3GPP TSG-RAN2#116bis-e Tdoc R2-22XXXX

Electronic meeting, 2022-01-17 - 2022-01-25

Agenda Item: 8.24.3 Other

Source: Ericsson

Title: Report [AT116bis-e][043][NR17] MINT (Ericsson)

Document for: Discussion, Decision

# 1 Introduction

This document summarizes this offline discussion:

* [AT116bis-e][043][NR17] MINT (Ericsson)

Scope: Take into account submitted documents incl Reply LS from CT1. Update Running CR to reflect Reply LS from CT1, and other discussion if agreeable. 1 Determine agreeable parts, and points for online CB if any. 2 endorse updated CR

Intended outcome: Report, endorsed CR

Deadline: 1 Friday W1 (can CB W2 if needed), 2 EOM

The following delegates participated in the discussion:

|  |  |
| --- | --- |
| Company | Contact Name, Email |
| Ericsson | Mattias Bergström, mattias.a.bergstrom@ericsson.com |
| CATT | HaoXu, xuhao@catt.cn |
| OPPO | qianxi.lu@oppo.com |

The following documents were treated:

[R2-2200061](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs//R2-2200061.zip) Response to reply LS on UAC enhancements and system information extensions for minimization of service interruption ([C1-217156](http://www.3gpp.org/ftp//tsg_ct/WG1_mm-cc-sm_ex-CN1/TSGC1_133e/Docs//C1-217156.zip); contact: Nokia) CT1 LS in Rel-17 MINT To:RAN2

[R2-2200151](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs//R2-2200151.zip) Reply LS on LS on MINT functionality for Disaster Roaming ([S3-214416](http://www.3gpp.org/ftp//tsg_sa/WG3_Security/TSGS3_105e/Docs//S3-214416.zip); contact: LGE) SA3 LS in Rel-17 MINT To:SA2 Cc:SA5, CT1, CT4, CT6, RAN2, SA, CT, RAN

[R2-2201471](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs//R2-2201471.zip) Resolving open isseus for supporting disaster roaming LG Electronics discussion Rel-17

[R2-2201437](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs//R2-2201437.zip) Introduction of MINT for LTE Huawei, HiSilicon CR Rel-17 36.331 16.7.0 4751 - B MINT

[R2-2201141](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs//R2-2201141.zip) Further discussion on support of MINT feature in AS Lenovo, Motorola Mobility discussion Rel-17 MINT

[R2-2201142](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs//R2-2201142.zip) Introduction of MINT feature in TS 38.306 Lenovo, Motorola Mobility draftCR Rel-17 38.306 16.7.0 B MINT

[R2-2201143](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs//R2-2201143.zip) Introduction of MINT feature in TS 36.306 Lenovo, Motorola Mobility draftCR Rel-17 36.306 16.7.0 B MINT

[R2-2201552](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs//R2-2201552.zip) Remaining issues for MINT Ericsson other Rel-17

[R2-2201550](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs//R2-2201550.zip) Introduction of MINT Ericsson draftCR Rel-17 38.331 16.7.0 B TEI17

[R2-2201551](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs//R2-2201551.zip) Introduction of MINT Ericsson draftCR Rel-17 36.331 16.7.0 B TEI17

# 2 Discussion

## 2.1 SA3 LS in [R2-2200151](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs//R2-2200151.zip)

SA3 sent the following LS:

[R2-2200151](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs//R2-2200151.zip) Reply LS on LS on MINT functionality for Disaster Roaming ([S3-214416](http://www.3gpp.org/ftp//tsg_sa/WG3_Security/TSGS3_105e/Docs//S3-214416.zip); contact: LGE) SA3 LS in Rel-17 MINT To:SA2 Cc:SA5, CT1, CT4, CT6, RAN2, SA, CT, RAN

**Question 1**: Do you foresee any RAN2 impact or action due to this LS, or can this LS simply be noted? If you foresee any RAN2 impact or action, please provide details.

|  |  |  |
| --- | --- | --- |
| **Company** | **Answer** | **Comments** |
| Ericsson | Can be noted |  |
| CATT | Noted |  |
| OPPO | Can be noted |  |

## 2.2 Applicable Access identities for MINT UEs

CT1 wrote in their LS in [C1-217156](http://www.3gpp.org/ftp//tsg_ct/WG1_mm-cc-sm_ex-CN1/TSGC1_133e/Docs//C1-217156.zip):

|  |
| --- |
| *Question 1: Can a UE that performs disaster roaming be configured with any other Access Identities than Access Identity 3? And if so, which Access Identities should be considered by the UE when performing access barring evaluation? For example, should a UE performing disaster roaming which is configured with Access Identity 1, 2 or 11 to 15 and 3, only consider Access Identity 3?*  Yes, a UE performing disaster roaming can be configured with one or more access identities other than Access Identity 3. Such a UE can be configured with Access Identity 1, 2, or 11 – 15. When an access attempt occurs, the NAS layer of a UE performing disaster roaming will provide all valid access identities including Access Identity 3 to the AS layer of the UE (note that even if a UE is configured with Access Identity 11 or 15, Access Identity 11 or 15 would not be valid while the UE is performing disaster roaming because Access Identities 11 and 15 are valid in (E)HPLMN only). |

