\_solutions-Core
5. [R2-2205028](file:///C:\Data\3GPP\Extracts\R2-2205028%20%5bDRAFT%5d%20Reply%20LS%20to%20CT1%20on%20NR%20satellite%20RAT%20type%20in%20UE%20NAS.docx) [DRAFT] Reply LS on NR satellite RAT type in UE NAS CMCC LS out Rel-17 NR\_NTN\_solutions-Core To:CT1 Cc:RAN3, SA2