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:**

|  |  |
| --- | --- |
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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.

The email discussion was conducted in two phases.

# Phase 1

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 featurze), 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).  [Apple2] If the feature ‘X’ is such that any non-X UEs are not allowed even for emergency calls, then in our view, ‘X’ should follow a bit like NES (not all of it), MIB should be set to barred for cells that support ‘X’ and ‘X’-supporting UEs would check for a SIB1 bit allowing such UEs. In such a case, any Rel-18 or lower UEs would naturally bar the cell (even for EM calls).  **[Rapp2]: The current exercise to enable EM Calls for all possible cases, still under network control i.e., not in a “default” way.** |
| 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 |
| Nokia | It is not clear to us what is meant by common solution. Common barring-exempt bit, or feature specific barring-exempt bit or no barring -exempt bit? | RAN2 has already agreed RedCap specific barring-exempt bit for emergency call. It would be logical to use barring-exempt bit for other features as well. We are ok to use same barring-exempt bit for all the features or feature specific barring-exempt bits.  **[Rapp2]: “*Common barring-exempt bit, or feature specific barring-exempt bit or no barring -exempt bit*” are all part of solution space. The aim is to enable EM Calls for all possible cases, still under network control. In other words, the aim is to avoid un-necessary prohibition of EM Calls – since that was not the intention while developing these individual features.** |
| vivo | Yes | To avoid introducing individual exempt bit for each feature, a common solution is preferred. |
| ZTE | Yes,  but we would like to clarify what we mean by “common solution” – seems what we are thinking is slightly different to others that said yes. | We think the view from above seems to be to have a common solution but to also avoid SIB1 overhead. So, from this perspective, we think we should actually be able to reuse the “barring-exempt” bit we introduced for RedCap in a general way to indicate barring exemption for any feature that bars the UE for the specific feature (when the UE can otherwise access the cell – i.e. MIB is not set to barred and the UE can in general camp on the cell as acceptable cell).  So, our proposal is to make “barringExemptRedCap” bit as a generic one. E.g: “barringExemptIndication”. We can then reuse this for all features including RedCap, eRedCap and also XR, and any other feature in future.  The advantage of this is that this will not require any new ASN.1 additions. But also, this will mean that we can reuse the same bit for eRedCap which means that we don’t need a separate bit for eRedcap which was introduced at the last meeting (i.e. barringExempt-eRedCap) can be removed there by further reducing the SIB1 overhead (seems this is one of the concerns expressed above).  Also, this gives networks control over other future UEs for emergency calls (i.e. similar argument as RedCap).  **[Rapp2]: The “barringExemptIndication” is the intention behind Option D.**  **[ZTE2]. Okay, in this case, we are okay with option D then. But, may be this is not clear to others too. Some companies said that option D will result in extra overhead (please see below), infact option D will require fewer (just a single bit) – i.e. even fewer than what we currently have (with the separate bit for eRedCap removed).** |
| OPPO | Seems so far the only use case is for NES, so not sure what the other feature(s) are | R2 has agreed barring exempt bit for (e)Redcap, and seems then the only remaining issue is for NES (considering NTN-cell does require NTN functionality to access the network), where we may want to allow non-NES UE to do EM call (NOTE that anyway not feasible for legacy UE before R18).  **[Rapp2]: (e)RedCap, NES, 2XR etc. and hopefully also future features from R19 as well.** |
| Lenovo | Yes | The aim is to not need any(more) Exempt bit, at least not on a per feature basis, as this will load SIB1. |
| Ericsson | Maybe | We should first discuss whether the problem is common for cases mentioned above, i.e., they may be similar but not necessarily common, especially considering the motivation regarding, for example, why barring exempt bit is introduced. For (e)RedCap, there is an explicit indication whether the feature is enabled in the cell. Then RAN2 agreed to introduce barring bits for UEs that support 1Rx/2Rx for the operators to control access even when (e)RedCap feature is enabled in the cell. This was due to a concern that those UEs may have an impact on performance in the cell, not because it was not technically possible for those UEs to operate in the cell.  Now we are discussing whether a similar mechanism should be introduced for NES cells. But this time it is not about performance degradation. It is rather that UEs that do not support NES will not be able to operate in the cell unless NES features are disabled. So barring exemption cannot simply be a solution, at least by itself, e.g., the network may need to know if a UE that does not support NES is trying to access.  **[ZTE2] In this case the MIB is set to be barred I guess. So, a non-NES UE will never access the cell. The common solution is only for the case where the UE can actually access the cell.**  Considering that every new feature RAN2 may introduce that requires barring of legacy UEs, i.e., via MIB, may have different technical reasons, it may not be feasible to introduce a common solution. We think we should first formulate the problem right and consider if there is a need for a (common) solution.  **[ZTE2] The common solution we are talking about is for the case where the UE can access the cell but is barred (for other reasons e.g. fewer antennas etc - same as 2RX/1Rx RedCap, XR 2RX, NES UEs).** |
| BT | Not clear | As VDF, we do not want to introduce any new bit in SIB1. SIB1 is a key for UEs in idle/inactive mode. The fewer bits the UE needs to decode, the better as we had experience problems with that in the past.  It is not clear to us what “common” means. A NES cell DTX/DRX UE skips MIB barring signaling but not a RedCap UE.  If common means reuse RedCap barring exception, we are fine. Currently, we don’t have any RedCap device on field so it should be possible to modify the name from *barringExemptRedCap* to *barringExempt* and reuse it. |