The relevant section of the NR RRC running CR for MINT is shown here:

|  |
| --- |
| 5.3.14.5 Access barring check The UE shall:  1> if one or more Access Identities equal to 1, 2, 11, 12, 13, 14, or 15 are indicated according to TS 24.501 [23], and  1> if for at least one of these Access Identities the corresponding bit in the *uac-BarringForAccessIdentity* contained in "UAC barring parameter" is set to *zero*:  2> consider the access attempt as allowed;  1> else:  2> if the establishment of the RRC connection is the result of release with redirect with *mpsPriorityIndication* (either in NR or E-UTRAN)*;* and  2> if the bit corresponding to Access Identity 1 in the *uac-BarringForAccessIdentity* contained in the "UAC barring parameter" is set to *zero:*  3> consider the access attempt as allowed;  2> else if Access Identity 3 is indicated:  3> draw a random number '*rand*' uniformly distributed in the range: 0 ≤ rand < 1;  3> if '*rand*' is lower than the value indicated by *uac-BarringFactorForAI3* included in "UAC barring parameter":  4> consider the access attempt as allowed;  3> else:  4> consider the access attempt as barred;  2> else:  3> draw a random number '*rand*' uniformly distributed in the range: 0 ≤ *rand* < 1;  3> if '*rand*' is lower than the value indicated by *uac-BarringFactor* included in "UAC barring parameter":  4> consider the access attempt as allowed;  3> else:  4> consider the access attempt as barred;  1> if the access attempt is considered as barred:  2> draw a random number '*rand*' that is uniformly distributed in the range 0 ≤ *rand* < 1;  2> start timer T390 for the Access Category with the timer value calculated as follows, using the *uac-BarringTime* included in"UAC barring parameter":  T390 = (0.7+ 0.6 \* *rand*) \* *uac-BarringTime.* |

[R2-2201552](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs//R2-2201552.zip) claims that with the way the current running NR RRC CR for MINT is written, CT1's intention regarding this is already captured.

[R2-2201141](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs//R2-2201141.zip) suggests RAN2 to confirm that if special Access Identities are configured to a UE that performs disaster roaming, the UAC barring configuration of valid special Access Identities takes precedence over Access Identity 3.

[R2-2201471](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs//R2-2201471.zip) says that, provided that RAN2 will introduce AI3 specific UAC barring factors, there is no additional specification work on UAC to support disaster roaming access configured with both AI3 and other AI(s).

**Question 2**: Do you foresee any further RAN2 impact in light of the above CT1 reply? If so, what?

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| --- | --- | --- |
| **Company** | **Answer** | **Comments** |
| Ericsson | No |  |
| CATT | No |  |
| OPPO | No |  |

## 2.3 NPNs

CT1 wrote in their LS in [C1-217156](http://www.3gpp.org/ftp//tsg_ct/WG1_mm-cc-sm_ex-CN1/TSGC1_133e/Docs//C1-217156.zip):

|  |
| --- |
| *Question 3: RAN2 understood that disaster roaming is not supported for SNPNs, but is disaster roaming supported for PNI-NPNs?*  With respect to SNPN, CT1 agrees with RAN2. With respect to PNI-NPN, CT1 agreed that disaster roaming is not supported, i.e., a PNI-NPN does not accept a UE performing disaster roaming if the UE is not allowed to access the PNI-NPN, as per the guidance provided by SA1 in the attached LS [C1-213553](http://www.3gpp.org/ftp//tsg_ct/WG1_mm-cc-sm_ex-CN1/TSGC1_130e/Docs//C1-213553.zip). |

**SNPNs**

CT1 confirms that MINT is not supported for SNPNs. [R2-2201552](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs//R2-2201552.zip) suggests that this implies that the network should be able to indicate that **no** disaster roaming is applicable for SNPNs and hence that a "noDisasterRoaming" codepoint is to be added to the "ApplicableDisasterInformation" IE. The ASN.1 is suggested to be changed as follows:

|  |
| --- |
| SIBX-r17 ::= SEQUENCE {  commonDisasterPLMNs-r17 SEQUENCE (SIZE (1..maxPLMN)) OF PLMN-Identity OPTIONAL, -- Need R  applicableDisasterInformationList-r17 SEQUENCE (SIZE (1..maxPLMN)) OF ApplicableDisasterInformation-r17 OPTIONAL, -- Need R  lateNonCriticalExtension OCTET STRING OPTIONAL,  ...  }  ApplicableDisasterInformation-r17 ::= CHOICE {  noDisasterRoaming-r17 NULL,  oneBitApproach-r17 NULL, -- The semantics for this approach is TBD  commonDisasterPLMNs-r17 NULL,  dedicatedDisasterPLMNs-r17 SEQUENCE (SIZE (1..maxPLMN)) OF PLMN-Identity  } |

And it is proposed to clarify in the field description of *applicableDisasterInformation* that "For SNPNs, the network indicates the value *noDisasterRoaming*.".

**Question 3**: Do you agree with adding a new value *noDisasterRoaming* to *applicableDisasterInformation* and to clarify in the field description that the network indicates this codepoint for SNPNs?

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| --- | --- | --- |
| **Company** | **Answer** | **Comments** |
| Ericsson | Yes |  |
| CATT | No | With CT1’s feedback, it was stated that :“ With respect to PNI-NPN, CT1 agreed that disaster roaming is not supported“. Hence, we don’t think it is needed to update the current CR. If there is any misunderstanding, please correct me, thanks. |
| OPPO | Yes |  |

**PNI-NPNs**

[R2-2201141](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs//R2-2201141.zip) argues that the CT1 reply regarding PNI-NPNs could be interpreted in two ways:

1. disaster roaming is not supported for PNI-NPN at all (i.e. with or without CAG), or
2. disaster roaming service can be provided by a PNI-NPN with CAG, so that a disaster roaming UE that is configured with an Allowed CAG list is allowed to access a PNI-NPN with CAG and may select and register on a CAG cell of that PNI-NPN, if the CAG cell identity is contained in the UE’s Allowed CAG list.

[R2-2201471](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs//R2-2201471.zip) points towards the yellow highlighted wording below and concludes that MINT is not supported for PNI-NPN.

