3GPP TSG-RAN WG2 Meeting #109bis-eR2-200xxxx

Electronic meeting, 20th – 30th April 2020

Agenda Item: 6.20.1.1

Source: Intel Corporation

Title: Report from email discussion [AT109bis-e][048][TEI16] on 5G indicator

Document for: Discussion and decision

# 1. Introduction

This contribution captures the discussion and result of the following email discussion that took place during RAN2#109bis-e:

* [AT109bis-e][048][TEI16] 5G Indicator (Intel)

Scope: Treat papers above on 5G indicator. If convergence is difficult, this may be treated on-line.

Wanted Outcome: Agreed solution in Agreed-in-principle CRs

Deadline: April 28 0700 UTC

Where the papers discussed are:

R2-2002535 LS on 5G indicator (RP-193265; contact: Intel) RAN LS in Rel-16 NR\_newRAT-Core, TEI16 To:RAN2 Cc:SA, CT, GSMA

R2-2002660 A RAN Based Solution for the 5G Indicator VODAFONE discussion

R2-2003420 EN-DC bandlist for 5G indicator Huawei, HiSilicon, BT, Telefonica, Telecom Italia S.p.A., Samsung discussion Rel-15 36.331 NR\_newRAT

R2-2003416 Introduction of bandlist for ENDC for 5G indicator HUAWEI, HiSilicon, Telefonica, Telecom Italia S.p.A., Samsung CR Rel-16 36.331 16.0.0 4214 2 C NR\_newRAT-Core R2-2002098

R2-2003417 Introduction of bandlist for ENDC for 5G indicator Huawei, HiSilicon, Telefonica, Telecom Italia S.p.A., Samsung CR Rel-16 36.331 16.0.0 4264 - A NR\_newRAT-Core

R2-2003418 Introduction in new SIB of bandlist for ENDC for 5G indicator Huawei, HiSilicon, BT, Samsung CR Rel-15 36.331 15.9.0 4265 - C NR\_newRAT-Core

R2-2003419 Introduction in new SIB of bandlist for ENDC for 5G indicator Huawei, HiSilicon, BT, Samsung CR Rel-16 36.331 16.0.0 4266 - A NR\_newRAT-Core

R2-2002969 Upper layer indication ZTE Corporation, Sanechips discussion

# 2. Discussion

The LS from RAN in RP-193265 gives RAN2 an action to provide CRs to the next RAN plenary meeting to implement some specific enhancements to the 5G indicator mechanism. 3 discussion papers where submitted to this RAN2 meeting to discuss the RAN2 specification changes for these enhancements. The remaining documents submitted to the meeting are CRs.

The email discussion is structured with a first phase to discuss the main RAN2 specification changes that are required based upon the LS and the 3 discussion papers. Once the first phase has concluded then there will be a second phase to finalise the remaining details of the CR. **The deadline for providing input to the first phase is Friday 24 April 2020, 0700 UTC.**

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### 2.1 Questions/comments on LS

**Any questions or comments to the LS in R2-2002535 can be provided below.**

|  |  |
| --- | --- |
| Company | Additional comments |
| Vodafone | For the connected mode DRX should be considered by RAN2 and 3GPP (e.g. CT1 should consider hysteresis timer |
|  |  |
|  |  |

### 2.2 Update to LTE system information

The LS requests RAN2 to introduce the following:

Introduce signalling to enable a UE camped on an E-UTRA cell to be informed, with frequency band granularity, of the NR frequency bands available for configuration of EN-DC operation within the area of this cell. In the case of RAN sharing, it must be possible to provide the NR frequency bands independently per PLMN. RAN2 can involve other groups as necessary to introduce the appropriate signalling.

All the discussion paper propose that the additional NR frequency band information is provided using LTE system information. However, the 3 discussion papers have different alternatives for which SIB should be used - SIB2, SIB24 or a new SIB.