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. |
|  | Nokia: There should be feature specific NW control as agreed in different work items. We do not support changing the meaning of the bits. |
|  | vivo: The repurpose will overwrite the original intention. |
|  | ZTE: The question is a bit unclear to us. As explained above, we donot intend to change the meaning of other bits. |
|  | Ericsson: We do not think we should change/update the interpretation of existing bits. As mentioned in our reply to the first question above, it is not clear to us if the problem is common and if there is a need for a (common) solution. |
|  | **BT**  This will be complex to read as one type of UEs will read SIB1 IE that are not supposed to be for them. In addition, all these values are optional so, e.g., NES UEs will require RedCap implementation to know if an emergency call is allowed when the cell is barred.  We do not support the change |

**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 |  |
| Nokia | N-P |  |
| vivo | N-P |  |
| ZTE | N-P |  |
| Huawei | N-P |  |
| OPPO | N-P |  |
| Lenovo | N-P |  |
| Ericsson | N-P |  |
| BT | 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.  [Apple2] If feature Y is not compatible with R18 and older UEs to the extent that even EM call is not possible, then this feature ‘Y’ should set MIB barred and only allow feature “Y’ supporting UEs with a field in SIB1. Then R18 and legacy UEs are blocked and so we do not run into R18 UEs not seeing feature ‘Y’. Hope we did not misunderstand your intention.  [OPPO] similar concern as Rapp, and so far our understanding is that unless we define an **additional SIB1 R19 bit explicitly**, we cannot solve the issue for feature Y. |
| 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.** |  |
| Nokia | We don’t understand this option. What is meant by that “if cell allows access for any feature“? Does it mean that cell allow access for emergency call for any feature or something else? For RedCap for example 1Rx and 2Rx can be barred, but emergency call can be allowed if barringExemptRedCap is set to “true”.  **[Rapp2]: Essentially, this option means that if there is service provided for any feature UEs, the operator is happy to serve EM Calls for all UEs.** |
| ZTE | Also, a bit unclear to us. Similar confusion as Nokia.  We think in general, EM call can be allowed in the cell as long as the UEs can access the cell and the network allows EM calls to be made even if the cell is barred otherwise. |
|  | [OPPO] And for NES, the issue is that we may want NES-incapable UE (i.e., not the UE supporting feature X) to access the network for EM, so not sure whether the logic holds here. |
|  | Ericsson: The solution is also not clear to us. It should still be possible for the UE to operate in the cell from technical standpoint, otherwise it does not matter whether it is allowed to make an emergency call. |
|  | **BT**  Our understanding of option B is that a RedCap, NES or 2Rx XR UE will be allowed to initiate an emergency call on the cell if at least one of the barring bits (RedCap, NES, 2Rx) is set to not barred.  That implies, it is mandatory for the (e)RedCap, NES cell DTX/DRX and 2Rx XR UEs to read all the SIB1 IE associated with cell barring. |