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| --- |
| ***Reply LS from CT1 in [R2-2200061](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs//R2-2200061.zip).***  *Question 3: RAN2 understood that disaster roaming is not supported for SNPNs, but is disaster roaming supported for PNI-NPNs?*  With respect to SNPN, CT1 agrees with RAN2. With respect to PNI-NPN, CT1 agreed that disaster roaming is not supported, i.e., a PNI-NPN does not accept a UE performing disaster roaming if the UE is not allowed to access the PNI-NPN, as per the guidance provided by SA1 in the attached LS [C1-213553](http://www.3gpp.org/ftp//tsg_ct/WG1_mm-cc-sm_ex-CN1/TSGC1_130e/Docs//C1-213553.zip). |

The rapporteur thinks that the yellow highlighted above does not exclude MINT support for PNI-NPNs. The yellow just states that the UE has to be a member of the CAG for the UE to be allowed to do disaster roaming in an PNI-NPN. Therefore, the rapporteur suggests to dig further.

The SA1 LS ([C1-213553](http://www.3gpp.org/ftp//tsg_ct/WG1_mm-cc-sm_ex-CN1/TSGC1_130e/Docs//C1-213553.zip) / [S1-211323](http://www.3gpp.org/ftp//tsg_sa/WG1_Serv/TSGS1_94e_ElectronicMeeting/Docs//S1-211323.zip)) referred to by CT1 reveals relevant information:

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| --- |
| SA1 thanks CT1 for the LS.  On following question from CT1:  **Question:** When a CAG-supporting UE determines that Disaster Condition applies, and a PLMN can provide disaster roaming to the UE, is the UE without CAG configuration for the PLMN allowed to select and register on a CAG cell of the PLMN?  SA1’s answer is:  **Answer:** No.  Current CAG restrictions apply also during disaster conditions and roaming. As such, a UE without CAG configuration for a PLMN (even if it can provide disaster roaming) is not allowed to select and register on a CAG cell of that PLMN. |

It is the rapporteur's interpretation of the CT1 and SA1 LSs that indeed, MINT is applicable for PNI-NPNs. From that CT1 asks the question on a detail of how a UE should behave in a PNI-NPN network in a MINT-scenario, it is clear that at least CT1 thinks that MINT is supported for PNI-NPNs. If MINT was **not** applicable for PNI-NPN, CT1 would not have asked the question they did.

And the reply from SA1 clarifies that also SA1 thinks that MINT is supported in PNI-NPNs. SA1 replies that a UE cannot do disaster roaming in a PNI-NPN unless it is configured with the correct CAG. If SA1 did not think that MINT does not work in PNI-NPNs, SA1 would simply replied that disaster roaming is not applicable for PNI-NPNs.

The above is however only the rapporteur's interpretation, and indeed it has not been stated explicitly in any of the above that MINT is supported in PNI-NPNs.

**Question 4**: Should RAN2 assume that MINT is supported for PNI-NPN?

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| --- | --- | --- |
| **Company** | **Answer** | **Comments** |
| Ericsson | Yes |  |
| CATT | No | Please see our answer in Q3, thanks. |
| OPPO | See comment | Although we have similar observation, good to further confirm with CT1 and SA1 in order to be cristally clear. |

**If** RAN2 assumes that MINT is supported in PNI-NPNs, [R2-2201552](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs//R2-2201552.zip) argues that changes to the running RRC CR are needed. Namely these:

1. Allow the network to indicate disaster roaming information also for the PNI-NPNs, which are signalled in *npn-IdentityList-r16*.
2. Change the name *applicableDisasterPLMNsList* to *applicableDisasterInformationList* as for the case of "no" disaster roaming, there are no applicable PLMNs.

The resulting field description is suggested to be the following:

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| ***applicableDisasterInformation***  A list indicating the applicable disaster information for the networks indicated in plmn-IdentityList and npn-IdentityList.  The network indicates in this list one entry for each entry of *plmn-IdentityList*, followed by one entry for each entry of *npn-IdentifyList-r16*, meaning that this list will have as many entries as the number of entries of the combination of *plmn-IdentityList* and *npn-IdentifyList-r16*.  The first entry in this list indicates the disaster information applicable for the network(s) in the first entry of *plmn-IdentityList*/*npn-IdentityList-r16*, the second entry in this list indicates the disaster information applicable for the network(s) in the second entry on *plmn-IdentityList*/*npn-IdentityList-r16*, and so on.  Each entry in this list can either be having the value *noDisasterRoaming*, *oneBitApproach*, *commonDisasterPLMNs*, or can contain a list of *dedicatedDisasterPLMNs*.  If an entry in this list takes the value *noDisasterRoaming*, disaster roaming is not allowed for this network(s).  If an entry in this list takes the value *oneBitApproach*, [TBD what happens].  If an entry in this list takes the value *commonDisasterPLMNs*, the applicable disaster PLMNs are those PLMNs indicated in the field *commonDisasterPLMNs*.  If an entry in this list contains a list of *dedicatedDisasterPLMNs*, the applicable disaster PLMN(s) for the PLMN(s) corresponding to this entry are those provided in this *dedicatedDisasterPLMNs*.  For SNPNs, the network indicates the value *noDisasterRoaming*. |

**Question 5**: Do you have any comments on the field description above?

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| --- | --- | --- |
| **Company** | **Answer** | **Comments** |
| OPPO | See comment | There are two fields with same name, i.e., *commonDisasterPLMNs*, we wonder if it is possible to differentiatie between the two. |
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## 2.4 Reception of the disaster information in system information

