3GPP TSG-RAN WG2 Meeting #109e R2-2001681

Elbonia, Online, 24 February – 6 March 2020

**Agenda item: 16.8.3**

**Source: Nokia (summary rapporteur)**

**Title: Report from email discussion [118][PRN] Connected mode aspects**

**WID/SID: NG\_RAN\_PRN -Core - Release 16**

**Document for: Discussion**

# 1 Introduction

This document is the report for the following email discussion:

* [AT109e][118][PRN] Connected mode aspects (Nokia)

Scope: Continue the discussion on connected mode aspects, trying to conclude on proposals from [R2-2001674](file:///C:\Data\3GPP\Extracts\R2-2001674%20SummaryPRN-ConnectedMode-v3.docx) not concluded online.

Initial intended outcome:

* + - Initial set of proposals with full consensus (agreeable over email)

Initial intermediate deadline (for companies' feedback): Thursday 2020-02-27 23:59 CET

Initial intermediate deadline (for rapporteur's list of proposals): Friday 2020-02-28 12:00 CET

Proposed agreements not challenged until Monday 2020-03-02 12:00 CET will be declared as agreed by the session chair.

Final intended outcome: summary of the offline discussion in R2-2001681 with:

* + - (Further) set of proposals with full consensus, if any (agreeable over email)
    - Set of proposals with almost full consensus to discuss in the follow up conference call
    - Set of open issues and proposals to postpone to next meeting
    - Open issues that should no longer be pursued

Final deadline (for companies' feedback): Monday 2020-03-02 23:59 CET

Final deadline (for rapporteur's summary): Tuesday 2020-03-03 12:00 CET

# 2 Discussion

## 2.1 SIB procedure related proposals

The proposals of this section are based on the following proposals:

[**R2-2000130**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_109_e/Docs/R2-2000130.zip) **[2]**

Proposal 10: When cellReservedForOtherUse is set to true, UE shall use first network identity (PLMN, SNPN) in the npn-IdentityInfoList instead of in the PLMN-IdentityInfoList. If the first network identity is an SNPN identity, both PLMN and NID shall be used when validating stored SI.

[**R2-2000401**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_109_e/Docs/R2-2000401.zip) **[5]**

Proposal 1: For NPN-only cells the UE shall use first *NPN-Identity* in the *NPN-IdentityInfoList* to check the SIB validity in clause 5.2.2.2.1. It is proposed to adopt the corresponding text proposal of Annex A.1.

Proposal 2: The procedure of clause 5.2.2.4.2 (Actions upon reception of the SIB1) shall be extended with the use of NPN related information and selected NPN identity. It is proposed to adopt the corresponding text proposal of Annex A.2.

[**R2-2001378**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_109_e/Docs/R2-2001378.zip) **[9]**

Proposal 1: For NPN-only sharing case, the first NPN ID is used for the SIB validity check for R16 NPN UEs by default:

* the first NPN ID includes both PLMN ID and NID in case that the SNPN ID is the first one in the NPN list;
* the first NPN ID includes only PLMN ID in case that the CAG ID is the first one in the NPN list.

Proposal 2: For PN and NPN mixed cell, Rel-15 UEs and Rel-16 PN UEs use the first PLMN ID in the Rel-15 PN list for the SIB validity check.

Proposal 3: For PN and NPN mixed cell, NPN UEs can use the first PLMN ID in the Rel-15 PN list or the first NPN ID in the NPN list to perform the SIB validity check.

Proposal 4: For PN and NPN mixed cell, for area specific SIB, the new areascope-R16 is introduced.

* If the areascope-R16 is absent, both Rel-15 and Rel-16 UEs use the first PLMN ID in the Rel-15 PN list for the SIB validity check;
* If the areascope is absent and the areascope-R16 is set to “TRUE”, the Rel-16 UEs use the first NPN ID for the SIB validity check.

**During the discussion of R2-2001674 Summary of [PRN] Connected mode aspects) the following relevant agreements were made:**

* For cells shared between PLMNs and NPNs, non-NPN capable UEs use the first PLMN ID in the Rel-15 PLMN list for the SIB validity check.

### 2.1.1 Proposals to be commented

**Q1.1 Do you agree with the following proposal:**For NPN-only cells, the first NPN ID (PLMN ID and NID or PLMN ID and CAG ID) is used for the SIB validity check by NPN capable UEs.

