3GPP TSG-RAN WG2 Meeting #109-e R2-200xxxx

Electronic Meeting, 24th February – 6th March 2020

Agenda: 6.21

Source: Ericsson

Title: On-demand SIB in CONNECTED Functionality

Document for: Discussion, Decision

# 1 Introduction

This document is to kick off the following email discussion:

* [AT109e][082][OdSIBconn] on-demand SIB in CONNECTED Functionality (Ericsson)

Scope: Treat and progress based on R2-2001670

Intended outcome:

Deadline: MAR 4

# 2 Summary of remaining issues

## Issue 2.1 On-demand request of SIB9 and others

One issues regarding which SIBs can be requested on-demand while in CONNECTED, is brought up by Ericsson. What is claimed is that in the DCCA WI, it was decided to have a separate SIB for delivering the early measurement configuration to all UEs under the coverage of the same cell.

* The UE shall not request on-demand the SIB specified in the DCCA WI for early measurements. [6] (Ericsson)

Since whether to configure early measurement or not is a network choice, it should be quite straightforward to not allow the UE to request the new SIB specified in the DCCA WI on-demand. Therefore, what we suggest is:

1. The UE shall not request on-demand the SIB specified in the DCCA WI for early measurements.

Q1: Do companies agree with Proposal 1?

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| Samsung |  | The proposal can be discussed together with other Rel-16 SIBs which can be requested on-demand or not. No need to discuss in isolation |
| Ericsson | Yes | Since the new SIB specified in the DCCA WI is related to the configuration of early measurement, we not see the benefit for the UE to request this on-demand. It should be a network choice, indeed, to configure early measurements or not. |
| Futurewei | Yes | Similar principle can be applied when other R16 SIBs are considered for on-demand request. |

## Issue 2.2 Configurability of on-demand SIB in CONNECTED

According to what has been discussed during the email discussion [108#61][R16] and the Online discussion, one issue was whether the NW should use a flag to enable/disable the on-demand SIB feature on the UE-side. Regarding this topics, three options are currently on the table:

1. Explicit network indication (other than *si-broadcaststatus* bit) is not needed to inform the UE whether the on-demand SIB request in RRC\_CONNECTED is supported.
2. Explicit indication is needed for Rel-16 On-demand SI procedure in RRC\_CONNECTED is an optional feature for the network and independent from the On-demand SI procedure in RRC\_IDLE/RRC\_INACTIVE.
3. Explicit indication is needed for Rel-16 On-demand SI procedure in RRC\_CONNECTED but only if SIB9 can be requested on-demand.

According to this, we would like to ask companies their view on which option should be pursued for a possible agreement.

Q2: Which Option should be pursued regarding the configurability of On-demand SIB in CONNECTED?

