3GPP TSG-RAN WG2 Meeting #126 R2-240xxxx

Fukuoka, Japan, May 20-24th, 2024

**[POST125bis][019][Emergency Calls] Common solution (Lenovo)**

**Intended outcome: Discuss need for a common solution and possible solutions for a common framework**

**Deadline: two weeks**

**Please fill in the below table:**

|  |  |
| --- | --- |
| **Contact person – Company** | **Email** |
| Prateek – Lenovo | pmallick@lenovo.com |
| **Naveen – Apple** | **naveen.palle@apple.com** |
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**Phase 1**: Deadline 29th April UTC 22:00

**Phase 2**: Depending on the outcome of the Phase 1, input for Phase 2 shall be made available until May 1st: Deadline for Phase 2: May 3rd, 2024.

**Discussion**

When cell status "barred" is indicated or to be treated as if the cell status is "barred", as specified in Ch. 5.3.1 of 38.304, the UE is not permitted to select/reselect this cell, not even for emergency calls. Some wireless features are introduced (in Rel. 17, 18) which allow access only for UEs supporting that feature, barring access to all other UEs. This prohibits emergency calls for non-feature UEs, which is unfortunate if both the UE and the network are otherwise capable of supporting an emergency call or public safety service. To enable emergency support, REDCAP CRs were endorsed in the Changsha meeting and the problem is similar for NES feature:

NES feature in Rel. 18 allows cell access only for UEs supporting NES feature. In such a case not only legacy UEs (that obviously do not support this new feature) but also new UEs (specified/ developed according to the same 3GPP release as for the new feature) would not be able to access the cell. These UEs are barred using the *cellBarred* IE included in the Master Information Block (MIB). This prohibits the emergency call establishment from these UEs. This could be detrimental and unfortunate since the cell, even if supporting the new feature, may still be capable for supporting emergency calls. For example, for NES (Network Energy Saving), the network must listen to the PRACH occasions configured in the cell, as in previous releases. Besides this, once the gNB recognizes there is an emergency call or public safety related service (e.g., MPS or MCS), the network should ensure that there is no impact to that service (e.g., it may release or deactivate cell DTX/DRX configuration). So, it would be unfortunate if non-NES UEs (i.e., legacy UEs not supporting NES feature or release 18 UEs not supporting NES feature) can’t make an emergency call while the network is equipped to support it**.**

We can introduce a feature specific barring-exempt bit for each feature in addition to the ones in the endorsed REDCAP CRs, but this email discussion aims for finding a common solution for supporting emergency calls in feature specific scenarios/ cells. This will relieve the SIB1 signalling load, keep our specification lighter e.g., needing less text in 38.331 and 38.304 and simplify UE implementation/ testing efforts. If the common solution is generic enough it may also take care of new features coming in Rel. 19 onwards. However, one may argue that this comes at a price of reduced network control e.g., if network would only want to allow emergency calls for non-NES UEs but not for say REDCAP UEs (or vice-versa). Given the principle that emergency calls should/ must be supported until these can’t be e.g., due to real cell maintenance, the extra operator control for supporting emergency calls appears to be overkill/ un-necessary in rapporteur’s opinion.

**Q1: Would your company support a common solution for supporting emergency calls in feature specific scenarios/ cells?**

Table 1

|  |  |  |
| --- | --- | --- |
| Company name | Yes (=common solution); No (=feature specific) | Comments |
| Apple | Yes | Common solution without new SIB1 signalling. As mentioned online, when a feature (Rel-18 or later) is introduced and if this feature brings in barring for UEs which do not support this feature, we can evaluate if UEs which do not support this feature are allowed to make EM calls. If we allow (if it is technically possible to make EM calls even when the UE does not support this feature), then we should strive for allowing EM calls by default. Meaning the introduction of the feature for a release also includes the support of this by default without any new SIB signalling.  Rapp> Let’s think of a new feature ‘X’. A cell supporting this feature may not provide service (not even EM calls) to UEs not capable of ‘X’. This can then lead to problem if a non-X-UE assumes that it will receive limited service (and be able to make EM calls) but indeed a cell supports UEs only with the new implemented feature X. Basically, there’s no way to signal that EM calls are not possible (we intend to bypass the MIB barring bit in R18). |
| Vodafone | Yes | I also agree that in general we should design a common behavior for the treatment of emergency calls without the impact of SIB1. Please consider that SIB1 is the main SIB and any additional bits are costly and shall not be introduced if other solutions can be found. |
| TMUS | Yes | We believe allow emergency calls for everything except when the cell is barred in MIB or IMS emergency call isn’t supported |

Assuming RAN2 is willing to find a common solution for supporting emergency calls, following options are possible.