|  |  |  |
| --- | --- | --- |
| Company | Answer | Comments |
| ZTE | Disagree | With regards to the SI validity check in NPN, the following two options can be considered.   * Option1: Use the first PLMN in the legacy PLMN list for SI validity check * Option2: Use the first NPN in the new NPN list for SI validity check   The applicability of the two options in different scenarios have been analyzed in the following table.   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | |  | | | Rel-15 UE | R16 UE | | | NPN capable | Non-NPN capable | | NPN only cell | Cell specific SIB | Option1 | √ (NOTE1) | √(NOTE1) | √(NOTE1) | | Option2 | **×** | √ | √ (NOTE2) | | Area specific SIB | Option1 | √ (NOTE3) | √(NOTE3) | √(NOTE3) | | Option2 | **×** | √ | √ (NOTE4) | | PLMN+NPN cell | Cell specific SIB | Option1 | √ | √ | √ | | Option2 | **×** | √ | √ | | Area specific SIB | Option1 | √ | √ | √ | | Option2 | **×** | √ | √ |   NOTE1: The dummy PLMN in the legacy PLMN list + cell Identity +value tag are used in SI validity check.  NOTE2: The first NPN + cell Identity +value tag are used in SI validity check with the requirement that Non-NPN capable R16 UE has to read and identify the first NPN in the NPN list.  NOTE3: The dummy PLMN in the legacy list + *systemInformationAreaID* +value tag are used in SI validity check.  NOTE4: The first NPN + *systemInformationAreaID* +value tag are used in SI validity check with the requirement that Non-NPN capable R16 UE has to read and identify the first NPN in the NPN list.  With the above analysis, it is clear that option1 is applicable for all the scenarios and is also consistent with the existing Rel-15 behavior. To have a common solution for all the Rel-15 and Rel-16 UEs and all the scenarios, we would like UE to use the first PLMN in the legacy PLMN list for SI validity check.  Thus, for NPN only cell, we prefer to use the first PLMN in the legacy PLMN list (i.e. the dummy PLMN) for SI validity check. |
| QC | No for SNPNs with NID in unmanaged space.  Yes for others. | For SNPNs with NID using “self-assignment” (TS 23.501, Sec5.30.2.1): NPN ID+{CellID/AreaID} is non-unique. Hence, SIB validity check can have errors.  For SNPNs with NID outside “self-assignment” space, and for CAGs, we agree with the proposal in Q1.1.  We see higher risks of false SIB validity check with ZTE's proposal above (given it relies on a dummy PLMN ID). |
| CATT | Yes | For NPN-only cells,only the NPN-Identity in the NPN-IdentityInfoList is valid,it is reasonable to use the first NPN ID for SIB validity check. |
| Huawei | Yes | The NPN-only cell is deployed by an NPN operator, and SIB validity check should resort to the PLMN IDs in the NPN list, not the ones in the legacy PLMN list. Using the first NPN ID is reasonable. |
| Nokia | Yes | In NPN-only cells the 1st PLMN ID can be anything in the PLMN ID list, e.g. a dummy PLMN ID. The problem of using a dummy PLMN ID for SIB validation is that different NPNs may use the same dummy PLMN ID. |
| Ericsson | Yes (but see comment) | We are basically fine with the proposal but instead of using the first NPN ID (which is defined as a PLMN ID + a list of CAG IDs or a PLMN ID + a list NIDs in the running CR) for the SI validity check it should be sufficient to use the first PLMN ID (if the first NPN is a PNI-NPN) or the first PLMN ID+NID (if the first NPN is an SNPN). This would be more aligned with how the legacy SI validity check is done. |
| Futurewei | Yes | Once the rule is clear, NPN operator can provision NPN-only cell with the right indication for SIB validity check. |
| Lenovo | Yes | We understand that in an NPN-only cell the legacy PLMN list doesn’t contain valid PLMN-IDs. |
| Intel | Yes | For Rel-15 UE and non-NPN capable UE, the UE only camps on the cell for emergency call in limited service state and if SIB validity check is performed will be based on the dummy PLMN.  For NPN capable UE, the UE will use the first NPN ID in the NPN list for SIB validity check. As like Ericsson said, if the first NPN-ID is PLMN with CAG(D(s), only the PLMN-ID is used. If the first NPN-ID is PLMN with NID, the PLMNID with the first NID is used. |
| Apple | Yes | For NPN only cells this seems to be an acceptatble solution for us. |
| Samsung | Yes |  |
| Vodafone | Yes | In NPN only cells, a dummy PLMN ID can be used to validate the SIB, however this dummy PLMN must be a real PLMN (with MCC, MNC and cell IDs etc.) which is not used in the network but still in existence. |

**Summary:** TBA

**Proposal:** TBA

**Q1.2 Which option do you prefer:**For cells shared between PLMNs and NPNs, NPN capable UEs use

* Option A: the first PLMN ID in the Rel-15 PLMN list
* Option B: the first NPN ID in the NPN list to perform the SIB validity check.

|  |  |  |
| --- | --- | --- |
| Company | Answer | Comments |
| ZTE | Option A | See comments to Q1.1. |
| QC | Option A | There seems to be no gain with Option B. But we are open if there are any benefits for option B. |
| CATT | Option A | It is simple to follow the legacy way as the first PLMN ID in *PLMN-IdentityInfoList* is valid. |
| Huawei | Option B | For Option A, both PN UEs and non NPN UEs consider the first PLMN as primary network, which will restrict the network deployment: the PN and SNPN mixed cell must be deployed by a PN operator. For instance, a physical cell contains PLMN 1 and “PLMN 2 + CAG 1”. The network could be deployed by PLMN 2, but the operator of PLMN 2 does not want to deploy public network in this cell. With Option A, the primary network is PLMN 1, which is not reasonable because the network is deployed by PLMN 2 and only shared to PLMN 1.  Thus, Option B is preferred. |
| Nokia | Option A | This makes SIB validation the same for all UEs |
| Ericsson | Option A | To align with Rel-15 UEs. Don’t really understand the comment from Huawei; the first PLMN in the legacy PLMN list is only used for the SI validity check, there are no implications on what the UE considers to be the primary network. |
| Futurewei | Option B | With the understanding that NPN could provide more customized services to NPN UE, and that when an NPN capable UE moves from a PLMN only cell to a cell shared between the PLMN and an NPN, option A may hinder the NPN from providing UE more advanced service. |
| Lenovo | Option A | We have some sympathy for Option B but considering the current ASN.1 signaling structure and in order not to complicate matters in the specification, Option A looks reasonable. |
| Intel | Option A | All Rel-16 UEs, will use the first PLMN ID in the Rel-15 PLMN list for SIB validity check |
| Apple | Option B | We agree with the comments made by Futurewei. For ensuring that targered services be provided to NPN UEs Option B is preferable. |
| Samsung | Option A |  |
| Vodafone | Option A | NPN cells are subset of the PLMN and not the other way around! |

**Summary:** TBA

**Proposal:** TBA

## 2.2 Network indexing related proposals

The proposals of this section are based on the following proposals:

[**R2-2000130**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_109_e/Docs/R2-2000130.zip) **[2]**

Proposal 2 : To index NPN’s, build on the existing plmn-IdentityIndex to avoid changes other than in SIB1.