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| --- | --- | --- |
| Company | Option | Comment |
| Samsung | Option 1 | Rel-15 OSI feature for IDLE/INACTIVE UEs is optional feature for the Network. This is based on the si-broadcaststatus bit in SIB1. We are wondering why companies think this existing bit cannot be reused for OSI feature in Connected. UE in Connected anyway have to read schedulinginfo to determine what SIBs are broadcasted and what are not broadcasted.  Assuming Option2 is pursued and new bit is introduced then following 4 cases are possible:  Case1: Broadcast bit indicates ‘broadcasting’ and new indication is set FALSE  Case2: Broadcast bit indicates ‘broadcasting’ and new indication is set TRUE  For above cases UE is not allowed to send SI request, when UE is configured with CSS.  Case3: Broadcast bit indicates ‘notbroadcasting’ and new indication is set TRUE  For Case3 UE is allowed to send SI request, when UE is configured with CSS.  Case4: Broadcast bit indicates ‘notbroadcasting’ and new indication is set FALSE  In this case UE can neither acquire required SIB from broadcast nor send SI request. NW shall perform unsolicited delivery of the required SIB to the UE in dedicated manner. Such NW requirement will be required to be specified explicitly in the specification. Is this acceptable to NW vendors ?  For Case1, the UE which does not have CSS configured will not be allowed to send SI request. In such case NW shall perform unsolicited delivery of the required SIB to the UE in dedicated manner  Such NW requirement will be required to be specified explicitly in the specification. Is this acceptable to NW vendors ?  We fail to understand the justification for Option 2.  With Option 1 such problems do not exist.  UE which does not have CSS configured shall be always allowed to send SI request regardless of the setting of broadcast bit and in normal conditions it is expected NW reply to the UE request. This is much simple and clean approach rather than specifying Option2 which cannot be justified and unnecessary specifying NW requirements.  Option3 is a separate discussion and should be discussed in this context. There are other ways for delivery of the reference timing information |
| Ericsson | Option 2 or Option 3 | In general, we prefer to go for Option 2 as we do not see the benefit to have this feature mandatory for the network. Since the on-demand feature for IDLE/INACTIVE is completely different from the one for CONNECTED, one cannot assume that a gNB would support both of them. |
| Futurewei | Option 1 | The support of on-demand SI should be optional to network, and there is no need of having different means to indicate it for Idle/Inactive and Connected UEs. Whether a particular SI should be requested by Idle/Inactive or Connected UE is determined by the related functionality and should already be clear to UE. |

## Issue 2.3 DL response by the network

In the email discussion [108#61][R16], an issue was discussed about how the UE should handle the DL response sent (or not) by network upon receiving the on-demand request for certain SIB(s). Further, this issue was discussed during the online session on Thursday and no conclusion has been reached regarding this issue:

[R2-2000875](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_109_e\Docs\R2-2000875.zip) Summary of [108#61][R16] On-demand SI procedure in RRC\_CONNECTED\_summary Ericsson discussion Rel-16 NR\_unlic-Core, 5G\_V2X\_NRSL-Core, NR\_IIOT-Core

DISCUSSION

P5

- ZTE think this shall be left for UE implementation and need no further discussion. CATT agrees.

- MTK think that the network should always respond. Would there be networks that do not have this capability?

- LG think a prohibit timer would be useful. Vivo think this is useful for congestion case. Lenovo think there might be a case.

- Samsung assume that the UE know if the network has this capability, and there is two delivery mechanisms, dedicated and if the UE has common seach space, broadcast delivery is possible, and think this does not need to be specified. Intel agrees. CATT agrees as well. NEC also agrees.

- Apple also think the network shall always reply

- Chair proposes: The UE knows whether the network has capability for this feature (e.g. based on existing indication or FFS new indication), and it is assumed that the network always replies to a UE request. Ericsson think that the network can choose to ignore the UE, e.g. at high load.

- Intel think the network should always reply, and the only abnormal case when network doesn’t reply is if the network loses the message.

- Nokia think we don't need to standardize much for this.

- Huawei would be ok either way,

- Ericsson strongly think a prohibit timer would be needed. Samsung think we didn’t introduce a prohibit timer in R15.

- Intel wonder what “UE implementation” would mean? The procedure would normally always be successful.

- Apple think that anyway modification period would be a normal condition in the UE.

- Ericsson think there already is a method for the network to reject access in Idle/inactive mode, but not for connected. For V2X there may be cases with very frequent requests.

Some company assumes that, upon the request, the UE expect always a DL reply from the network. This DL may be via broadcast of via dedicated signalling, depending of the network choice (except for the case of a UE with no CSS configured where the DL reply is only via dedicated signalling.

Assuming this, another aspect that is not clear at the moment is what is the UE behaviour if the DL request does not arrive (or anyway arrive with certain delay due to the congestion or bad radio conditions). Here, the options were different, and no common understanding was reached. The different UE behaviours discussed, were:

1. The UE, if not receiving a DL response, it triggers again the on-demand SIB procedure.
2. The UE waits until receiving a DL response

According to this, we would like to check with companies what is their understanding regarding the possible UE behaviours described.

Q3: Do companies agree on the UE behaviour described in Option 1 and Option 2?