**Option A: Reuse one of the existing feature specific barring bits broadcasted in SIB1 and repurpose this to have a common meaning.**

To explain we can take following example:

Ex) One can repurpose ‘*cellBarred-eRedCap1Rx*’ bit and say that not only eREDCAP UEs but any other e.g., even NES UEs (and any other UE barred otherwise) can camp in limited service and therefore consider this cell as “acceptable”, when this bit is set to “not barred”. Of course, RAN2 may decide to use another bit e.g., ‘*cellBarredNES’* or something else.

Some initial Pros-Cons analysis is done here for this option. Kindly keep adding to the table:

Table 2

|  |  |
| --- | --- |
| Pros | Cons |
| Rapp: No ASN.1 impact. | Rapp: Can confuse the feature specific UEs. For example, if RAN2 decides to use ‘*cellBarredNES’,* then in cells where NES isnot intended to be supported, NES UEs will wrongly assume that this is a NES-only cell. This is not a big issue for the said example (as NES UEs can easily survive in “normal” cells) but will be quite problematic if ‘*cellBarred-eRedCap1Rx*’ bit is used for the said purpose and a cell does not indeed support ‘*cellBarred-eRedCap1Rx*’ UEs. Even reuse of ‘*cellBarredNES’* could be seen as problem if NES UEs find every cell as NES, it could have future repercussions. |
|  | Apple: Assuming we are talking about Rel-18 bits for re-purposing, we are not in favor of this. The barring bits are set specific to the feature, and it’s better to leave them as is (for eg, which R18 feature would we use to generalize..?). And we also like to point out, we have R17 barring bits – *cellBarredRedCap1Rx* for eg, where this anyway won’t be possible.  Rapp> The intention is to have R17 question in the phase 2 once we know which solution direction is preferred for R18. |
|  | Vodafone: I would also not like to re-propose existing bits, but e.g. in case of NES for the Rel 18 UEs, the structure could be: If MIB indicates that the cell is barred and the SIB1 indicates that NES is supported, the Rel 18 UEs could declare the cell as acceptable.. Probably we can also target release 19 for a common solution…We have only 3 features for rel 18 (NES, 2Rx XR UEs and (e)redcap and to realize exceptions for emergency, I think no more bits are needed above what we already discussed |
|  | TMUS: We believe we should not mess up the MIB Bar with exception for NES or any other feature, Bar in MIB means no access to the cell for all, even the emergency call. The feature level bar should be at SIB1 level. |

**Q2: Do you think Option A works, and is this your preferred (P), acceptable (A), not-preferred (N-P) solution?**

|  |  |  |
| --- | --- | --- |
| Company name | P/ A/ N-P | Comments |
| Apple | N-P | We think there are even simpler ways. |
| Vodafone | N-P |  |
| TMUS | N-P |  |
|  |  |  |

**Option B: Agree to a general principle that if cell allows access for any feature (from a subset of features), it supports emergency calls.**

To explain, if the cell allows camping of any (feature-specific) UE, the emergency call for all UEs is supported on the cell. This will mean if one or more of the specific barring bits in SIB1 is set to “not barred”, a UE can camp in limited service and therefore consider this cell as “acceptable”. The said bits are already listed in Ch. 5.3.1 (and of course defined in SIB1) e.g., *cellBarredATG, cellBarred-eRedCap1Rx, cellBarred-eRedCap2Rx, cellBarredNES etc.* Please note that some bits may not be used for this purpose e.g., *cellBarredNTN* as this requires the UE to be NTN capable, and also *cellReservedForOperatorUse/* *cellReservedForOtherUse/ cellReservedForFutureUse* etc. is better left untouched. For the remaining bits (*halfDuplexRedCapAllowed, iab-Support, ncr-Support, mobileIAB-Support*) some further discussion in RAN2 may be needed to decide if these can be included in the said subset of features.