Proposal 3 : In sharing scenarios, the order of low to high index values shall be PLMN (lowest index values)– CAG/PNI-NPN – NID/SNPN (highest index values)

Proposal 4: Agree a definition of CAG-index and NID index such that: CAG index = PLMN-index + x in the xth cag-IdentityList NID index = PLMN-index+CAG-index+ N1-N2+…+N(n-1) + p, for the NID in position p in the nth nid-List where N(s) is the number of NIDs in each nid-List respectively

Proposal 5: Add a condition that when cellReservedForOtherUse is set to true, generating an NPN-index (CAG index, NID index) shall count the PLMN-index part as zero

[**R2-2000400**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_109_e/Docs/R2-2000400.zip) **[4]**

Proposal 3.1: It is proposed to extend the PLMN indexing to NPNs and remove the following Editor’s Note:

Editor's Note: A definition of network indexing for NPNs is FFS.

Proposal 3.2: It is proposed to use the following indexing mechanism for NPNs:

The NPN index is defined as B+c1+c2+…+c(n-1)+d1+d2+…+d(m-1)+i for the NPN identity included in the n-th entry of NPN-IdentityInfoList and in the m-th entry of NPN-Identitylist within that NPN-IdentityInfoList entry, and the i-th entry of its corresponding NPN-Identity, where B is the index used for the last PLMN in the PLMNIdentittyInfoList, c(j) is the number of NPN-Identity entries in the j-th NPN-IdentityInfoList entry, and d(k) is the number NPN-Identity entries in the k-th NPN-IdentityList entry within the nth NPN-IdentityInfoList entry. In NPN-only cells B is considered 0.

**[R2-2001169](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_109_e/Docs/R2-2001169.zip) [6]**

Proposal#3: The same network indexing mechanism (i.e. the network indexing always starts from the Rel-15 list to the net list containing the CAGID and SNPNID) should be applied to selectedPLMN-Identity in the RRCSetupComplete message.

[**R2-2001376**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_109_e/Docs/R2-2001376.zip) **[7]**

Proposal 2: RAN2 to consider SNPN specific UAC scheme by extending the index of plmn-IdentityIndex IE to indicate the related PLMN ID and NID across the npn-IdentityInfoList fields included in SIB1.

**[R2-2001377](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_109_e/Docs/R2-2001377.zip) [8]**

Proposal 1: RAN2 to discuss the following network indexing mechanism:

* Option 1: CAG is considered as a separate network when indexing. When including the selected network in MSG5, UE only considers the PLMN part.
* Option 2: CAG is not considered as a separate network when indexing. The public list (legacy list) index values are reused if same PLMN occur together with CAG IDs in the NPN list. An indication is added to MSG5 to inform the gNB whether UE is accessing via PLMN or CAG.

**During the discussion of R2-2001674 Summary of [PRN] Connected mode aspects) the following relevant agreements were made:**

* To index NPNs, build on the existing plmn-IdentityIndex (to avoid ASN.1 changes other than in SIB1).
* In RAN sharing scenarios, the lowest index values belong to the PLMNs (using legacy indexing) and the highest index values belong to NPNs.
* Add a condition that NPN-only cell generating NPN-indexes (for PNI-NPNs and SNPNs) shall count the PLMN-index part as zero.
* There is no need to include CAG ID in RRCResumeComplete message for UE in automatic CAG selection mode.

### 2.2.1 Proposals to be commented

**Q2.1 Do you agree with the following proposal**There is need to create any order between SNPNs and PNI-NPNs during the indexing.

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| --- | --- | --- |
| Company | Answer | Comments |
| ZTE | Agree | It is better to have a fixed order between the SNPN and PNI-NPNs in a shared cell. Otherwise, when NW change the order of the SNPNs and PNI-NPNs, NW has to send a system information modification indicator in paging DCI to inform UE that the order has changed and the interpretation of the network index is also changed. And, it is still not clear to us what is the benefit for having the flexibility to change the order of SNPN and PNI-NPNs. |
| QC | No | There are no good reasons for the network to change order, but if the network wants to do so, the readily available SI update procedures are available anyway |
| CATT | No | According to the structure of NPN-IdentityInfoList in the RRC running CR, the appearance of PNI-NPN and SNPN in “NPN-IdentityInfoList” does not have fixed order |
| Huawei | No | Similar view with CATT. |
| Nokia | No | It could depend on the deployment which order is preferred by the operator. E.g. an SNPN operator may share a cell with a PNI-NPNs or vica versa. There is not technical reason to specify a fix order. (Cell reconfiguration case mentioned by ZTE is a good reason to ask UEs to read SIBs again. It does not happen frequently.) |
| Ericsson | ? | Not sure I fully understand the question.  Defining a fixed order between the PLMNs, PNI-NPNs and SNPNs (e.g. PLMNs are indexed from 1 to n, PNI-NPNs are indexed from n+1 to n+m, and SNPNs are indexed from n+m+1 to n+m+k) can be considered if it simplifies the definition of the index. |
| Futurewei | No | We don’t see benefit in functionality. |
| Lenovo | No | We agree with CATT. |
| Intel | No | We are not sure why there is a need for the order in the specification. It can be left to the network implementation if such order is needed. There is no need to specify it. |
| Apple | No | We don’t see a benefit |
| Samsung | No |  |
| Vodafone | No | In our view SNPN cells are independent of NPN /CAG cells and no indexing or hierarchy is deemed necessary |

**Summary:** TBA

**Proposal:** TBA

**Q2.2 Which option do you prefer:**PNI-NPNs having the same PLMN ID are considered

* **Option A:** separate networks when indexing (i.e. they will have their own index values).
* **Option B:** single network when indexing (i.e. they will have a common single index value).