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| --- | --- | --- |
| Company | Yes/No | Comment |
| Samsung |  | In the Web CC there was common understanding that the scenarios such as congestion is abnormal condition. Smart NW implementation will change the status of broadcast bit from notbroadcasting to broadcasting to avoid UE request in such abnormal situations.  For another scenario that the UE request is lost due to bad radio conditions in this situation the UE will encounter RLF.  In our opinion Q3 is not justified and not a valid question |
| Ericsson | Yes | In our understanding, the scenarios described in Option 1 and Option 2 may happen. We acknowledge that they may be not common in normal network condition, but we should address also the cases on when the network is overloaded, loses the RRC message, or the DL response may come with some delay. |
| Futurewei |  | Connected UE should know the request message has been delivered to network.  If the requested SI is not received, UE just can’t use it.  The UE doesn’t need to retransmit the request, and the UE doesn’t need to stop everything and “wait for the response” |

Now, if Option 1 is true, what it may happen is that multiple UE may keep requesting certain SIBs to the network thus causing even more congestion and overhead on the network side. One possible use case for this situation, is given by platooning use case for V2X, where a group of cars may keep requesting the V2X SIB if this is not delivered in a reasonable time.

If Option 2 is true, the UE may wait for along amount of time for a response that may come with delay (or may never come).

Even if Option 2 may not be an issue, in case of Option 1 a solution is needed to avoid the network to be overflooded with continue on-demand SIB request. Therefore, a prohibit timer (as discussed in the online session) may be a good solution to avoid this.

We note also that, for the on-demand request in IDLE/INACTIVE no prohibit timer has been specified because the network has the possibility to reject the UE request once that this performs random access to acquire the SIB. However, for the on-demand SIB in CONNECTED, the network so far does not have this possibility.

Therefore, we would like to ask companies whether a prohibit timer is needed for the on-demand SIB in CONNECTED.

Q4: Do companies agree to specify a prohibit timer for the on-demand SIB in CONNECTED?

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| --- | --- | --- |
| Company | Yes/No | Comment |
| Ericsson | Yes | In the on-demand SI for IDLE/INACTIVE, the network has still some form of control in rejecting the request of the UE. In fact, the network can reject the UE request once this perform the RRC setup/resume for acquiring the requested SIB.  In case of on-demand SIB for CONNECTED, the network cannot control the requests made by the UE and it totally exposed to possible overloading or overflooding caused by continue on-demand requests made by the UE.  For this reason, a prohibit timer may help preventing these phenomena. On top of this, for all the procedure triggered autonomously by the UE a prohibit timer is always configured and we prefer to have the same principle also here. |
| Futurewei | No | UE in Connected state should know if the request has been received by gNB, as it is sent by RRC message. |
|  |  |  |

## Issue 2.6 Triggering of the on-demand SIB procedure while in CONNECTED

A good number of companies addressed the issue on when to trigger the on-demand SIB procedure for CONNECTED. In particular, the following proposals have been made regarding this issue:

* Specify following additional conditions for triggering SI request:[1] (Samsung)
  + If common search space is configured in the active BWP and if required SIB is supported in cell (i.e. required SIB is mapped to a SI message as per si-SchedulingInfo) and for the SI message mapped to required SIB, si-BroadcastStatus is set to notBroadcasting in stored SIB 1 acquired in current modification period: UE initiate transmission of the DedicatedSIBRequest message
  + If common search space is not configured in the active BWP and if required SIB is supported in cell (i.e. required SIB is mapped to a SI message as per si-SchedulingInfo) in stored SIB 1, UE initiate transmission of the DedicatedSIBRequest message
* For SIBs with value tag in SIB1, UE can make an on-demand request for the SIB upon detecting a change in SIB based on the value tag in SIB1 and the UE feature requirement.[2] (Intel)
* Add a UE requirement in RRC to acquire the other SIBs based on UE internal requirement. [2] (Intel)
* No need to introduce separate trigger condition of RRC Connected UE to request on demand SI.[4] (Apple)
* The UE may trigger the on-demand SIB procedure while in RRC\_CONNECTED, but only upon the reception of SIB1. Otherwise the UE shall not trigger the on-demand SIB procedure. [6] (Ericsson)
* To confirm that UE in RRC\_CONNECTED is required to check SIB1 before requesting some SIBs. [9] (LG)