Some initial Pros-Cons analysis is done here for this option. Kindly keep adding to the table:

Table 3

|  |  |
| --- | --- |
| Pros | Cons |
| Rapp: No ASN.1 impact. | Rapp: This option works and sounds very good in principle (“allow one – allow all for emergency”) but maintenance (of the subset of features) could be an issue in future. For example, a R18 UE implementing this common-emergency solution might consider itself barred even for emergency calls if a new feature restriction introduced on R19/ R20 restricting access for that future-specific UEs is used. Some companies may wish to downplay this risk assuming 5G is nearing its term.  [Apple] could the rapp explain the usecase a bit more for the R19/R20? If we generalize in R18, then future introductions can add a bit if a restriction needs to be introduced…? For eg, if in Rel-18 feature X allows “all” UEs to use this cell for EM call, and in Rel-19 we have feature Y where we do not allow, then we could add UEs supporting feature Y need to check an additional SIB1 R19 bit to consider this cell for EM call?  Rapp> I think it is not the Feature Y UEs that will face issues but rather say R18 UEs will not see the “feature Y” in the subset list we would define today to exempt EM calls. The “subset of features” can’t be retrospectively updates for the “legacy UEs” of a feature release. |
| Apple: This to us to the better solutions among all discussed. No new feature is to be introduced, and any UEs and NWs implementing R18 are expected to implement this – no NBC. This even allows for compatibility in older release UEs (if they chose to implement it – meaning the CRs can have the magic sentence). | Apple – do not see any, except that R17 or lower release UEs cannot use this unless they implement the R18 CR. |
| Vodafone | I am not sure I understand the explanation by the rapporteur as today in my view we have 3 cases:  1Rx/2Rx (e)redcap: In this case the emergency is allowed:   * MIB indicates: not barred * SIB1 indicates barred for 1rx/2rx (e)redcap   2Rx XR UEs: In this case the emergency is allowed:   * MIB indicates: not barred * SIB1 indicates barred 2Rx XR UE   Rel 18 UEs without a support of NES can make an emergency call in the cell supporting NES if:   * MIB indicates: barred * SIB1 indicates NES support   The general principle is ok, but not sure if we have to introduce it from rel 18.  Rapp> The aim of the Option B is to say that EM calls for any/ all UEs are allowed as long as the cell is not barring at least one type of UE/ feature. This logic basically ensures that cell is genuinely not down/ under maintenance, and therefore support EM calls. The actual implementation of “cell is not barring at least one type of UE/ feature” will need to create a list out of the bits already listed in Ch. 5.3.1 and as I tried to explain above, not every bit can be used here and therefore this concept of “subset bit/ feature” may need to be used. |
| TMUS: Agree with Apple  Also we believe the Option B should be more clear: “**Option B: Agree to a general principle that allow emergency calls for everything except when the cell is barred in MIB or IMS emergency call isn’t supported”; IMS emergency support is missing from current statement.** |  |

**Q3: Do you think Option B works, and is this your preferred (P), acceptable (A), not-preferred (N-P) solution?**

|  |  |  |
| --- | --- | --- |
| Company name | P/ A/ N-P | Comments |
| Apple | P | Pls see comments above.  In addition, our intention is to capture in 38.304 as below for acceptable cell behavior (where every new feature that has this applicability will add entry below following redcap logic)   * If the cell MIB is not barred, but redcap is barred, and allowEMCallforRedCap bit is set, consider this as acceptable cell * If the cell MIB is *barred*, but cellBarredNES is set to *notBarred*, consider this as acceptable cell * If the cell MIB is not *barred*, but Rel-18 feature X is *barred*, consider this as acceptable cell * If the cell MIB is not *barred*, but Rel-19 feature A is *barred*, consider this as acceptable cell   The logic for each entry would depend on how the feature filters UEs. For eg., NES bars all and allow supporting UEs, while RedCap allows all and bars particular type of RedCap UEs. We can fit the logic based on feature.  To us this should not bring in any issues with Rel-19/Rel-20 introductions. Could the rapp explain the usecase where there will be issues?  Rapp> Is there a way R19 cell supporting only feature A can signal R18 UE that EM Calls are supported? |
| Vodafone | P | For me the general principle could be:  If MIB is not barred, but individual feature is barred, consider this cell as acceptable.  In general, if MIB is barred, then all UEs are barred with the exception of NES..  Rapp> This works as long as we will not have another NES-like feature in R19/ later requiring cell barring for all except *that-feature-UEs*. |
| TMUS | P | We believe if Barred in MIB, all UE should be barred, even for NES UE. |