|  |  |  |
| --- | --- | --- |
| Company | Answer | Comments |
| ZTE | Both option A and option B are acceptable to us. |  |
| QC | One index per NPNIdentityInfo for CAGs | CAGs listed in the same NPNIdentityInfo will have the same index, and CAGs listed in separate NPNIdentityInfo will have different index. This is irrespective of the PLMN ID these CAGs are under. |
| CATT | Option B | common single index value for the PNI-NPNs having the same PLMN ID is helpful to avoid implicitly revealing the CAG ID |
| Huawei | Both are ok, with some concerns | **Option A:**  For security reasons, RAN2 has agreed that CAG ID is not included in MSG5. So if Option A is adopted, RAN2 needs to clarify that when including the selected network in MSG5, UE only considers the PLMN part (e.g., UE can report whichever of #7 and #8 for CAG 1/2 in the following example) and the gNB only detects the PLMN part of the network index).    **Option B:**  If Option B is adopted, another indication is needed in MSG5 to tell the gNB whether the UE is accessing through PLMN or CAG. The reason is as follows:  As agreed in R3-197776, the gNB transmits the supported CAG List of the selected PLMN of the selected cell via the Initial UE Message to AMF for further admission control. However, there is no need for the gNB to transmit the supported CAG List to AMF when the UE (e.g., PLMN UE) is not requesting to access via CAG cell. |
| Nokia | Option A | This gives the flexibility to refer them separately if needed (e.g. to advertise HRNNs). As PNI-NPNs are counted in the maximum number of networks even if they even if they share the same PLMN ID, this will not increase the maximum value of the index. |
| Ericsson | Option B | Option B has two advantages:   1. The CAG ID is not revealed when the index is signalled in the RRC setup complete message   (The same can be achieved also with option A but requires special rule, e.g. UE transmits the lowest CAG index associated with the same PLMN) 2. All CAG IDs belonging to the same PLMN will use the same UAC configuration.   (Don’t see how this can be achieved with option A). |
| Futurewei | Option A | No strong preference, but option A seems more flexible with the same overhead. |
| Lenovo | Option A | We agree with Nokia. |
| Intel | Option B | It is unclear to us what the motivation is to treat CAG ID belonging to PLMN ID separate in the indexing.  For AMF selection, the PLMN ID will be used for selection  For UAC, the access control should be to the PLMN ID and user defined access categories should be used. |
| Apple | Option B | Option B provides the additional advantage of UAC for CAG IDs in same PLMN |
| Samsung | Option B |  |
| Vodafone | Option A | Option A offers more flexibility. |

**Summary:** TBA

**Proposal:** TBA

## 2.3 RRC setup and RRC resume related proposals

The proposals of this section are based on the following proposals:

[**R2-2000005**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_109_e/Docs/R2-2000005.zip) **[1]**

Proposal 3: Request SA2 to clarify Whether UE in manual CAG selection mode shall only stay on cell supporting the selected CAG ID in RRC\_CONNECTED state.

Proposal 4: Based on the clarification from SA2, possible options are as following,

Option 1: If answer from SA2 is YES, NG-RAN shall make sure UE in manual CAG selection mode always stay on cell supporting the selected CAG ID. Then a new mechanism should be introduced to signal the selected CAG ID of UE in manual CAG selection mode to NG-RAN.

Option 2: If answer from SA2 is NO, NG-RAN shall make sure UE handover to a cell supporting any CAG ID belonging to the allowed CAG list.

Proposal 5: There is no need to include CAG ID in RRCResumeComplete message for UE in automatic CAG selection mode.

Proposal 6: whether to include the selected CAG ID in RRCResumeComplete message for UE in manual CAG selection mode depends on SA2 clarification requested in 2.3. It may be necessary for the UE in manual CAG selection mode to provide the selected CAG ID in RRCResumeComplete message if it is clarified by SA2 that UE can only stay on Cell supporting the selected CAG ID.

[**R2-2000401**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_109_e/Docs/R2-2000401.zip) **[5]**

Proposal 3a: Extend the procedure description in clause 5.3.3.4 that the selected network can be an NPN. It is proposed to adopt the corresponding text proposal of Annex A.3a.

Proposal 3b: Clarify in the description of *RRCSetupComplete* that the *selectedPLMN-Identity* can refer to a NPN. It is proposed to adopt the corresponding text proposal of Annex A.3b.

Proposal 3c: Extend the procedure description in clause 5.3.13.4 that the selected network can be an NPN. It is proposed to adopt the corresponding text proposal of Annex A.3c.

Proposal 3d: Clarify in the description of *RRCResumComplete* that the *selectedPLMN-Identity* can refer to a NPN. It is proposed to adopt the corresponding text proposal of Annex A.3d.

Proposal 3e: UE shall use the smallest PLMN/NPN index value that refers to PLMN or PNI-NPN that has the same PLMN identity as the selected PNI-NPN in the *RRCSetupComplete*, and *RRCResumComplete* messages interpedently from the selected CAG ID. It is proposed to adopt the corresponding text proposal of Annex A.3a and A3c.

[**R2-2001169**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_109_e/Docs/R2-2001169.zip) **[6]**

Proposal#3: The same network indexing mechanism (i.e. the network indexing always starts from the Rel-15 list to the net list containing the CAGID and SNPNID) should be applied to selectedPLMN-Identity in the RRCSetupComplete message.

[**R2-2001572**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_109_e/Docs/R2-2001572.zip) **[11]**

Proposal 1: Include the index of the selected NPN in the RRCSetupComplete message.

Proposal 2: For CAG, UE includes the index of the PLMN selected by the UE from the *plmn-IdentityList* and the *npn-IdentityInfoList* fields included in SIB1 in the RRCSetupComplete message.

Proposal 3: For SNPN, UE includes the index of the PLMN selected by the UE from the *plmn-IdentityList* and the *npn-IdentityInfoList* fields included in SIB1 and associated index of the NID selected by the UE from the *npn-IdentityInfoList* fields included in SIB1 in the RRCSetupComplete message.