According to the proposals made by the company, it is possible to substantially divide them in two main options:

1. If the UE does not have a valid stored version of that SIB, the UE triggers the on-demand SIB request only after checking if the required SIBs are mapped to a SI message as per *si-SchedulingInfo* in SIB1. If a CSS is configured in a active BWP the on-demand request is triggered only for those SIBs with a *si-BroadcastStatus* is set to *notBroadcasting* (Samsung, Ericsson)
2. The UE triggers the on-demand SIB request based on UE requirements (Intel)
3. No other triggers are needed for on-demand SIB in CONNECTED. (Apple, LG, Ericsson)

Looking at the possible options, we believe that Option 1 is somehow need in case the UE has not store a valid version of a SIB and needs to acquire a new one. Nevertheless, we think that basic principle that is reflected in Option 3 should be also clarified because not crystal clear in the current specification. In fact, the UE should trigger the on-demand SIB request only after checking if the required SIBs are mapped to a SI message as per *si-SchedulingInfo* in SIB1. If a CSS is configured in an active BWP, the on-demand request is triggered only for those SIBs with a *si-BroadcastStatus* is set to *notBroadcasting*. Otherwise, if no CSS is configured for an active BWP, then the on-demand request is done regardless of the *si-BroadcastStatus* since the UE cannot check the broadcast channel. Therefore, our suggestion is to have the following:

1. The UE should trigger the on-demand SIB request only after checking if the required SIBs are mapped to a SI message as per *si-SchedulingInfo* in SIB1.
   1. If a CSS is configured in an active BWP, the on-demand request is triggered only for those SIBs with a *si-BroadcastStatus* is set to *notBroadcasting*.
   2. if no CSS is configured for an active BWP, then the on-demand request is done regardless of the *si-BroadcastStatus* since the UE cannot check the broadcast channel.
2. If the UE does not have a valid stored version of a SIB, the same principles described in P2 are applied.

Therefore, we would like to ask companies whether they agree with the two proposals formulated above.

Q5: Do companies agree with Proposal 2?

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| --- | --- | --- |
| Company | Yes/No | Comment |
| Samsung | Yes | We agree with the rapporteur summary. Therefore, we support P2 |
| Ericsson | Yes | This is currently supported in the running CR |
| Futurewei | Yes |  |

Q6: Do companies agree with Proposal 3?

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| --- | --- | --- |
| Company | Yes/No | Comment |
| Samsung | Yes | We agree with the rapporteur summary. Therefore, we support P3 |
| Ericsson | Maybe | According to 5.2.2.4.2 the UE in RRC\_CONNECTED with T311 not running is not triggering the on-demand SI when it has not stored a valid version of a SIB. Therefore, we are not sure whether we should allow a different behaviour from what has been done in Rel-15. |
| Futurewei | Yes but | The triggering conditions describes in P2 are required before a UE performs on-demand request of a SIB. But a UE doesn’t have to trigger on-demand request of an SIB, if it doesn’t have use of it. In other words, what described in P2 are necessary conditions, not sufficient conditions. |

## Issue 2.7 On-demand SIB request upon reconfiguration with sync (handover)

Two contributions from Samsung and LG had made proposal regarding the handling of the on-demand SIB request during reconfiguration with sync (handover). The following is proposed:

* Upon receiving RRC reconfiguration message which includes reconfigurationWithSync in spCellConfig of an MCG and dedicatedSIB1-Delivery, SI request is initiated when MAC of MCG completes the random access procedure towards the target SpCell.[1] (Samsung)
* DedicatedSIBRequest-r16 is not included in the HandoverPreparationInformation. [9] (LG)