**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   ZTE: Wouldn’t the NES capable UE treat the cell as suitable in the above case. Why say acceptable cell? It is a bit unclear to us.   * 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?  [Apple2] If R19 feature A does not hinder operation of legacy UEs for EM calls, then R18 EM call should be possible without any explicit signaling from R19 cell which supports feature A…right? I suspect I am missing some specific use-case, request you pls provide the usecase in more detail.  [ZTE] The intention to allow the EM calls is good. But, we think the same logic should apply as the one agreed for RedCap. i.e. reuse the barring exception bit. |
| 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.  **[Rapp2]: That will be dis-allowing EM Calls for non-NES UEs.** |
| Nokia | Not sure |  |
| vivo | P | In general, the feature-specific cell status includes two types, RedCap-like and NES-like. For these two type of features, the common solution for emergency calls can be:   * RedCap-like: Cell is not barred in MIB, feature is barred in SIB1. In this case, if barringExempt-eRedCap is set to “true”, the cell can be considered as supporting emergency call. * NES-like: Cell is barred in MIB, feature is not barred in SIB1. In this case, the cell can be considered as supporting emergency call. |
| ZTE | Not sure | The option is a bit unclear to us… May be an example can help!  **[Rapp2]: Essentially, this option means that if there is service provided for any feature (NES, RedCap….), the operator is happy to serve EM Calls for all UEs, who otherwise do not find normal service (suitable cell) anywhere. Basically, the feature(s) act as “proxy” to configure EM Call support in a cell.**  **However, as mentioned by somebody obviously the *cellBarredNTN* can’t be used as a proxy to allow EM Calls (a TN only UE will not get service on a NTN cell), so there was a need to talk about “subset of features” listed in 5.3.1. of 38.304.**  **It is bit cryptic option but seems my attempts at clarifying this option has not helped so far and people have chosen this option without fully understanding its impact. My apologies at not being clear enough in defining and exemplifying this option.** |
| Huawei | P, but with clarification | **Emergency call is only allowed in case cellbarred MIB is not barred (i.e. UE shall not ignore MIB cellbaring)**  **For R18 eRedCap and other R18 feature (2RX XR UE), we don’t use explicit NW control bit** (revert R18 eRedCap 331 CR [R2-2402904](file:///C:\Users\panidx\OneDrive%20-%20InterDigital%20Communications,%20Inc\Documents\3GPP%20RAN\TSGR2_125bis\Docs\R2-2402904.zip)). It means: If MIB does not bar the UE and ims-EmergencySupport is supported, R18 UE can consider the cell as acceptable cell for emergency call case. |
| OPPO | N-P | This option-B is  **Option B: Agree to a general principle that if cell allows access for any feature (from a subset of features), it supports emergency calls.**  But NES targets at a use case where the UE, which is **incapable of NES, and also no need to be capable of another feature**, it can access the NES-cell for EM call, so **not** align with the intention of option-B |
| Lenovo | N-P | Since the EM calls will need to be depending on the subset of feature bits, an update “subset” will make it NBC in future. |
| Ericsson | Not clear | This option is not clear to us. It seems for those who indicated P does not seem to have the same interpretation for this solution. |
| BT | N-P | For example, any Rel-18, Rel-19 or Rel-20 UEs should be capable to decode Rel-17 cell barring for RedCap as that can be the only bit implemented by the network.  We are introducing an extra complexity totally unnecessary. |

**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). |
|  | Nokia: NW should be able to bar for example RedCap UE emergency call, but allow emergency call for non-RedCap UE. With this solution this would not be possible. |
|  | vivo: This solution just makes the new indication barringExempt-eRedCap useless. |
|  | Ericsson: We do not think this option would work as suggested above without overlooking the functionality this bit was introduced for. Besides it would not provide a flexible enough mechanism, i.e., cell would either be barred for emergency calls for all types of UEs or not.  An “acceptable” cell definition should not be associated with whether *ims-EmergencySupport* is broadcasted regardless of whether the cell is barred.  Yet another aspect is that the solution does not seem to be NBC. |
|  |  |