**During the discussion of** [**R2-2001674**](file:///C:\Data\3GPP\Extracts\R2-2001674%20SummaryPRN-ConnectedMode-v3.docx) **(Summary of [PRN] Connected mode aspects) the following relevant agreements were made:**

* There is no need to include CAG ID in RRCResumeComplete message for UE in automatic CAG selection mode.

### 2.3.1 Proposals to be commented

**Q3.1 Do you agree with the following proposal**The *selectedPLMN-Identity* can refer to a NPN or set of PNI-NPNs having the same PLMN ID (in case CAG ID is not sent in the RRC message) in the description of *RRCSetupComplete RRCResumComplete* messages and the relevant procedures. (Note this agreement is independent from the agreement whether CGA ID is sent or not sent to the network in RRC messages).

|  |  |  |
| --- | --- | --- |
| Company | Answer | Comments |
| ZTE | Agree | We suggest to add the highlighted part for clarification:  The *selectedPLMN-Identity* can refer to a NPN (a SNPN or a PNI-NPN) or set of PNI-NPNs having the same PLMN ID (in case CAG ID is not sent in the RRC message) in the description of *RRCSetupComplete RRCResumComplete* messages and the relevant procedures. |
| QC | Agree |  |
| CATT | YES | It is beneficial to reuse the legacy ASN.1 structure |
| Huawei | Agree |  |
| Nokia | Yes |  |
| Ericsson | Yes |  |
| Futurewei | Yes |  |
| Lenovo | Yes |  |
| Intel | No on Resume for SNPN,  Yes for Setupcomplete | For SNPN, there is no AMF selection (no equivalent SNPN concept) during resume and thus the *selectedPLMN-Identity* is not used in Rel-16. Hence it has to be made clear that it is for PNI-NPN case for the resume case.  For the PNI-NPN, only the index of the PLMN ID part needs to be provided (Option B in Q2.2). |
| Apple | Agree | Agree with CATT |
| Samsung | Yes |  |
| Vodafone | Yes |  |

**Summary:** TBA

**Proposal:** TBA

**Q3.2 Do you agree with the following proposal**When there is no need to send the selected CAG ID in the RRC message (this disclaimer intends to make this agreement independent from the agreement whether CGA ID is sent or not sent to the network in some RRC messages), the UE shall use the smallest PLMN/NPN index value that refers to PLMN or PNI-NPN that has the same PLMN identity as the selected PNI-NPN in the *RRCSetupComplete* and *RRCResumComplete* messages interpedently from the selected CAG ID.

|  |  |  |
| --- | --- | --- |
| Company | Answer | Comments |
| ZTE | Disagree | This proposal is related to Q2.2.  If we go for option A: separate networks when indexing (i.e. they will have their own index values) in Q2.2, we do not understand why UE does not transmit the selected network index in Msg5 directly? We are a little bit confused about the benefits of this proposal.  If we go for option B:single network when indexing (i.e. they will have a common single index value) in Q2.2, this proposal is not needed any more as there will be only one network index pointing to the PLMN which is associated with more than one CAG IDs. |
| QC | No | The term “selected PNI-NPN” is not defined in our view, as NAS does not provide such information to the UE.  Also, refer to our answer for Q2.2 |
| CATT | Yes | Same reason for Q2.2 |
| Huawei | Agree | This is related to our comment for Option A in Q2.2. |
| Nokia | Yes | Sending the CAG ID (even in an implicit way) brings up security issues (SA3 LS in R2-2000074) and there is an SA2 conclusion that there is no need the UE to send the CAG ID to the network (SA2 LS in R2-2000057). Therefore, RAN2 specification should avoid sending any reference to CAG ID in RRC if possible:   * If a PLMN ID is in the PLMN list, then the UE should use the index of the PLMN in PLMN list. * If we go for option A of Q2.2 then the network index sent by the UE should only depend on the selected PLMN ID, and should not depend on the selected CAG ID. |
| Ericsson | No | I’m disagreeing because this is related to proposal Q2.2. What we could agree is that the index transmitted in the RRC setup complete should not reveal which of the CAG IDs associated with the same PLMN ID that the UE has selected (assuming the #CAG IDs > 1). This would be a more neutral way of formulating the proposal. |
| Futurewei | Yes | We understand this is to avoid disclosing CAG ID. |
| Lenovo | No | The selection of PLMN/NPN index is tied to Q2.2. |
| Intel | No | The network indexing should follow the rules below:   * The indexing of the network should follow first from the *PLMN-IdentityInfoList* and then follow by the *NPN-IdentityInfoList-r16* * If a network (i.e. PLMN ID) occurs in the *PLMN-IdentityInfoList* and the *NPN-IdentityInfoList-r16* occurs multiple times in both list for PLMN network or PLMN with CAGID, only the PLMN ID in the *PLMN-IdentityInfoList* are indexed. |
| Apple | No | This is related to proposal 2.2 and we would ideally want to avoid revealing CAG IDs |
| Samsung | No |  |
| Vodafone | Yes | CAG ID should not be sent in the RRC message |

**Summary:** TBA

**Proposal:** TBA

**Q3.3 Do you agree with the following proposal**UE in manual CAG selection mode shall only stay on cell supporting the selected CAG ID in RRC\_CONNECTED state and there is no need to include CAG ID in RRCResumeComplete message for UE in manual CAG selection mode.