[R2-2201552](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs//R2-2201552.zip) refers to an editor's note in the running RRC CR for MINT ([R2-2111553](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_116-e/Docs//R2-2111553.zip)):

|  |
| --- |
| 5.2.2.4.X Actions upon reception of *SIBX* Upon receiving *SIBX*, the UE shall:  1> forward the applicable disaster PLMNs for each PLMN to upper layers.  Editor's note: The one-bit-approach described in the CT1 LS in [R2-2109818](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_116-e/Docs//R2-2109818.zip) may require some modification of the above. The impact is pending further CT1 input. Also it is TBD if this should instead be captured in 304. |

Regarding the yellow the paper refers to the CT1 in LS [R2-2109818](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_116-e/Docs//R2-2109818.zip) which states:

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| --- |
| Thus, for available PLMN(s), NAS will need to obtain from RRC:  a) disaster related indication, for which CT1 still discusses whether it indicates (a) solely that the available PLMN is accessible for disaster inbound roamers or (b) that the available PLMN is accessible for disaster inbound roamers and all other PLMNs have disaster condition; or  b) "list of one or more PLMN(s) with disaster condition for which disaster roaming is offered by the available PLMN" where each PLMN with disaster condition is identified by its PLMN ID. The list will need to be able to hold at least the same amount of PLMN IDs as number of PLMNs which can share an NR cell. |

It is proposed to wait for further CT1 input regarding the "one bit indicator":

**Question 6**: Do you agree that RAN2 should wait for further CT1 input regarding the "one bit indicator"?

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| --- | --- | --- |
| **Company** | **Answer** | **Comments** |
| Ericsson | Yes |  |
| CATT | Yes |  |
| OPPO | Yes |  |

Regarding the green in the editor's note, the paper indicates that it was discussed at RAN2#116e whether the forwarding of the applicable disaster PLMNs should be captured as in the running CR, or in 38.304. The paper argues that the forwarding the disaster PLMNs is something the UE shall do upon reception of the new SIB hence it is proposed to keep the current approach.

**Question 7**: Do you agree to keep in RRC that the UE shall forward the applicable disaster PLMNs upon reception of the new SIB?

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| --- | --- | --- |
| **Company** | **Answer** | **Comments** |
| Ericsson | Yes |  |
| CATT | Yes |  |
| OPPO | Yes |  |

## 2.5 Which SIB to carry the disaster roaming information

In the last meeting it was suggested to add the disaster roaming information (e.g. the PLMNs with disaster conditions) in a new SIB. This was implemented in the running NR RRC CR in [R2-2201550](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs//R2-2201550.zip). However, during the running RRC CR drafting, an editor's note was added keeping this issue TBD.

In [R2-2201552](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs//R2-2201552.zip) it is proposed to confirm that the disaster roaming information is to be added in a new SIB.

**Question 8**: Can we confirm that the disaster roaming information is provided in a **new** SIB in NR?

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| --- | --- | --- |
| **Company** | **Answer** | **Comments** |
| Ericsson | Yes | At the last meeting, the main reason for RAN2 going in the direction of a new SIB was that no other SIB seemed suitable. SIB2 was discussed, but that idea was dismissed due to overhead reasons. The new SIB approach allows the network to schedule the disaster roaming information less frequent if needed. |
| CATT | Yes |  |
| OPPO | Yes | A new SIB seems a clearer way. |

[R2-2201437](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs//R2-2201437.zip) proposes for LTE a different approach compared to the running NR CR: to add the disaster roaming to SIB2.

**Question 9**: Which SIB do you think should provide the disaster roaming information in LTE:

* An existing SIB? If so, which one?
* New SIB?

|  |  |  |
| --- | --- | --- |
| **Company** | **Answer** | **Comments** |
| Ericsson | New SIB | Last meeting it was raised for NR that SIB2 is not suitable to carry the disaster roaming info due to overhead. We think the same argument applies to LTE. |
| CATT | New SIB | We share the same view as Ericsson. Further, it is preferred the same solution to LTE and NR. |
| OPPO | New SIB |  |

## 2.6 Signalling detail

[R2-2201552](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs//R2-2201552.zip) discusses a signalling detail related to how disaster roaming information is to be provided in RAN sharing scenarios. This was briefly discussed in the previous meeting, but not concluded and the following editor's note was captured in the NR RRC running CR:

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| --- |
| Editor's note: TBD if this information is to be provided in SIB1 or other existing SIB. And TBD if an approach where, for each PLMN, the common disaster PLMNs are merged with the per-PLMN dedicated disaster PLMNs to form the complete list of disaster PLMNs. |

The paper compares the two alternatives that were discussed at the previous meeting. See the paper ([R2-2201552](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs//R2-2201552.zip)) for full description:

* Alternative 1: Merging common and specific PLMNs
* Alternative 2: Either common PLMNs or specific PLMNs (in current running CR)

**Question 10**: Which alternative do you prefer? Please motivate.

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| --- | --- | --- |
| **Company** | **Answer** | **Comments** |
| Ericsson | 2 | For the likely most common scenario where all PLMNs sharing a cell provides disaster roaming for the same PLMNs with disaster conditions, there is no difference between the two proposals. So both work.  In certain (not very common) scenarios Alternative 1 has some benefits over Alternative 2. And in some other (not very common) scenarios Alternative 2 has some benefits over Alternative 1.  Both alternatives work but Alternative 2 is what is implemented in the running CR now. So unless there are any (serious) concerns identified, we prefer to stick to Alternative 2. |
| CATT | 2 | Both have some minor issues and we would like to accept 2 as a compromise way-out. |
| OPPO | 2 | We do not see much gain in further optimization, so the current running-CR is sufficient already. |