**Please provide your company view on which LTE SIB should be used to provide the NR frequency band information.**

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| --- | --- | --- |
| Company | Which LTE SIB to be used?  SIB2/SIB24/new SIB | Additional comments |
| ZTE | New SIB | It seems there are some concerns on the overhead introduced by this. This to us indicates that we should put it in a SIB which is not as frequent. On the other hand, putting it in existing SIBs and reducing the scheduling rate would also impact other system aspects related to that SIB and this is undesirable. Given this, to us, the best approach seems to be to put it in a new SIB. We can live with SIB24 also (2nd preference), but SIB2 seems certainly undesirable! |
| Qualcomm Incorporated | New SIB | Not very strong view, but new SIB looks cleaner and avoids impact to the existing SIBs which are more critical in terms overhead with necessary periodicities.  EN-DC only (SCG only) NR frequencies (e.g. FR2) are not signalled for cell reselection in SIB24. So a new frequency list seems necessary anyway. |
| Intel | New SIB | Our preference is to not add the new NR frequency band information to SIB2. The information is not required prior to accessing the LTE cell and hence it cannot be justified to add it to the frequently transmitted SIB2. Both SIB24 and a new SIB could both be acceptable solutions with the benefit of using a new SIB that it could be scheduled with a long periodicity. We also note that if the SIB24 approach was used in a network that only supports EN-DC then it is not possible to completely omit all the parameters intended for inter-RAT cell reselection to NR, and it is not fully clear how a legacy UE might behave.  **Response to question from Telecom Italia**: In a system that supports EN-DC but doesn't support NR standalone, a legacy UE that does support NR standalone (i.e. one that understands SIB24 but does not understand the non-critical extension to SIB24) will see exactly the same SIB24 content irrespective of whether we introduce the non-critical extension in a Rel-15 or Rel-16 CR. So unfortunately we can't address the potential problem by our choice of release for the CR.  The SIB24 content seen by the legacy UE will be the single TreselectionNR parameter which is mandatory present in the existing SIB24 with the carrierFreqListNR-r15 being be absent. In this situation a sensible UE implementation would ignore the TreselectionNR parameter and not perform any NR measurements. However, this behaviour is not defined in our specification and so we cannot be completely confident that existing UE implementations would behave this way. If there was a preference among companies to go for the SIB24 approach, then device vendors should check that it doesn’t cause unexpected problems for any existing implementations. |
| Huawei | New SIB | Our initial proposal was SIB2 but after more considerations (see the comments made by others above) we now think that a new SIB is the cleanest and more efficient approach. |
| Verizon | New SIB | New SIB appears cleaner approach as it avoids impacting existing SIBs. |
| CATT | New SIB | New SIB is cleaner. The signalling size will be limited if it is put in existing SIBs |