|  |  |  |
| --- | --- | --- |
| Company | Answer | Comments |
| ZTE | Agree with the first part | 1. For the manual CAG selection mode, since the UE is allowed to select a CAG which is not in the allowed list based on the new requirements from SA1 (R2-2002096), the allowed CAG list in the mobility restrictions cannot be used to restrict the UE mobility anymore. In this case, it is better to let UE stay on the same CAG to avoid HO failure. 2. For the second part, since UE is allowed to select a CAG which is not in the allowed list, the selected CAG is useful at network side for admission control or keeping UE in the same CAG during mobility. The selected CAG ID can either be provided from UE to network via AS or NAS signaling. |
| QC | No | We agree with: “no need to include CAG ID in RRCResumeComplete message for UE in manual CAG selection mode”  We do not agree with: “UE in manual CAG selection mode shall only stay on cell supporting the selected CAG ID in RRC\_CONNECTED state”.  We do not believe that the manually selected CAG has any persistence w.r.t. UE behavior. The network may chose to update the UE’s CAG Allowed List based on the UE’s manual selection, and the UEs behavior is only a function of the CAG Allowed List. |
| CATT | Agree with the first part | 1. Regarding whether “UE in manual CAG selection mode shall only stay on cell supporting the selected CAG ID in RRC\_CONNECTED state”, the answer is YES.  From CATT’s point of view, the manually selected CAG ID is user’s preference and it keeps valid until user selects another CAG ID or changes to automatic CAG selection mode. It should be considered in UE’s mobility including cell selection/reselection in idle/inactive mode and handover in connected mode.  2. Regarding whether to “include CAG ID in RRCResumeComplete message for UE in manual CAG selection mode”, the answer is YES.  RAN should prioritize to handover UE to cell supporting the selected CAG ID. so it is necessary for UE to inform the updated selected CAG ID to NG-RAN when resuming as manual CAG selection can occurs in RRC\_INACTIVE state.  General suggestion:  There are different views on the role of the manually selected CAG ID in mobility procedure for UEs in idle and connected mode right now.  I think that is because we focus on the role of selected CAG ID from the access control perspective in passed discussion. The role of the manually selected CAG ID from the UE mobility perspective has been less touched yet. In addition, it is not clearly specified in SA2 and CT1 specification.  There are alternative ways to address this problem in RAN2.We can conclude this in RAN2 based on the majority view. But I am afraid this is a risk that there could be a mismatch between NAS’s expectation and RAN2’s conclusion.so we prefer to request a clarification on the usage/role of the manually selected CAG ID from SA2/CT1 in UE mobility, both in idle/inactive and connected mode. |
| Huawei | No | Agree with “no need to include CAG ID in *RRCResumeComplete* message for UE in manual CAG selection mode” since it is clarified in the LS from SA2 (R2-2000069) that SA2 does not think there is any need for the UE to provide the CAG ID to the network. We do not see anything different between automatic selection and manual selection in this respect.  Cannot agree with “UE in manual CAG selection mode shall only stay on cell supporting the selected CAG ID in RRC\_CONNECTED state”. It is agreed in RAN2 #108 that manual selection is not supported in RRC\_CONNECTED, thus in our understanding, UEs in RRC\_CONNECTED does not need to take selected CAG ID into account. |
| Nokia | Yes (No need to send CAG ID) | There is an SA2 conclusion that there is no need the UE to send the CAG ID to the network (SA2 LS in R2-2000057). There is no SA2 requirement that UE shall stay in a cell of the selected CAG ID in case of manual selection.  We do not think that selected CAG ID should be taken into consideration in Connected mode mobility. Note that Connected mode mobility is network controlled and is out of the scope of RAN2. |
| Ericsson | No | Same view as Qualcomm.  We agree with the 2nd part: “no need to include CAG ID in RRCResumeComplete message for UE in manual CAG selection mode”  We disagree with the 1st part: “UE in manual CAG selection mode shall only stay on cell supporting the selected CAG ID in RRC\_CONNECTED state”. The manually selected CAG ID is only used for the initial cell selection. Once the UE has selected a cell the UE will register to the network and the UE’s Allowed CAG list and the RAN’s mobility restriction list will be updated. The UE can then be handed over to any CAG member cell. |
| Futurewei | No | The treatment of the CAG cell selected by manual selection, especially the relation between the CAG ID from manual selection (but not in the allowed CAG list) and the allowed CAG list, need to be clarified first. |
| Lenovo | No (1st part), Yes (2nd pat) | No: The selected CAG-ID is relevant only for initial cell selection. For subsequent cell reselection or connected mode operation the CAG-IDs in UE’s Allowed CAG list applies.  Yes: No need to include CAG ID in RRCResumeComplete message for UE in manual CAG selection mode. Otherwise, SA3 needs to specify new mechanism to protect CAG-ID transmission. |
| Intel | Yes |  |
| Apple | No | Agree with “No need to include CAG ID in RRCResumeComplete”. This mimics the current manual selection behaviour. We do not agree similar to QC that the “UE in manual CAG selection mode shall only say on cell supporting the selected CAG ID in RRC\_CONNECTED state”. The network should be allowed to update the CAG allowed list. |
| Samsung | Yes |  |
| Vodafone | Yes | If the CAG Cell is manually selected and there are no other changes to the radio/RAN environment then there is no need to send the CAG ID again, this addition serves no purpose |

**Summary:** TBA

**Proposal:** TBA

## 2.4 Measurements related proposals

The proposals of this section are based on the following proposals:

[**R2-2000358**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_109_e/Docs/R2-2000358.zip) **[3]**

Proposal 2: When execute measurement procedure configured by the *Mesconfig*, the UE shall not ignore the measurement of some cells (indicated in the *MeasObject*) based on the reserved PCI list information.

Proposal 3: The CAG ID/SNPN NID information shall be added into the *CGI-InfoNR.*

[**R2-2000401**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_109_e/Docs/R2-2000401.zip) **[5]**

Proposal 5a: Extend the procedure description in clause 5.5.5.1 that a UE may also report about *npn-IdentityInfoList* in *MeasurementReport* message. It is proposed to adopt the corresponding text proposal of Annex A.5a.

Proposal 5b: Extend the *CGI-InfoNR* information element with *npn-IdentityInfoList* to enable sending of NPN information in *MeasurementReport* message. It is proposed to adopt the corresponding text proposal of Annex A.5b.