**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 |  |
| Nokia | N-P |  |
| vivo | N-P |  |
| ZTE | N-P | We need to consult with other groups if we were to repurpose those in this way. Better to not go this way. |
| OPPO | N-P |  |
| Lenovo | A | Not sure if this option has been clearly stated but if operators are fine to support an EM Calls from a registered R18 UE (but otherwise barred) in a R15 network, then this option works without any extra cost. |
| Ericsson | N-P |  |
| BT | 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.**

**[ZTE2] For this option, rather than introduce “a new bit” in SIB1, we would suggest to actually repurpose the RedCap bit for this. The point is that we check whether the UE can access the cell and if so, we have a bit to say whether such UE is allowed to treat the cell as acceptable cell for emergency calls (even if the cell is barred for normal access – e.g. due to fewer number of antennas etc).**

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. |  |
|  | Ericsson: Please see our reply to Q1. |

**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 |  |
| Nokia | N-P | It seems that this would not be needed for non-feature UEs as generally they would have more cells to consider as acceptable cells rather than the feature UEs. |
| vivo | A | If we agree to introduce a common solution, this 1bit for Option D seems duplicated with the new indication barringExempt-eRedCap.  **[ZTE2]: Yes, in this case there is actually no need for having a RedCap or eRedCap specific bit anymore** |
| ZTE | ~~N-P~~  P  (changed to preferred with the clarification from rapporteur) | In general, we think we just need a bit to allow the UE to consider the cell as acceptable (i.e. similar solution as RedCap).  **[Rapp2]: Based on my understanding you actually prefer this option?**  **[ZTE2] Seems so. But just to clarify, we don’t want to actually add any new bits. We actually want to remove the eRedCap bit and reuse the other (currently called “*barringExemptRedCap*” bit for all features)…** |
| Huawei | N-P | See our comment in Q3. |
| OPPO |  | Considering this enhancement is anyway meaningful for R18 UE but not the legacy UE, and also as pointed out by Nokia, non-feature UE (as the main case considered in R18 for NES case) does not require this, it seems not super necessary. |
| Lenovo | P | This is the cleanest solution is also perhaps what ZTE wants, and maybe some other companies when they mentioned converting “barringExemptRedCap” to e.g: “barringExemptIndication”.  **[ZTE2] Okay, changed our preference based on clarification.** |
| Ericsson | N-P | Please see our reply to Q1. |
| BT | N-P |  |

**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 ☺ .

[ZTE]: May be just want to mention here for clarity that our preference is to have general solution where we repurpose the barringExemptRedCap bit as a general indication (i.e. make it like “barringExemptIndication” and to use this for any case where SIB1 is set to barred for UEs that can access the cell otherwise (including NES case). For UEs that cannot access the cell otherwise (i.e if there is an issue with BW/duplexing etc), we need to bar the UEs even for EM calls regardless.

[OPPO] Not sure the issue here is same as for Redcap, where the target UE is the ones supporting specific features (redcap) for which the SIB1 is set to barred, but for NES, the target UE is the ones **not** supporting specific feature (NES) for which the MIB is set barred. So need to clarify whether we are considering a 1-bit solution to allow EM call for MIB-barred case (which seems risky since that lose the feature dependency) or SIB-barred case (yet no other case foreseen in R18 besides Redcap)

**[Rapp2]: I think at least an explicit one bit like ZTE’s “barringExemptIndication” will also help non-NES UEs. The principle will be if the UE considers itself to be barred (due to MIB or SIB1 barring), if the barringExemptIndication is set to True and there’s no suitable cell for the UE, the UE is allowed to camp on this cell to obtain limited service – this is Option D. The option C tries to achieve the same purpose by reusing the existing *ims-EmergencySupport* bit.**

[BT] It seems easier to rename barringExemptRedCap.

# Phase 2

Let’s start with clarifying the aim of the common solution, as:

1. Common solution for EM Calls aims only UEs which are capable of EM Calls “in this cell”. Similar to (e)RedCap endorsed CRs, it will required to be defined how UE determines that UE can make EM calls in the cell under consideration.
2. Common solution aims at enabling EM Calls for EM call capable UEs that are otherwise barred in the cell either due to MIB barring or feature specific SIB1 barring.