**Option C: Use of ‘*ims-EmergencySupport*’ to allow cell camping for UEs to obtain limited services.**

The bit was intended to support emergency calls in rel. 15 for roaming UEs that can’t register itself to obtain normal services. Now RAN2 needs to think if this bit can be repurposed without distorting its original meaning and without causing inter-operability issues e.g., what happens when a new UE implementing repurposed ‘*ims-EmergencySupport*’ initiates emergency call in an older release (say R15) network. Is it a problem to allow emergency call to registered UEs (which consider the cell as barred due to MIB *cellBarred* set to ‘*barred’*) when allowing limited service to roaming UEs (‘*ims-EmergencySupport*’ set to ‘true’)? A new release network will set the ‘*ims-EmergencySupport*’ set consciously to ‘true’ to allow emergency call (or not) i.e., to roaming UEs and non-feature UEs. If the network does not want this since it wants to really bar the cell e.g., for maintenance purpose it may set MIB *cellBarred* to ‘*barred’* and not broadcast‘*ims-EmergencySupport*’. So, still providing full control to the network operator.

The field description of this IE says the following:

***ims-EmergencySupport***

Indicates whether the cell supports IMS emergency bearer services **for UEs in limited service mode**. If absent, IMS emergency call is not supported by the network in the cell for UEs in limited service mode.

Therefore, it is sufficient to allow the non-feature UEs which are otherwise barred in the cell to treat the cell as acceptable cell when *ims-EmergencySupport* is ‘true’. This can be achieved as an example with the following change only:

|  |
| --- |
| 4.5 Cell Categories  The cells are categorised according to which services they offer:  **acceptable cell:**  An "acceptable cell" is a cell on which the UE may camp to obtain limited service (originate emergency calls and receive ETWS and CMAS notifications). Such a cell shall fulfil the following requirements, which is the minimum set of requirements to initiate an emergency call and to receive ETWS and CMAS notification in an NR network:  - The cell is not barred, see clause 5.3.1 or *ims-EmergencySupport* is broadcasted.  - The cell selection criteria are fulfilled, see clause 5.2.3.2. |

The TS 38.304 already ensures that UEs select such a cell only when there’s no other cell available as specified in Ch. 5.2.8 (Camped on Any Cell state).

Some initial Pros-Cons analysis is done here for this option. Kindly keep adding to the table:

Table 4

|  |  |
| --- | --- |
| Pros | Cons |
| Rapp: No ASN.1 impact. | Rapp: Likely only “notional” issues in reusing an old bit? |
| Rapp: No dependency on future/ current list of feature specific cell/ scenario. |  |
| Apple: we do not see any ☺ | Apple: introduces NBC risk at RAN and CN!  Also we wonder on why a new bit or reuse an old bit is needed if we agree that all R18 and future releases are assumed to allow EM calls (where the needed conditions exist). |
|  |  |

**Q4: Do you think Option C works, and is this your preferred (P), acceptable (A), not-preferred (N-P) solution?**

|  |  |  |
| --- | --- | --- |
| Company name | P/ A/ N-P | Comments |
| Apple | N-P | Pls see above. |
| Vodafone | N-P |  |
| TMUS | N-P |  |

**Option D: We introduce a new bit in SIB1 to explicitly (dis)allow a non-feature UE to consider the cell as acceptable.**

Some initial Pros-Cons analysis is done here for this option. Kindly keep adding to the table:

Table 5

|  |  |
| --- | --- |
| Pros | Cons |
| Rapp: Clean, generic.  Forward compatibility.  No inter-operability issues: Old UEs in new network will not see/ use this and new UEs in old network can’t make emergency when MIB barring is used but no new issues crop-up. | Rapp: ASN.1 change at this late stage of R18. |
| Apple, same view on pros as Rapp mentioned. | Apple: our 2nd preferred option, but it unnessarily increases SIB1 bits. |
| Vodafone | We do not like to introduce new SIB1 IEs  Rapp> Do you consider this still ‘A’ assuming this is forward compatible; or rather ‘N-P’? |
| TMUS: We believe ims-EmergencySupport  should set to supported, otherwise voice centric device will keep trying to find another cell even this might be the only available cell and cause emergency call fail to establish at the cell. |  |

**Q5: Do you think Option D works, and is this your preferred (P), acceptable (A), not-preferred (N-P) solution?**

|  |  |  |
| --- | --- | --- |
| Company name | P/ A/ N-P | Comments |
| Apple | A |  |
|  |  |  |
| TMUS | A |  |

**Option E: Any other option?**

[Apple] Well, there is a variant of option C – where instead of using *ims-EmergencySupport* we can create a new Rel-18 SIB1 field (for eg *cellBarredEmergencySupport-r18*) and this applies to **all** Rel-18 and future releases. We do not prefer this and also do not want to “overload” RedCap EM support bit ☺ .

**Conclusion**

**References:**

1. [R2-2402903](file:///C:\Users\panidx\OneDrive%20-%20InterDigital%20Communications,%20Inc\Documents\3GPP%20RAN\TSGR2_125bis\Docs\R2-2402903.zip) Introduction of barring exemption for RedCap UEs for emergency calls [RedCap\_EM\_Call] Apple, China Telecom, Vodafone, Verizon, TMobile USA, ZTE, Vivo, Ericsson CR Rel-18 38.304 18.1.0 0380 2 B TEI18 [R2-2400931](file:///C:\Users\panidx\OneDrive%20-%20InterDigital%20Communications,%20Inc\Documents\3GPP%20RAN\TSGR2_125bis\Docs\R2-2400931.zip)
2. [R2-2403472](file:///C:\Users\panidx\OneDrive%20-%20InterDigital%20Communications,%20Inc\Documents\3GPP%20RAN\TSGR2_125bis\Docs\R2-2403472.zip) Introduction of barring exemption for eRedCap UEs for emergency calls [RedCap\_EM\_Call] Apple, China Telecom, Vodafone, Verizon, TMobile USA, ZTE, Vivo, Ericsson CR Rel-18 38.304 18.1.0 0381 2 B TEI18 [R2-2403141](file:///C:\Users\panidx\OneDrive%20-%20InterDigital%20Communications,%20Inc\Documents\3GPP%20RAN\TSGR2_125bis\Docs\R2-2403141.zip)
3. [R2-2402902](file:///C:\Users\panidx\OneDrive%20-%20InterDigital%20Communications,%20Inc\Documents\3GPP%20RAN\TSGR2_125bis\Docs\R2-2402902.zip) Introduction of barring exemption for RedCap UEs for emergency calls [RedCap\_EM\_Call] Apple, China Telecom, Vodafone, Verizon, TMobile USA, ZTE, Vivo, Ericsson CR Rel-18 38.331 18.1.0 4570 1 B TEI18 [R2-2400930](file:///C:\Users\panidx\OneDrive%20-%20InterDigital%20Communications,%20Inc\Documents\3GPP%20RAN\TSGR2_125bis\Docs\R2-2400930.zip)
4. [R2-2402904](file:///C:\Users\panidx\OneDrive%20-%20InterDigital%20Communications,%20Inc\Documents\3GPP%20RAN\TSGR2_125bis\Docs\R2-2402904.zip) Introduction of barring exemption for eRedCap UEs for emergency calls Apple, China Telecom, Vodafone, Verizon, TMobile USA, ZTE, Vivo, Ericsson CR Rel-18 38.331 18.1.0 4571 1 B TEI18 [R2-2400932](file:///C:\Users\panidx\OneDrive%20-%20InterDigital%20Communications,%20Inc\Documents\3GPP%20RAN\TSGR2_125bis\Docs\R2-2400932.zip)
5. [R2-2403000](file:///C:\Users\panidx\OneDrive%20-%20InterDigital%20Communications,%20Inc\Documents\3GPP%20RAN\TSGR2_125bis\Docs\R2-2403000.zip) Emergency Call in Feature specific cells Lenovo discussion