| BT | New SIB | We slightly prefer a new SIB but we don’t have a strong position to have a new SIB or modify SIB24 in a way that it captures the source cell NR frequency bands per PLMN.  We don’t want this solution being implemented in SIB2 even we initially propose it. After a further analysis, we consider this is not acceptable due to the overload it introduces and the possible consequences it may have for a UE to camp in the cell. |
| Telecom Italia | SIB2 (but open to other options) | We understand that the overhead issue due to adding NR bands related information in SIB2 is because typically in RAN2 contributions on this topic a high number of NR bands per PLMN (e.g. 10) is considered to be signalled. However, this might not be the case as just up to 3 NR bands should be enough, with a possible further overhead reduction due to proper signalling size optimizations.  But if majority prefers a new SIB we can live with this, provided that the periodicity is chosen in such a way that new incoming EN-DC capable UEs can read NR bands information timely.  **Question to Intel**: your concern on the impact to legacy UEs on using SIB24 is with respect to Rel-15 UEs that are also able to operate in NR SA? Because we think the issue doesn’t exist if we specify this mechanism from Rel-16 (as per our preference to Q2.5) |
| Vodafone | SIB24 | Our concern is the **increase in size of SIB1.**  If we introduce a new SIB can companies please calculate the increase size of SIB1 from introducing a new SIB that has a scheduling period that is not shared with other SIBs  In our estimation the overhead in SIB1 (due to its frequent transmission) is likely to dwarf any overhead in SIB2 or other SIBs |
| NEC | New SIB | Given this information can be provided with longer periodicity than any other SIBs, new SIB will be suitable. SIB24 may be acceptable, while it broadcast for different purpose (i.e. cell reselection), so new SIB is cleaner. |
| NTT DOCOMO | SIB24 or New SIB | We don’t prefer to extend SIB2 for this purpose due to the increased overhead to SIB2 which is typically broadcast in a shorter period. We are fine with both approaches, i.e. utilising SIB24 or a new SIB. Anyway, SIB24 is needed when the NW deploys NR SA, even though only EN-DC is deployed currently. On the other hand, if SIB24 is chosen to support the additional requirement for 5G indicator, as Intel highlighted, we need to check how the legacy UE behaves when receiving SIB24 which includes only the IEs required for 5G indicator and the mandatory field. |
| Samsung | New SIB | We think new SIB is preferable as it brings more flexibility. If SIB2 is used, it may have impacts on both UE and NW i.e.   * The required NR band list for EN-DC operation per PLMN will result in huge signalling overhead in SIB2 as SIB2 provides other essential information as well * The growing size of SIB2 may cause the UE to acquire SIB2 at the right time.   But SIB2 can be acceptable to us if our concerns are validated. |
| LG | New SIB | In our view, SIB2 should not be used since SIB2 is not serving that purpose. For the same reason, SIB24 is not appropriate (while it is not impossible in practice). Given that SCG only frequencies would not be included in SIB24, we think that a new SIB will be appropriate to indicate the information. |
| T-Mobile USA | New SIB | Information in the new SIB is unrelated to network operation which means the periodicity of SIB isn’t critical. |