Based on the discussion in Phase 1, the most acceptable and working solution seems: **One explicit bit in SIB1 to indicate if cell supports EM calls irrespective of the feature(s) supported in the cell**. This bit will replace (e)RedCap barringExempt-eRedCap bit and therefore does not pose any further signalling load in SIB1. This information is used by a UE capable of EM Calls, barred in the cell and having no suitable cell to camp on.

**Q1: Is an explicit 1-bit indication in SIB1 replacing *barringExempt-eRedCap* bit acceptable to your company? The 1-bit indication in SIB1 is to be used to indicate if cell supports EM calls irrespective of the feature(s) supported in the cell. It is to be used by a UE when it is considered barred in the cell and has no suitable cell to camp on, to obtain limited services.**

|  |  |  |
| --- | --- | --- |
| Company name | Yes/ No | Comments |
| ZTE | Yes,  with some clarifications (please see the comments) | We would like to add that the above should only be the case if the UE can access the cell normally (i.e. there is no issue with supported bandwidth, duplex mode etc) and MIB is not set to barred.  So, to be clear, in this case, we still need all the text below in Red (from the endorsed R2-2402903) which is to check that the UE can access the cell “normally” although it has fewer number of Rx antennas)- the only change is the actual SIB1 bit:  -----------------  When *cellBarredRedCap1Rx* is set to “barred” in SIB1, a RedCap UE that supports only 1Rx branch can consider the cell as acceptable cell, only if cell selection criteria are fulfilled as defined in clause 5.2.3, *cellBarred* in MIB is not set to “barred” and in SIB1, *barringExemptIndication* is set to “true” and, if the RedCap UE supports only half duplex FDD operation, *halfDuplexRedCapAllowed* is set to “true” and, *intraFreqReselectionRedCap* is present in SIB1; or  -----------------  Btw, the turquoise highlighted text above seems to be missing from R2-2402903 (and 3472)?? Shouldn’t this check also be there?? i.e. for the emergency calls for 2RX/1RX to be allowed the cell should support (e)redcap in the first place, right??  Similar text as above can then be reused for eRedcap (with the same “barringExemptIndication” bit and for both 1Rx and 2Rx cases).  Then, for XR we can add similar text too (e.g. as below):  ------------------ proposed text for XR -----  When *cellBarred2RxXR* is included in SIB1, an XR UE that supports only 2Rx branches can consider the cell as acceptable cell, only if cell selection criteria are fulfilled as defined in clause 5.2.3, *cellBarred* in MIB is not set to “barred” and in SIB1, *barringExemptIndication* is set to “true”; or  -----------------  Finally, for NES since the barring is based on MIB, we don’t think we need to do anything. i.e. when the MIB is set to barred and the cellBarredNES is present (note that cellBarredNES being present indicates that cell is actually **not barred**), the NES UE will anyway consider the cell as suitable cell. So, for this case, we don’t think anything is needed for the exemption (since the NES UE can access the cell normally for everything including EM calls).  Btw, an alternative for the above is to allow UEs by default without checking the “*barringExemptIndication*” bit. If the intention is to go this way, it is also fine, but then this should be used for all cases. In this scenario, we still need all the above checks for each feature (to ensure EM calls can be performed in the cell), but without the check for the *barringExemptIndication* bit. |
| Huawei | Partially Yes, but | We still prefer and also seems more supported option B that there is no need of this *barringExemptIndication* bit (also mentioned above by ZTE).  Rapp) It was not clear how the Option B would be implemented, even if many companies liked it…the problem was how to define “subset of features” that will stand good with time i.e., for future features still allow EM calls to past UEs.  If clear majority prefer to introduce on bit control, we can accept to reuse/rename the barringExempt-eRedCap for 1 bit explicit control for R18 features  But, this emergency call should only be used if the cell is not barred due to MIB *cellbarred*. We should not override the MIB cell barring function which has been there since R15 (this is also the principle for the last meeting agreed RedCap CRs.). |