## 2.7 Impact on cell (re)selection

CT1 wrote in their LS in [C1-217156](http://www.3gpp.org/ftp//tsg_ct/WG1_mm-cc-sm_ex-CN1/TSGC1_133e/Docs//C1-217156.zip):

|  |
| --- |
| *Question 2: RAN2 does not expect there is impact on cell selection/reselection and would like to confirm whether CT1 foresee any impact on cell selection/reselection due to MINT?*  CT1 does not foresee any impact on cell selection or reselection due to MINT. |

[R2-2201552](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs//R2-2201552.zip) and [R2-2201471](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs//R2-2201471.zip) suggests that no specification change should be done for cell (re)selection. [R2-2201141](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs//R2-2201141.zip) on the other hand proposes that the cell suitability criteria should be updated as follows:

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| --- |
| **suitable cell:**  For UE not operating in SNPN Access Mode, a cell is considered as suitable if the following conditions are fulfilled:  - The cell is part of either the selected PLMN or the registered PLMN or PLMN of the Equivalent PLMN list, and for that PLMN either:  - The PLMN-ID of that PLMN is broadcast by the cell with no associated CAG-IDs and CAG-only indication in the UE for that PLMN (TS 23.501 [10]) is absent or false;  - Allowed CAG list in the UE for that PLMN (TS 23.501 [10]) includes a CAG-ID broadcast by the cell for that PLMN;  - The cell selection criteria are fulfilled, see clause 5.2.3.2;  - For disaster roaming UEs the cell is part of the disaster roaming service area of the selected PLMN.  According to the latest information provided by NAS:  - The cell is not barred, see clause 5.3.1;  - The cell is part of at least one TA that is not part of the list of "Forbidden Tracking Areas for Roaming" (TS 22.011 [18]), which belongs to a PLMN that fulfils the first bullet above. |

**Question 11**: Do you agree to update the cell suitability criteria? If so, do you agree with the way proposed in [R2-2201141](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs//R2-2201141.zip)?

|  |  |  |
| --- | --- | --- |
| **Company** | **Answer** | **Comments** |
| Ericsson | Probably no? | The existing bullet with "The cell is part of either the selected PLMN" covers MINT already? |
| CATT | No |  |
| OPPO | No |  |

## 2.8 NAS and AS functional split

[R2-2201552](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs//R2-2201552.zip) states that the table in section 4.2 of 38.304 which indicates the functional division of AS and NAS needs updating. The proposal is that RAN2 should clarify that AS forwards the disaster information to NAS and that NAS maintains this information. The change is suggested to be captured as follows:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 4.2 Functional division between AS and NAS in RRC\_IDLE state and RRC\_INACTIVE state Table 4.2-1 presents the functional division between UE non-access stratum (NAS) and UE access stratum (AS) in RRC\_IDLE state and RRC\_INACTIVE states. The NAS part is specified in TS 23.122 [9] and the AS part in the present document.  Table 4.2-1: Functional division between AS and NAS in RRC\_IDLE state and RRC\_INACTIVE state   | RRC\_IDLE and RRC\_INACTIVE state Process | UE Non-Access Stratum | UE Access Stratum | | --- | --- | --- | | PLMN Selection | **For a UE not operating in SNPN access mode, perform the following:**  Maintain a list of PLMNs in priority order according to TS 23.122 [9]. Select a PLMN using automatic or manual mode as specified in TS 23.122 [9] and request AS to select a cell belonging to this PLMN. For each PLMN, associated RAT(s) may be set.  Evaluate reports of available PLMNs and any associated CAG-IDs from AS for PLMN selection.  Maintain a list of equivalent PLMN identities.  Maintain applicable disaster roaming information for available PLMNs including potential disaster PLMNs for available PLMNs.  To support manual CAG selection, provide request to search for available CAGs and evaluate reports of available CAGs from AS for CAG selection.  **For a UE operating in SNPN access mode, perform the following:**  Maintain a list of SNPNs according to TS 23.122 [9]. Select a SNPN using automatic or manual mode as specified in TS 23.122 [9] and request AS to select a cell belonging to this SNPN.  Evaluate reports of available SNPNs from AS for SNPN selection. | For a UE not operating in SNPN access mode, search for available PLMNs.  If associated RAT(s) is (are) set for the PLMN, search in this (these) RAT(s) and other RAT(s) for that PLMN as specified in TS 23.122 [9].  For a UE operating in SNPN access mode, search for available SNPNs only consider NR cells.  Perform measurements to support PLMN/SNPN selection.  Synchronise to a broadcast channel to identify found PLMNs/SNPNs.  Report available PLMNs and any associated CAG-IDs with associated RAT(s) to NAS on request from NAS or autonomously.  Report applicable disaster roaming information for available PLMNs autonomously including potential disaster PLMNs.  For a UE operating in SNPN access mode, report available SNPNs to NAS autonomously.  **To support manual CAG selection, perform the following:**  Search for cells broadcasting a CAG-ID.  Read the HRNN (if broadcast) for each CAG-ID if a cell broadcasting a CAG-ID is found.  Report CAG-ID(s) of found cell(s) broadcasting a CAG-ID together with the associated manual CAG selection allowed indicator, HRNN and PLMNto NAS.  On selection of a CAG by NAS, select any acceptable or suitable cell belonging to the selected CAG and give an indication to NAS that access is possible (for the registration procedure)  To support manual SNPN selection, report available SNPNs together with associated HRNNs (if available) to NAS on request from NAS. | |