### 2.3 Connected DRX

The LS describes the required UE behaviour for providing the *upperLayerIndication* to upper layers when the UE is in idle, inactive and connected mode. The LS doesn’t state any requirement for connected mode DRX different to connected mode in general. The discussion paper in R2-2002660 discussed this case and proposes that during C-DRX the UE should provide the *upperLayerIndication* to upper layers in the same way as in idle (i.e. based on the content of the LTE system information).

**Please provide your company view on how a UE in C-DRX should provide the upperLayerIndication to upper layers (same as in idle/inactive or same as connected)**

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| --- | --- | --- |
| To avoid possible confusion, it is clarified that the upperLayerIndication in C-DRX is "same as connected" should be understood to mean that the criteria to provide the upperLayerIndication is the same as when the UE is actively transferring data (this clarification was added at the time Vodafone commented) Company | UpperLayerIndication in C-DRX?  Same as connected/same as idle | Additional comments |
| ZTE | No strong view | We do acknowledge the problem indicated in R2-2002660 and this seems to be the root cause of the discussion on hysteresis as well (i.e. the fact that the connected and IDLE mode indications seem to indicated different things if we strictly go with the implementation in the RAN LS).  We suspect this might be difficult to solve it in RAN2 and hence our proposal was to just provide the necessary information to RAN/GSMA and let them decide. |
| Qualcomm Incorporated | No | C-DRX can be of many forms with different DRX cycles and different parameters. We do not think it is desirable to differentiate UE behaviour based on C-DRX configuration.  If anything, we can consider relying on the system information in connected mode when the UE is not configured with EN-DC, i.e. regardless of C-DRX configuration. |
| Intel | Same as connected | We appreciate that there is a difference in the condition for the upperLayerIndication to be forwarded to upper layers in idle/inactive compared to connected - i.e. in idle/inactive the indication is provided when there is potential for the UE to use 5G, whereas in connected the indication is provided when the UE is actually configured with 5G. This could cause some misleading indication to the user if the UE were to remain in LTE connected DRX without EN-DC configured for a long period of time, but if the period of time is not long then it could be masked by the hysteresis in the user display.  However, we accept that the indication cannot be perfect in all situations and we prefer to avoid further optimisations beyond what was requested by RAN plenary. |
| Huawei | Same as connected | We think we should not make a difference for the C-DRX case. There will be different network implementation out there, for example some network implementation could leave the UE in connected with EN-DC still configured, C-DRX on, then release it to IDLE. It is complex to design the AS behaviour in a way that we take all the possibilities into account, and in our view unnecessary. |
| Verizon | Same as connected | It seems simpler and more logical to have same behaviour for upperLayerIndication for UE independent of C-DRX configuration. Acknowledge there may be corner cases where this is not perfect. |
| CATT | Same as connected | Agree with Huawei |
| BT | Same as connected | In our understanding, the UE shall leave the 4G or 5G indicator that it has in connected mode before starts CDRX. The idea is to avoid hysteresis in toggling as much as possible. |
| Telecom Italia | Same as connected | We think this is a corner case that can be simply solved if we keep the same indicator as the UE had in connected prior entering C-DRX mode |
| Vodafone | Same as Idle | In C-DRX, the UE should set the indicator according to the IDLE mode handling of the indicator within the “area”  We don’t see this as a corner case but depends upon the eNodeB’s RRC Inactivity Timer e.g. 15-30 seconds and the “heartbeat” of the UEs Applications (which could establish a RRC Connection every e.g. 2 minutes) |
| NEC | Same as connected | We do not see any need for taking into account C-DRX for this feature. |
| NTT DOCOMO | Same as connected | If the possible C-DRX configurations were considered, we would have to distinguish multiple sub-cases as to whether the upper layer indication is provided or not. We don’t see much gain to address such the short term transition, especially for customer’s perception. |
| Samsung | Same as connected | We are not quite sure why the idle mode handling needs to be applied during C-DRX. We think it seems sufficient to forward the upperLayerIndication to upper layers if the connected UE is configured in EN-DC. |
| LG | Same as connected | We also acknowledge the concern indicated by Vodafone in that the indication may be different depending on the UE RRC state in the same geographical area.  However, the concern may be somehow relaxed by applying Hysteresis, and hence we can accept what was requested by GSMA without further optimization. |
| T-Mobile USA | same way as in idle | If EN-DC isn’t configured, then the UE isn’t in 5G mode. The GSMA Liaison states “The UE shall display a 5G icon when the UE is in active mode and is using NR”. If the SCG leg isn’t configured, then the UE is unable to use NR and the 5G icon hysteresis timer should apply.  We don’t believe that 3GPP needs to toggle the upperLayerIndication to upper layers based on active mode state. This information is easily determined by the UE using the existing RRC signalling. |

### 2.4 Hysteresis in toggling of the *upperLayerIndication*

The LS states the following:

TSG RAN has decided that further 3GPP work related to the display of any user interface indication, such as hysteresis to avoid toggling between displaying 4G and 5G icon as mentioned in the GSMA LS, is not needed.

The discussion in RAN plenary related to this sentence was that any hystersis in the toggling of the indication on the display could be left to implementation of the UE's user interface, and therefore would not need to be specified in 3GPP specifications. However, the discussion papers in R2-2003420 and R2-2002660 both raise this topic for discussion in RAN2. R2-2002660 concludes that to have consistent UE behaviour from 'open market devices' the 3GPP specifications should capture a 10s hysteresis when the *upperLayerIndication* is turned off

**Please provide your company view on whether the 3GPP specifications should capture a hysteresis to be applied when the *upperLayerIndication* is turned off. In case your company view is that it should be captured then comments can be used in indicate a preference on how it is captured (e.g. informative, recommendation, requirement), the length of the hysteresis, and the location where to capture this.**