| Apple | No | We have concerns with re-interpreting the Redcap bit. That redcap bit is meant to also allow R17 redcap UEs to utilize the cell for EM calls. It will create confusion and likely corner cases if a single bit will link rel-17 Redcap and all Rel-18 features.  Rapp) The R17 part is the next question and I understand HW point about R17 already on the field.  ZTE2: We need to understand why we need such bit for RedCap (but not for eRedCap and/or XR). The point is that there is nothing special the network needs to do to support EM call for a 2RX/1RX UE (the only implication is that these UEs have slightly inferior performance, but the EM call itself should go through regardless). If this assumption is wrong, then we need separate bits for each feature. Given that there is no issue to support EM call as such even in existing networks as long as the network supports (e)RedCap, then we don’t really understand what is the difference between eRedCap/XR and RedCap as far as EM calls are concerned.  We think it is simple to just allow EMs calls for R18 and future features where they have similar cases as eRedCap and NES. AND do this without any new bit – why would we need to consider NWs which support and which do not support EM calls by the Rel-18 UEs when we already know that EM calls are possible even when the UE bars the cell (with the conditions that ZTE listed). We do not see the need for additional SIB1 bit! This will only complicate where both the NWs and UE need to have procedures with the presence and absence of this bit.  No need for a SIB1 bit for eRedCap, NES and any other R18 and future features.  Rapp) This “default” allowing EM calls will make MIB barring or complete barring (not even EM Calls allowed) impossible, or? |
| Ericsson | No | As we tried to explain during the first phase of this discussion, the problem does not seem to be common for all cases mentioned in this document. For example, barring bits for RedCap UEs that support 1Rx/2Rx are introduced so that operators can control access of such UEs when RedCap feature is enabled in the cell. It was due to a concern that those UEs may have an impact on performance in the cell, not because it was not technically possible for those UEs to operate in the cell. On the other hand, for NES cells  it is not about performance degradation. It is rather that UEs that do not support NES will not be able to operate in the cell unless NES features are disabled. So barring exemption cannot simply be a solution, at least by itself. One can say that for XR the case is similar to the case for RedCap UEs with 1Rx/2Rx, but then the question is if operators would be willing to bundle such access control together, i.e., it will not be possible to bar devices that are RedCap with 1Rx branch yet allow XR devices with reduced receiver branches.  Rapp) Operator input is helpful here – So far, I am not sure if there’s a need to control RedCap with 1Rx branch separately from XR UEs for EM calls. My understanding from talking to operators was that the cell/ operator is willing to allow EM Calls as much as possible. And so, I assume a “temporary” and hopefully not huge performance hit should be acceptable. The question is here about "technical e.g., hardware feasibility" - so, I agree that the UE needs to understand if it can make EM Calls in "this" cell. But this determination will have to be specific for each feature and will need to be described in 38.304 per feature as in endorsed CRs for (e)RedCap. With aiming for the common bit, we are going with the belief that an operator allows (or not) EM Calls for "any" UE capable of EM Calls in "this" cell. In other words, operator is (not) willing to take a performance hit and allow EM Calls as long as it is technically possible. The "willingness" might also be regulatory in many cases.  Alternative is to have one bit to control EM access per feature.  ZTE2: Agree with Rapporteur view. So, the question really is whether operators really want to differentiate between UEs with different features as far as 2RX UEs are concerned for EM calls. i.e. for emergency call, is a 2RX XR UE different to a 2RX RedCap UE? If the answer is yes from operator perspective, then we need separate bit for each feature. If it is no, then we don’t need a separate bit.  Yet another criteria that should be considered is that how it would be possible for a UE to interpret a feature that it does not support so that the UE can judge whether it can camp in the cell to perform an EM call if there is an exception.  Rapp) That’s the benefit of the common bit since it will be then not require to interpret past/ future features. |