Similarly, the paper proposes the following change for 36.304:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 4.2 Functional division between AS and NAS in Idle mode Table 1 presents the functional division between UE non-access stratum (NAS) and UE access stratum (AS) in idle mode. The NAS part is specified in TS 23.122 [5] and the AS part in the present document.   | Idle Mode Process | UE Non-Access Stratum | UE Access Stratum | | --- | --- | --- | | PLMN Selection | Maintain a list of PLMNs in priority order according to TS 23.122 [5]. Select a PLMN using automatic or manual mode as specified in TS 23.122 [5] and request AS to select a cell belonging to this PLMN. For each PLMN, associated RAT(s) may be set.  Evaluate reports of available PLMNs and, for E-UTRA if the UEs supports E-UTRA connected to 5GC, CN type(s) from AS for PLMN selection.  Maintain a list of equivalent PLMN identities.  Maintain applicable disaster roaming information for available PLMNs including potential disaster PLMNs for available PLMNs. | Search for available PLMNs.  If associated RAT(s) is (are) set for the PLMN, search in this (these) RAT(s) and other RAT(s) for that PLMN as specified in TS 23.122 [5].  Perform measurements to support PLMN selection.  Synchronise to a broadcast channel to identify found PLMNs (and CN type(s).  Report available PLMNs with associated RAT(s) and, for E-UTRA if the UE supports E-UTRA connected to 5GC, CN type(s) to NAS on request from NAS or autonomously.  Report applicable disaster roaming information for available PLMNs autonomously including potential disaster PLMNs. | | Cell  Selection | Control cell selection for example by indicating RAT(s) associated with the selected PLMN to be used initially in the search of a cell in the cell selection. NAS is also maintaining lists of forbidden registration areas and a list of CSG IDs and their associated PLMN ID on which the UE is allowed (CSG whitelist) and provide these lists to AS.  NAS may indicate whether the use of coverage enhancements is not authorized for the selected PLMN.  NAS may indicate whether the CE mode B is restricted for the UE supporting CE mode B.  For E-UTRA if the UE supports E-UTRA connected to 5GC, NAS indicates the CN type to be used for the selected cell. | Perform measurements needed to support cell selection.  Detect and synchronise to a broadcast channel. Receive and handle broadcast information. Forward NAS system information to NAS.  Search for a suitable cell. The cells broadcast one or more 'PLMN identity' in the system information. Respond to NAS whether such cell is found or not.  If associated RATs is (are) set for the PLMN, perform the search in this (these) RAT(s) and other RATs for that PLMN as specified in TS 23.122 [5].  If such a cell is found, the cell is selected to camp on.  For E-UTRA if the UE supports E-UTRA connected to 5GC, AS reports the CN type(s) for which the selected cell is suitable to NAS. | | Cell  Reselection | Control cell reselection by for example, maintaining lists of forbidden registration areas.  Maintain a list of equivalent PLMN identities and provide the list to AS.  Maintain a list of forbidden registration areas and provide the list to AS.  Maintain a list of CSG IDs and their associated PLMN ID on which the UE is allowed (CSG whitelist) to camp and provide the list to AS.  For E-UTRA if the UE supports E-UTRA connected to 5GC, NAS indicates the CN type to be used for the selected cell. | Perform measurements needed to support cell reselection.  Detect and synchronise to a broadcast channel. Receive and handle broadcast information. Forward NAS system information to NAS.  Change cell if a more suitable cell is found.  For E-UTRA if the UE supports E-UTRA connected to 5GC, the UE reports the CN type(s) for which the selected cell is suitable to NAS. | | Location registration | Register the UE as active after power on.  Register the UE's presence in a registration area, for instance regularly or when entering a new tracking area.  Maintain lists of forbidden registration areas.  Deregister UE when shutting down.  Control and restrict location registration for a UE in eCall only mode. | Report registration area information to NAS. | | Support for manual CSG selection | Provide request to search for available CSGs.  Evaluate reports of available CSGs from AS for CSG selection.  Select a CSG and request AS to select a cell belonging to this CSG. | Search for cells with a CSG ID.  Read the HNB name from BCCH on SIB9 if a cell with a CSG ID is found.  Report CSG ID of the found cell broadcasting a CSG ID together with the HNB name and PLMN(s) to NAS.  On selection of a CSG by NAS, select any cell belonging to the selected CSG fulfilling the cell selection criteria and not barred or reserved for operator use for UEs not belonging to AC 11 or 15 and give an indication to NAS that access is possible (for the registration procedure). | | RAN Notification Area Update | Not applicable | Register the UE's presence in a RAN-based notification area, periodically or when entering a new RAN-based notification area. |   Table 4.2-1: Functional division between AS and NAS in idle mode |

**Question 12**: Do you agree with the changes proposed above for 38.304 and 36.304? Please provide detailed comments if any.

|  |  |  |
| --- | --- | --- |
| **Company** | **Answer** | **Comments** |
| Ericson | Yes |  |
| CATT | Yes |  |
| OPPO | Yes |  |

## 2.9 Reserved for operator use

[R2-2201552](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs//R2-2201552.zip) states that it is clarified in 38.304 that the UE shall treat a cell as barred if it is "reserved for operator use", if the UE is assigned to Access Identity 0,1,2 and 12 to 14. It is proposed to extend this to also apply for Access Identity 3. A text proposal is provided:

|  |
| --- |
| 5.3.1 Cell status and cell reservations Cell status and cell reservations are indicated in the *MIB or SIB1* message as specified in TS 38.331 [3] by means of following fields:  - *cellBarred* (IE type: "barred" or "not barred")  Indicated in *MIB* message. In case of multiple PLMNs or NPNs indicated in *SIB1*, this field is common for all PLMNs and NPNs  - *cellReservedForOperatorUse* (IE type: "reserved" or "not reserved")  Indicated in *SIB1* message*.* In case of multiple PLMNs or NPNs indicated in *SIB1*, this field is specified per PLMN or per SNPN.  - *cellReservedForOtherUse* (IE type: "true")  Indicated in *SIB1* message. In case of multiple PLMNs indicated in *SIB1*, this field is common for all PLMNs.  *- cellReservedForFutureUse* (IE type: "true")  Indicated in *SIB1* message. In case of multiple PLMNs or NPNs indicated in *SIB1*, this field is common for all PLMNs and NPNs.  NOTE 0: IAB-MT ignores the *cellBarred*, *cellReservedForOperatorUse, cellReservedForFutureUse* and *intraFreqReselection* (i.e. treats *intraFreqReselection* as if it was set to *allowed*) as defined in TS 38.331 [3]. IAB-MT also ignores *cellReservedForOtherUse* for cell barring determination (i.e. NPN capable IAB-MT considers *cellReservedForOtherUse* for determination of an NPN-only cell) as defined in TS 38.331 [3].  - *iab-Support* (IE type: "true") Indicated in *SIB1* message. In case of multiple PLMNs or NPNs indicated in *SIB1*, this field is specified per PLMN or per SNPN.  When cell status is indicated as "not barred" and "not reserved" for operator use and not "true" for other use and not "true" for future use,  - All UEs shall treat this cell as candidate during the cell selection and cell reselection procedures.  When cell broadcasts any CAG-IDs or NIDs and the cell status is indicated as "not barred" and "not reserved" for operator use and "true" for other use, and not "true" for future use:  - All NPN-capable UEs shall treat this cell as candidate during the cell selection and cell reselection procedures, other UEs shall treat this cell as if cell status is "barred".  When cell status is indicated as "true" for other use, and either cell does not broadcast any CAG-IDs or NIDs or does not broadcast any CAG-IDs and the UE is not operating in SNPN Access Mode,  - The UE shall treat this cell as if cell status is "barred".  When cell status is indicated as "true" for future use,  - The UE shall treat this cell as if cell status is "barred".  When cell status is indicated as "not barred" and "reserved" for operator use for any PLMN/SNPN and not "true" for other use and not "true" for future use,  - UEs assigned to Access Identity 11 or 15 operating in their HPLMN/EHPLMN shall treat this cell as candidate during the cell selection and reselection procedures if the field *cellReservedForOperatorUse* for that PLMN set to "reserved".  - UEs assigned to Access Identity 11 or 15 shall treat this cell as candidate during the cell selection and reselection procedures if the field *cellReservedForOperatorUse* for selected/registered SNPN is set to "reserved".  - UEs assigned to an Access Identity 0, 1, 2, 3 and 12 to 14 shall behave as if the cell status is "barred" in case the cell is "reserved for operator use" for the registered PLMN/SNPN or the selected PLMN/SNPN.  NOTE 1: Access Identities 11, 15 are only valid for use in the HPLMN/ EHPLMN; Access Identities 12, 13, 14 are only valid for use in the home country as specified in TS 22.261 [12]. |

**Question 13**: Do you agree with the intention of the above? If so, do you agree with the text proposal?

|  |  |  |
| --- | --- | --- |
| **Company** | **Answer** | **Comments** |
| Ericsson | Yes | Yes |
| CATT | Yes |  |
| OPPO | Yes |  |

## 2.10 Open issues for 306

[R2-2201552](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs//R2-2201552.zip) and [R2-2201141](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs//R2-2201141.zip) discusses impact of MINT to 36.306 and 38.306. Both identify that the AS functionality for MINT is acquisition of disaster related information in SIB and UAC based on Access Identity 3.

[R2-2201552](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs//R2-2201552.zip) proposes to capture the above MINT functionality as an optional feature without UE radio access capability parameters. The text proposal for this is as follows:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 5 Optional features without UE radio access capability parameters[...]5.4 Other features  | Definitions for feature | | --- | | **Segmentation for UE capability information**  It is optional for UE to support segmentation of *UECapabilityInformation* as specified in TS 38.331 [9]. | | **eCall over IMS**  It is optional for UE to support eCall over IMS as specified in TS 38.331 [9]. | | **Access Category 1 selection assistance information enhancement**  It is optional for UE that is configured for delay tolerant service to support Access Category 1 selection assistance information enhancement, according to *uac-AC1-SelectAssistInfo-r16* as specified in TS 38.331 [9]. | | **Random access prioritization for MPS and MCS**  It is optional for UE that is configured for MPS or MCS to support random access prioritization for Access Identity 1 or 2 as specified in TS 38.321 [8]. | | **Minimization of service interruption**  It is optional for UE to support minimization of service interruption including reporting to NAS of disaster roaming information for available PLMNs and Access Barring check for Access Identity 3. | |

[R2-2201141](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs//R2-2201141.zip) proposes to capture the above functionality as a conditionally mandatory feature, namely that it is mandatory to support UAC access barring check for Access Identity 3 and acquisition of broadcast disaster related information as specified in TS 38.331 [9] for UEs supporting MINT. The text proposal for this is as follows:

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 6 Conditionally mandatory features without UE radio access capability parameters  | Features | Condition | | --- | --- | | Skipping UL configured grant if no data to transmit. | Either *configuredUL-GrantType1* or *configuredUL-GrantType2* is supported. | | Downlink SDAP header | Either NAS reflective QoS or *as-ReflectiveQoS* is supported. | | IMS emergency call | It is mandatory to support IMS emergency call for UEs which are IMS voice capable in NR. | | MAC subheaders with one-octet eLCID field | It is mandatory to support MAC subheaders with one-octet eLCID field for UEs/IAB-MTs supporting MAC CEs using extended LCID values as specified in TS 38.321 [8]. | | Minimization of service interruption | It is mandatory to support UAC access barring check for Access Identity 3 and acquisition of broadcast disaster related information as specified in TS 38.331 [9] for UEs supporting MINT. | |