[**R2-2001377**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_109_e/Docs/R2-2001377.zip) **[8]**

Proposal 2: ANR in the following scenarios is supported to obtain target CAG ID or NID:

* ANR towards PLMN cells configured by PNI-NPN cells.
* ANR towards PNI-NPN cells configured by PNI-NPN cells.
* ANR towards PNI-NPN cells configured by PLMN cells.
* ANR towards SNPN cells configured by cells of the same SNPN.

Proposal 3: The current measurement configuration and reporting procedures of ANR can be extended to include NPN information.

[**R2-2001430**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_109_e/Docs/R2-2001430.zip) **[10]**

Proposal 4: there is no necessary of the CAG-UE to report the MemberStatus and corresponding identity of reported cell acquired from system information in the measurement report message as what the LTE CSG-UEs execute.

Proposal 7: The additional information, i.e. NPN ID, may be provided in the HO measurement report and gNB in NPN could evaluate this assistant information before making the HO decision.

[**R2-2001573**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_109_e/Docs/R2-2001573.zip) **[12]**

Proposal: Introduce a new indicator whether to include the *npn-IdentityInfoList* in the reportCGI field.

### 2.4.1 Proposals to be commented

**Q4.1 Do you agree with the following proposal**Extend the current measurement reporting procedures to include NPN information to support ANR.

|  |  |  |
| --- | --- | --- |
| Company | Answer | Comments |
| ZTE | Agree | If this proposal is agreed, does it mean that all the Rel-16 UE should be able to read and identify the NPN information? |
| QC | Agree | We would like to explicitly note that this applies to all Rel-16 UEs. For example, a UE in SNPN access mode shall perform SI reading and report SI for PLMNs when commanded by its serving network. |
| CATT | Agree | It is beneficial for gNB to learn about the supported NPNs of the cells |
| Huawei | Agree |  |
| Nokia | Yes | The support of the new extension could be optional in the UE. |
| Ericsson | Agree | Same question as ZTE. In our view only the NPN capable UE should be required to include NPN information in the CGI-Info report. |
| Futurewei | Agree | It can be made clear that this is a requirement only for the NPN capable UE. |
| Lenovo | Yes | nr-CGI-Reporting is mandatory in Rel-15 and we agreed that all mandatory features apply to NPN. Therefore, an NPN-capable UE is able to include NPN information for ANR. |
| Intel | Yes |  |
| Apple | Agree | We will need clarity on whether this is applicable for all Rel.16 UEs similar to the others’ comments. |
| Samsung | Agree |  |
| Vodafone | Yes |  |

**Summary:** TBA

**Proposal:** TBA

**Q4.2 Do you agree with the following proposal**The CAG ID/SNPN NID information shall be added into the *CGI-InfoNR*

|  |  |  |
| --- | --- | --- |
| Company | Answer | Comments |
| ZTE | Agree | Same comment as Q4.1 |
| QC | Agree |  |
| CATT | Agree | NA |
| Huawei | Agree |  |
| Nokia | Yes |  |
| Ericsson | Yes |  |
| Futurewei | Yes |  |
| Lenovo | Yes | See comment to Q4.1. |
| Intel | Yes |  |
| Apple | Agree |  |
| Samsung | Agree |  |
| Vodafone | Yes |  |

**Summary:** TBA

**Proposal:** TBA

**Q4.3 Do you agree with the following proposal**There is no necessary of the CAG-UE to report the MemberStatus and corresponding identity of reported cell acquired from system information in the measurement report message as what the LTE CSG-UEs execute.

|  |  |  |
| --- | --- | --- |
| Company | Answer | Comments |
| ZTE | Agree | The *MemberStatus* and the corresponding CSG ID is reported in LTE to report that the concerned cell is a CSG cell. If the CAG ID/SNPN NID information is added in *CGI-InfoNR*, there seems to be no need to report the the *MemberStatus* while the CAG ID can still be reported via *CGI-InfoNR.* |
| QC | Agree |  |
| CATT | YES | source gNB has knowledge of the list of CAG IDs supported by the neighbour target cells |
| Huawei | Agree | It has been agreed in RAN2 #107b that there is no preliminary check, thus *MemberStatus* information is not needed. |
| Nokia | Yes | NG-RAN receives the allowed CAG ID list of the UE from the AMF |
| Ericsson | Yes |  |
| Futurewei | Yes |  |
| Lenovo | Not sure | We should clarify first on the assumptions of measurement configuration for NPN cells:   * Definitely, the CAG UE shall measure and report serving cell and listed cells. * Question is whether the CAG UE is allowed to measure and report detected cells as well.   If the CAG UE is allowed to measure and report detected cells then reporting of the MemberStatus and cell-ID is needed.  If CAG UE is allowed to measure and report only serving cell and listed cells then only reporting of the cell-ID is needed. |
| Intel | Yes |  |
| Apple | Yes |  |
| Samsung | Yes |  |
| Vodafone | Yes |  |

**Summary:** TBA

**Proposal:** TBA

**Q4.4: Do you agree with the following proposal**Introduce a new indicator whether to include the *npn-IdentityInfoList* in the reportCGI field.