| Qualcomm Incorporated | See comment | We are still not 100% clear about the use case.  We believe this solution is only meant for the scenario where the cell is barred for UEs supporting a certain feature and is not barred for regular UEs, and allow emergency call by the former “feature UEs”.  Rapp) It is the other way round i.e., cell allows access only to NES/ 2Rx UEs. So, remaining UEs can’t make EM Calls as these are considered barred.  Such scenario seems to be only applicable to RedCap and XR 2Rx. We do not see any use case of such scenario in ATG, NTN and NES.  Rapp) NES is relevant as explained above. NTN and ATG cells will not be accessed by TN UEs and so that general discussion of UE being capable of EM calls “in this cell” still holds true.  ZTE2: I had the same understanding as Masato. We need to figure out solution for any case where the UE can access the cell normally (i.e. MIB not barred and system information can be obtained normally etc) whilst SIB1 indicates it is barred (e.g. because of fewer antennas etc). Currently the only features as of today are XR 2RX, Redcap (2 and 1 Rx) and eRedCap (2 and 1 RX). We don’t think we are trying to solve the case for NES. But seems there is different understanding on this issue?? May need further discussion perhaps…  We also think even if there is a common exempt bit is defined, RAN2 still need to additionally specify which type of UEs and features the exemption is applicable, because it depends on the amount of the impact to the system when the emergency call is exceptionally allowed.  Rapp) True. The UE needs to understand if it is capable of making EM calls in this cell, given what the cell is supporting.  ZTE2: Indeed, along with the exemption bit, there should be other rules to check that the feature specific UE can actually access the cell normally (we showed example text for each feature (redcap, eRedCap and XR in our comment above)  All in all, we suggest RAN2 discuss the use case and impact for induvial feature before jumping on to a “common solution”. |
| Nokia | No | Also, we are not clear on the use case and we are not ok that MIB barring would be ignored by any UE. In addition, the barringExempt-RedCap is already specified and we should not change its meaning. |
| Fraunhofer | For a global forward-compatible Rel-18 solution: yes  For mixing into the Rel-17 TEI solution: no | We think that a large discussion on this topic is overdue.  Why do not make it lean and clean and forward-compatible? And tackle both emergency calls and a unique global barring?  TS 38.304 Rel-15 (15.8.0) cell status and reservation – cellBarred, cellReservedForOperatorUse, cellReservedForOtherUse  TS 38.304 Rel-18 (18.1.0) cell status and reservation –  cellBarred, cellBarredATG, cellBarred2RxXR, cellBarred-eRedCap1Rx, cellBarred-eRedCap2Rx , cellBarredFixedVSAT, cellBarredMobileVSAT, cellBarredNES, cellBarredNTN, cellBarredRedCap1Rx, cellBarredRedCap2Rx, cellBarredRedCap2Rx, cellReservedForOtherUse, cellReservedForFutureUse, halfDuplexRedCapAllowed, iab-Support, ncr-Support, mobileIAB-Support  Where do we want to be on Rel-20? We still have one meeting to fix this still on Rel-18.  We added so many bits for custom solutions per WI, but somehow when aiming at a single solution the argumentation is to reuse bits or not add any bits.  Why can’t we add 2 more bits to say:  00 – Everything barred  01 – Look at your feature barring bits  10 – Look at your feature barring bits but make emergency calls if not possible elsewhere  11 - extension  And be glad that this works for Rel-18, Rel-19, 20, etc |
| OPPO | No | Reading all the reply above, our observation is there is no convergence regarding the use case.  There seems more voices talking about (e)redcap and XR, and thus focusing on SIB1 per-feature barring. Yet to us we do not need an additional solution given the solution agreed for (e)redcap and XR.  For NES, so far there seems no much support, and there is concern expressed that EM call enabling comes with NES disabling.  So that we do not need a strong need for a general solution yet. |