**Question 14**: Which alternative should be used to capture MINT in the 306 specs?

1. Under "Optional features without UE radio access capability parameters"
2. Under "Conditionally mandatory features without UE radio access capability parameters"

|  |  |  |
| --- | --- | --- |
| **Company** | **Answer** | **Comments** |
| Ericsson | 1 | There is no big difference. The reason we proposed to capture this as an "*Optional features without UE radio access capability parameters*" is that the MINT UAC-handling and disaster roaming info handling is AS functionality.  That all MINT UEs shall implement this AS functionatlity is clear since it does not work without it. One could argue that it is important that the UE does not skip implementing the MINT UAC handling, but since the MINT UAC handling is captured together with the disaster roaming info handling, it is clear that these two parts comes as a bundle.  But again, there is no big difference between the two. |
| CATT | 1 | No strong view and slightly alternative 1. Can follow the majority’s view. |
| OPPO | 1 | Same view as Ericsson. |

**Question 15**: If Alternative 1 is adopted, do you have any detailed comments on the corresponding text proposal?

|  |  |
| --- | --- |
| **Company** | **Comments on Text proposal for Alternative 1** |
|  |  |
|  |  |
|  |  |

**Question 16**: If Alternative 2 is adopted, do you have any detailed comments on the corresponding text proposal?

|  |  |
| --- | --- |
| **Company** | **Comments on Text proposal for Alternative 2** |
| Ericsson | A reference to what "MINT" is would be needed. |
|  |  |
|  |  |

## 2.11 Stage-2 descriptions

A stage-2 description of MINT for 38.300 is proposed in [R2-2201552](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs//R2-2201552.zip) as follows:

|  |
| --- |
| 2 References The following documents contain provisions which, through reference in this text, constitute provisions of the present document.  - References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.  - For a specific reference, subsequent revisions do not apply.  - For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.  ...  [3] 3GPP TS 23.501: "System Architecture for the 5G System; Stage 2".  ...  [x] 3GPP TS 23.122: "Non-Access-Stratum (NAS) functions related to Mobile Station (MS) in idle mode". 16.5 Emergency Services...16.5.x Minimization of Service Interruption In case of a disaster, a radio access network can experience outage, which can result in that UEs belonging to the network experience service interruptions. For this scenario, another network not affected by the disaster, which during non-disaster situations is considered by the UEs as a forbidden network, can allow roaming of the UEs belonging to the network experiencing such disaster service interruptions. Such roaming is referred to as disaster roaming. This is further described in sub-clause 5.40 of TS 23.501 [3] and 3.10 of TS 23.122 [x].  To allow such disaster roaming, a cell can broadcast a list of PLMNs with disaster conditions for which disaster roaming is offered.  Further, to be able to control the load that disaster roaming UEs put on a cell, the cell can broadcast access control parameters applicable specifically for disaster roaming UEs, which for example can be set so that access attempts of disaster roaming UEs are more likely to be barred compared to non-disaster roaming UEs. |

**Question 17**: Do you have any comments on the text LTE stage-2 text proposal above:

|  |  |
| --- | --- |
| **Company** | **Comments** |
|  |  |
|  |  |
|  |  |

And similarly, a stage-2 description of MINT for 36.300 is proposed as follows:

|  |
| --- |
| 2 References The following documents contain provisions which, through reference in this text, constitute provisions of the present document.  - References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.  - For a specific reference, subsequent revisions do not apply.  - For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.  ...  [82] 3GPP TS 23.501: "System Architecture for the 5G System; Stage 2".  ...  [x] 3GPP TS 23.122: "Non-Access-Stratum (NAS) functions related to Mobile Station (MS) in idle mode" 23 Others...23.x Minimization of Service Interruption In case of a disaster, a radio access network can experience outage, which can result in that UEs belonging to the network experience service interruptions. For this scenario, another network not affected by the disaster, which during non-disaster situations is considered by the UEs as a forbidden network, can allow roaming of the UEs belonging to the network experiencing such disaster service interruptions. Such roaming is referred to as disaster roaming. This is further described in sub-clause 5.40 of TS 23.501 [82] and 3.10 of TS 23.122 [x].  To allow such disaster roaming, a cell can broadcast a list of PLMNs with disaster conditions for which disaster roaming is offered.  Further, to be able to control the load that disaster roaming UEs put on a cell, the cell can broadcast access control parameters applicable specifically for disaster roaming UEs, which for example can be set so that access attempts of disaster roaming UEs are more likely to be barred compared to non-disaster roaming UEs. |

**Question 18**: Do you have any comments on the text LTE stage-2 text proposal above:

|  |  |
| --- | --- |
| **Company** | **Comments** |
|  |  |
|  |  |
|  |  |

## 2.12 Terminology

[R2-2201141](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs//R2-2201141.zip) identified misalignment between the current running CR and the terminology used in CT1. It is proposed to align the terminology as far as possible, and the following examples of CT1 terms are provided, which should be applied as much as possible.

* Disaster Condition
* Disaster Inbound Roamer
* Disaster Roaming
* PLMN with Disaster Condition
* PLMN without Disaster Condition
* PLMN that provides Disaster Roaming service

**Question 19**: Do you agree to align the terminology as suggested in [R2-2201141](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs//R2-2201141.zip)?

|  |  |  |
| --- | --- | --- |
| **Company** | **Answer** | **Comments** |
| Ericsson | Yes | This is easiest handled during drafting of the CRs. |
| CATT | Yes | It’s reasonable. |
|  |  |  |

## 2.13 Remaining open issues

Below companies are encouraged to list remaining open issues. Meaning open issues which are not addressed in this offline discussion.

**Question 20**: Do you foresee any other open issue for MINT?

|  |  |
| --- | --- |
| **Company** | **Comments** |
|  |  |
|  |  |
|  |  |

# 3 Conclusion (TODO)

Based on the discussion above we propose:

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