|  |  |  |
| --- | --- | --- |
| Company | Answer | Comments |
| ZTE | Disagree | The *reportCGI* field is used to configure a report type and also indicate the cell (identified by *PhysCellId*) to which the CGI report is expected. I guess the intention of this proposal is to introduce a new indicator on whether to report the *npn-IdentityInfoList* in the report CGI procedure.  In our understanding, there is no need for such indicator, UE will report the *npn-IdentityInfoList* if UE acquire it from the system information of the concerned cell. |
| QC | No | The bandwidth saving would be negligible. |
| CATT | No | Whether to include the *npn-IdentityInfoList* in the reportCGI field should depends on UE capability and the presence of *npn-IdentityInfoList in SIB1* |
| Huawei | Agree | When NPN information is not required by the network, the network can indicate the UE not to report such information, which saves some signalling. |
| Nokia | No |  |
| Ericsson | No |  |
| Futurewei | Yes | We are not sure if NPN capable UE should always report npn-IdentityInfoLIst when network can deduce if it is allowed to access those NPN neighbour cells, e.g., a roaming UE. This may not be friendly for deployment of diverse NPN networks. |
| Lenovo | No | If we agree on Q4.1 and Q4.2 then we see no need for a new indicator. |
| Intel | No | This is a best effort type of reporting. If the UE is capable of NPN, it will provide it, otherwise it doesn’t. |
| Apple | No |  |
| Samsung | Agree | It seems beneficial for NW to control whether to report npn-IdentityInfoList or not. |
| Vodafone | No |  |

**Summary:** TBA

**Proposal:** TBA

## 2.5 Other proposal

The proposals of this section are based on the following proposals:

[**R2-2000358**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_109_e/Docs/R2-2000358.zip) **[3]**

Proposal 4: The NPN-only cell can’t work as SCG of EN-DC.

[**R2-2001430**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_109_e/Docs/R2-2001430.zip) **[10]**

Proposal 6: it is proposed that normal network controlled mobility procedure can apply for a UE leaving a CAG cell in connected mode.

### 2.5.1 Proposals to be commented

**Q5.1 Do you agree with the following proposal**Normal network controlled mobility procedure can apply for a UE leaving a CAG cell in connected mode.

|  |  |  |
| --- | --- | --- |
| Company | Answer | Comments |
| ZTE | Disagree | The only concern is about the manual selection case, in which UE can select a CAG which is not in the allowed CAG list and the allowed CAG list in the mobility restrictions cannot be used to restrict the UE mobility anymore. In this case, it is better to let UE stay on the same CAG to avoid HO failure. |
| QC | Yes | Network will update the allowed CAG list if it wants the UE to stay on this CAG (because the connected mode mobility is in network control anyway). |
| CATT | Yes | Mobility from CAG cell to normal PLMN cell is same as mobility between PLMN cells from RAN2 point of view |
| Huawei | Yes |  |
| Nokia | Yes | There is no SA2 requirement to change the current mobility principles. It connected mode the network checks whether that the target cell is appropriate based on mobility restriction (SA2/RAN3 issue). |
| Ericsson | Yes | For the manual selection case we have the same comment as Qualcomm. The CN will update the UE’s allowed CAG list and the mobility restrictions in the RAN, and this will solve the handover issue mentioned by ZTE. Anyway this is more a RAN3 related issue. |
| Futurewei | Yes | We have some sympathy on ZTE’s comment - the relation between manual selection and allowed CAG list should be clarified, but this should be done in SA1/SA2 first. |
| Lenovo | Yes | We understand that as baseline normal network-controlled UE-assisted mobility procedure (by UE measurements) should be applied for CAG.  Special cases such as Manual CAG selection in connected mode need to be studied in more detail. |
| Intel | Yes | It is not clear to us what this proposal is for. In general, the normal network controlled mobility procedure should apply for mobility in Connected mode. Other procedures may also apply for UE leaving CAG cell such as manual selection. |
| Agree | Yes | Network is in control on the connected mode mobility anyway and the network can update the CAG list as needed |
| Samsung | Yes |  |
| Vodafone | Yes | This is normal network handover/cell selection procedure |

**Summary:** TBA

**Proposal:** TBA

# 3 Conclusions

**Proposals with full consensus**

**Proposals with almost full consensus**

**Proposals to be postponed to next meeting (no clear majority view)**

# 4 List of referenced documents

[1] [R2-2000005](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_109_e/Docs/R2-2000005.zip), “Connected Mode Open Issues for NPN” (Proposal 3, 4, 5, and 6), CATT

[2] [R2-2000130](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_109_e/Docs/R2-2000130.zip) “Remaining RRC aspects of NPN” (Proposal 2, 3, 4, 5, and 10), Ericsson

[3] [R2-2000358](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_109_e/Docs/R2-2000358.zip), “Consideration on the remaining Connected State Issues” (Proposal 2, 3, and 4), ZTE Corporation, Sanechips

[4] [R2-2000400](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_109_e/Docs/R2-2000400.zip), “Proposals on Editor’s Notes of running RRC CR” (Proposal 3.1 and 3.2), Nokia, Nokia Shanghai Bell

[5] [R2-2000401](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_109_e/Docs/R2-2000401.zip), “Proposals on open RRC issues” (Proposals 1, 2, 3a, 3b, 3c, 3d, 3e, 5a, 5b), Nokia, Nokia Shanghai Bell

[6] [R2-2001169](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_109_e/Docs/R2-2001169.zip), “Network indexing for UAC and Connection Control” (Proposal 3), Intel Corporation

[7] [R2-2001376](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_109_e/Docs/R2-2001376.zip), “General considerations on idle and inactive mode for NPN” (Proposal 2), Huawei, HiSilicon

[8] [R2-2001377](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_109_e/Docs/R2-2001377.zip), “General considerations on connected mode for NPN” (Proposal 1, 2, and 3), Huawei, HiSilicon, China Telecom

[9] [R2-2001378](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_109_e/Docs/R2-2001378.zip), “Considerations on SI Validity Checking” Huawei, HiSilicon

[10] [R2-2001430](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_109_e/Docs/R2-2001430.zip), “Access and mobility control for NPN” (Proposal 4, 6 and 7), CMCC

[11] [R2-2001572](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_109_e/Docs/R2-2001572.zip), “Transfer of NPN ID in RRC connection establishment”, Samsung Electronics Co., Ltd

[12] [R2-2001573](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_109_e/Docs/R2-2001573.zip), “Discussion on ANR for NPN”, Samsung Electronics Co., Ltd