**Q2: Can the same 1-bit indication in SIB1 be applicable to Rel. 17 UEs, specifically for RedCap UEs (i.e., *barringExempt-RedCap* is not required anymore) as well to obtain limited services? And for this purpose, a magic sentence in the Rel. 17 CRs is sufficient?**

|  |  |  |
| --- | --- | --- |
| Company name | Yes/ No | Comments |
| ZTE | Yes | One bit can indicate the barring exemption and we should capture that the barring exemption according to this bit is applicable only if the UE can access the cell normally please see the comment above. |
| Huawei | No | We should not bound the R18 feature and R17 feature together, which will delay the network to consider enable this feature for RedCap.  R17 RedCap is already deployed. The *barringExempt-RedCap* is to somehow indicate whether the network has been upgraded to support this TEI feature.  ZTE2: This reasoning is a bit unclear to us. What exactly is incompatible in the Rel-17 network to support EM call in this case for 2RX UEs? If there is something that needs to be done at the network side, then same reasoning should apply also for Rel-18 and future UEs including eRedCap and XR. We think there is nothing that the network needs to do and hence we can have the RedCap UEs also without any explicit bit if we were to go this way. |
| Apple | No | Same reason as HW and also pls see our comments above. |
| Ericsson | No | Please see our reply for the first question. |
| Nokia | No | Please see our reply above. |
| Fraunhofer | No | At this point in time, it sounds dangerous to tie the new Rel-18 solution to Rel-17 |
| OPPO | No | See our reply above |

# Summary

A total of 13 companies participated in this two-phase EMAIL DISCUSSION.

On perhaps the most important question asking if to support a common solution for supporting emergency calls in feature specific scenarios/ cells, most companies replied positively [Apple, Vodafone, TMUS, Vivo, ZTE, Lenovo] while some companies expressed doubts [Ericsson, BT, Oppo]. While simple vote counting on the rest of the question do not lead us to any concrete proposals, the 1-bit indication (e.g., in SIB1 replacing *barringExempt-eRedCap* bit with a general “barringExempt-Emergency”) also received support from just about half of the companies. Given the situation We do not attempt any technical agreement from this email discussion but propose the following to enable a future conclusion.

An assumption at least some of us made so far is that whenever possible an operator likes to (or even MUST) allow EM Calls for all, if feasible. The first proposal below questions this aspect:

**Proposal 1: Continue discussion in RAN2#126 on common solution for allowing EM Calls, following two points are to be resolved:**

Question A: [Requirement] RAN2 kindly seeks operator input to see if there’s a need to differentiate among features with respect to EM Calls support. Example: Allow EM calls to UE-A barred due to a feature-x but not to UE-B barred due to feature-y, if both UE-A and UE-B support EM calls on ‘this’ cell?

Next RAN2 should look for problematic cases with respect to the emergency calls. The situation looks like following:

Non-(e)RedCap UEs on (e)RedCap cells => No problem, the (e)RedCap specific barring bits are not meant for non-(e)RedCap UE.

Specific Redcap UEs barred on (e)RedCap cells => can be handled with one exception bit

NES UEs on NES cell => no problem

Non-NES UEs on NES cell => can be handled with one exception bit

Non-half-duplex Redcap UEs on (e)RedCap cells => No problem

*halfDuplexRedCap* UEs barred on (e)RedCap cells => can be handled with one exception bit

*2 Rx XR UEs?*

*Less than 5 MHz UEs?*

**Question B: [Feasibility] RAN2 kindly clarify if there are some hardware/ technical limitations (beyond temporary performance degradation) prohibiting EM Calls by a UE on a certain cell, needing separate/ specific EM call exemption.**

Finally, many companies exhibited reservation in including the R17 RedCap EM calls exemption in the common solution discussion. At least one company cited that “R17 RedCap is already deployed”. Given this it is proposed:

**Proposal 2: Endorsed R17 RedCap CRs can be approved.**

# Conclusion

Following proposal is made from this email discussion:

**Proposal 1: Continue discussion in RAN2#126 on common solution for allowing EM Calls, following two points are to be resolved:**

Question A: [Requirement] RAN2 kindly seek operator input to see if there’s a need to differentiate among features with respect to EM Calls support. Example: Allow EM calls to UE-A barred due to a feature-x but not to UE-B barred due to feature-y, if both UE-A and UE-B support EM calls on ‘this’ cell?

Question B: [Feasibility] RAN2 kindly clarify if there are some hardware/ technical limitations (beyond temporary performance degradation) prohibiting EM Calls by a UE on a certain cell, needing separate/ specific EM call exemption.

**Proposal 2: Endorsed R17 RedCap CRs can be approved.**

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