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| --- | --- | --- |
| Company | Capture hysteresis in 3GPP specs?  Yes/No | Additional comments  (including how to capture this, length of hysteresis and location where to capture this) |
| ZTE | Likely no | We suspect this will not be a fruitful discussion given that this goes against the plenary guidance. |
| Qualcomm Incorporated | No | This is likely to be complicated discussion, while the upper layers of the UE can apply any additional hysteresis / filter that overrides the lower layer has done anyway. So we do not think it is worth the effort. |
| Intel | No | We prefer to align with the request from RAN plenary and not capture the hysteresis in the 3GPP specs. Furthermore, we assume that all UE vendors will carefully consider hysteresis aspects when designing the user interface |
| Huawei | No | This should be left to upper layers as already decided by RAN plenary. We do not have to write anything in our specification about it. |
| Verizon | No strong view | Can be left to implementation, some informative recommendations might be useful. |
| CATT | No | No need to specify it. It could be left to UE implementation |
| BT | Yes | We would like to capture the hysteresis to avoid hysteresis in toggling. |
| Telecom Italia | Yes | We think this is important to ensure a UE behaviour that is as much consistent as possible especially with respect to open market devices (over which operators have no control). We can further discuss the exact value to be specified |
| Vodafone | Yes  (Liaise with CT1 and implement at higher layers) | in order to reduce the confusion of customers during the brief heartbeat period, we would prefer to have a hysteresis and as proposed in R2-2000156, in RRC Connected state, the UE should be allowed to run a 10 second hysteresis before turning off the “upperLayerIndication” |
| NEC | No | agree with ZTE |
| NTT DOCOMO | No | We’d like to respect and follow the RAN plenary guidance, given the fact that it was already discussed and decided by RAN plenary. |
| Samsung | No | Prefer to leave up to UE implementation |
| LG | No | We assume that UE implementation on 5G indicator is taking into various aspects including upperLayerIndication as well as hysteresis that may be adjusted depending on the underlying situations. Given this, we are fine to follow the RP guidance, I,e,, out of 3GPP RAN scope. |
| T-Mobile USA | No | GSMA Liaison doesn’t ask 3GPP to develop a mechanism to set the 5G icon in active mode, rather the LS asks for 3GPP to develop a mechanism that allows operators to set a configurable time that the SCG isn’t configured before disabling the 5G icon.  The 5G icon should be displayed as long as the SCG is configured and that information is easily determined by the UE.  The hysteresis timer starts when the SCG leg is no longer configured by RRC. |

In R2-2002969, while not proposing that 3GPP should specify any hysteresis, points out that the *upperLayerIndication* provided in idle mode is based the potential to use 5G, whereas the *upperLayerIndication* provided in connected is based on the UE actually being configured to use 5G. The document proposes to communicate this distinction to GSMA.

**Please provide your company view whether there is any need to provide further information to GSMA regarding the setting of the *upperLayerIndication* in idle and connected.**

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| --- | --- | --- |
| Company | Need for further LS to GSMA?  Yes/No | Additional comments |
| ZTE | Yes | If we want to avoid the discussion on hysteresis here (per the plenary guidance), we think that this is one way out i.e. to clarify that the current framework indicates different things in different RRC states and we can then leave it up to the upper layers to use this information accordingly. |
| Qualcomm Incorporated | Yes | It makes sense to communicate the final decision on the solution. (We do not intend to indicate any support for a given proposal in this comment.) |
| Intel | No | As mentioned in our answer in section 2.3, we appreciate that there is a difference in the condition for the upperLayerIndication to be forwarded to upper layers in idle/inactive compared to connected and that this could cause some misleading indication to the user in some cases. However, we accept that the indication cannot be perfect in all situations.  We prefer to avoid extending what has already been a very difficult discussion over more than 1 year, and therefore we prefer not to send another LS to GSMA. |
| Huawei | No strong opinion | No, if we are going to implement the RAN plenary decision. Yes, only if we take decisions in RAN2 different from what RAN tasked RAN2 to do. |
| Verizon | Yes | Would be good to communicate the final agreed solution to GSMA, |
| CATT | Yes | The final solution in RAN should be aligned with GSMA |
| BT | Yes | We, we should report back the final solution to GSMA. |
| Telecom Italia | Yes | Agree with Verizon, CATT, BT |
| Vodafone | Yes | As this particular issue has been an ongoing topic of discussion for many months, 3GPP needs to communicate its final solution to the GSMA . |
| NEC | No/Yes | No: if we focus on the question here, we do not see need to send another LS to GSMA. So, agree with intel.  Yes: if we talk about one more general LS informing RAN2 final decision, it is Ok to send it. (of course, it’s needed.) |
| NTT DOCOMO | Yes just to reply, No to ask further question/confirmation | We’re fine just to reply to inform GSMA of our decision. On the other hand, we’re not fond of invoking another discussion with GSMA to develop the solution. |
| Samsung | No strong view |  |
| LG | Yes | We think it is worthy of sending LS just to inform our final decision. |
| T-Mobile USA | Maybe | GSMA LS doesn’t ask for a reply, however a LS would be appropriate if the requirements need clarification. |

### 2.5 Release

The LS states that the it is Rel-16 and the WI is TEI16. However, the CR submitted to this meeting start from Rel-15.

**Please provide your company view on the release from which this is to be specified.**

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| --- | --- | --- |
| Company | Release?  Rel-15 or Rel-16 | Additional comments |
| ZTE | Rel-16 | The LS received from RAN is for Rel-16 and it seems this is a reasonable assumption to go with. |
| Qualcomm Incorporated | Rel-16 | Any significant change of release-15 ASN.1 confuses the market at this stage and should be avoided. |
| Intel | Rel-16 | We think it is sufficient for this enhancement to be added to Rel-16 (WI TEI16) as requested by RAN plenary. Early implementation by Rel-15 UEs would be acceptable. |
| Huawei | Rel-15 | Rel-15 CRs have been already prepared in a way not to cause interoperability problems in case they get implemented on top of the legacy Rel-15 5G indicator behaviour. In case some operator request this CR to be approved in Rel-15, we should do so. If not, it’s fine to have them in Rel-16 only (but we can still evaluate the early implementability of the CR and, in case it is early implementable, add this note to the cover sheet) |
| Verizon | Rel-15 | We would like to use this feature to be used in a software upgradable way for Rel-15 UEs. Per earlier comment, since CRs can written in a way to avoid interoperability or backwards compatibility issues, starting from Rel-15 should be targeted. |
| CATT | Rel-16 | We can stick to Rel-16 as the LS received from RAN is for Rel-16 |
| BT | Rel-15 | Agree with Huawei and Verizon.  We would like to have this in Rel-15 as it is written in a way that avoids any interoperability problem. Therefore, we don’t see any reason to wait for Rel-16. |
| Telecom Italia | Rel-16 | We prefer to have this ‘enhanced’ behaviour to be specified in Rel-16 (in line with the RAN plenary indications) to avoid further market fragmentation of Rel-15 UEs |
| Vodafone | CRs should make it clear that Release 15 device can implement this | The ASN.1 shall have no dependency on any Rel16 Feature |
| NEC | Rel-16 | RAN2 should follow the guidance from RAN via LS which indicates this is Rel-16. |
| NTT DOCOMO | Rel-16 | Agree that we should follow the RAN plenary guidance. Given the late stage, any extension/modification to Rel-15 ASN.1 should be avoided. |
| Samsung | Rel-16 | Same view i.e. follow the RAN2 plenary guidance. We think it is possible to go for R15, as we have not frozen R15. If we go this way, or R16 with Early Implementation Allowed, we think the CR should be updated and checked carefully. One example (as below):   * The –v16xy will not appear in R16, new SIB should be placed to the R16 SIBs (otherwise, it would be NBC). * The naming could be somewhat strange if we call it SIB29 and place it after SIB26   SystemInformation-r8-IEs ::=             SEQUENCE {          sib-TypeAndInfo                                        SEQUENCE (SIZE (1..maxSIB)) OF CHOICE {                 …                 sib26-v1530                                                   SystemInformationBlockType26-r15,                 sibxy-v15xy                                                   SystemInformationBlockTypexy-r15,                 sib27-v16xy                                                   SystemInformationBlockType27-r16,                 sib28-v16xy                                                   SystemInformationBlockType28-r16 }, |
| LG | Rel-16 | Early implementation by Rel-15 UEs would be possible, since implementation of this feature would be independent of any other R16 features. |
| T-Mobile USA | Rel -16 | We don’t see a strong market need to have this feature in Release 15. |

# Conclusions