Samsung and LG tackle two different issue related to reconfiguration with sync. Samsung targets the case on when the *dedicatedSIB1-Delivery* is included in *RRCReconfiguration* together with the *reconfigurationWithSync*. Our option would be that this issue could be easily solved by network implementation without requiring to specify any network behaviour. In fact, the network can avoid sending *dedicatedSIB1-Delivery* together with *reconfigurationWithSync*. Nevertheless, we acknowledge that what proposed by Samsung can be also a possible solution. Therefore, we suggest to discuss these two options:

1. RAN2 to discuss how to handle the case where *dedicatedSIB1-Delivery* is included in *RRCReconfiguration* together with the *reconfigurationWithSync*.
   1. Leave it to network implementation (e.g., *dedicatedSIB1-Delivery* not sent together with *reconfigurationWithSync*.)
   2. The on-demand SIB request is initiated by the UE only after successful completion of random access toward the target SpCell.

Q7: Which of the two Options should be pursued for the issue described in Proposal 4?

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| --- | --- | --- |
| Company | Option | Comment |
| Samsung | Option2 | option1 breaks Rel15 behaviour. There is no need to impose unnecessary NW implementation |
| Ericsson | Option 1 | Our understanding is that this can be handled by network implementation without further standardization effort. However, if majority of companies prefer to go for Option 2, we are also ok with it. |
| Futurewei | Option 2, but | On-demand request is triggered only when UE needs the SIB. In other words, the on-demand SIB request in Connected mode can be separate from HO procedure. |

The proposal from LG, instead, address the issue on whether the to enable a target node to know which SIBs the UE has requested in a source node and hence to provide the same/requested SIBs to the UE by the target node immediately after mobility. In our opinion, the benefits of having of having that information within *HandoverPreparationInformation* is limited and maybe the benefits are not very clear. Therefore, our proposal is to not pursue such optimization given the limited time we have to finish Rel-16.

1. *DedicatedSIBRequest-r16* is not included in the *HandoverPreparationInformation*.

Q8: Do companies agree with Proposal 5?

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| --- | --- | --- |
| Company | Yes/No | Comment |
| Ericsson | Yes |  |
| Futurewei | No strong view | If DedicatedSIBRequest-r16 is included in the HandoverPreparationInformation, couldn’t the target cell include the requested SIB already in HO command? |
|  |  |  |

## Issue 2.8 Other unclassified issues

According to papers submitted in the on-demand SIB for CONNECTED agenda item, the following remaining proposals are formulated:

* The *DedicatedSIBRequest* message should be sent after AS security activation.[5] (ZTE)
* The UE indicates a preference of dedicated signalling transmission for the request SIB in the SI request message.[7] (Huawei)
* To support partial delivery of the requested SIB(s) by dedicated signalling, RAN2 is asked to consider the option to send the SI scheduling information of the broadcast SIB(s) using *dedicatedSIB1-Delivery* in the *RRCReconfiguration* message even if the UE has an active BWP with CSS configured.[8] (Lenovo)
* UE is allowed to re-request the same SIB only after a fixed duration since UE has requested but not received the SIB. [9] (LG)

For the first issue raised by ZTE, where is proposed that the *DedicatedSIBRequest* should be sent only after AS security action, we still find hard to understand what the benefits about this are. Usually, SIBs do not need security (i.e., as also stated in Annex B.1 of 38.331). Therefore, we believe that this new message should follow the same principle of e.g., normal RRC messages sent via SRB1. We suggest, then, to not pursue proposal from ZTE.

Regarding the issue raised by Huawei, on whether the UE should be allowed to indicate a preference on how the SIBs should be delivered by the network, this topic was already discussed. The general understanding was that is up to the network to decide how the on-demand requested SIBs should be delivered. However, we agree that no clear agreement has been taken on this and therefore, our proposal is to ask RAN2 to confirm this understanding.

1. RAN2 to confirm that It is up to the network to decide how the requested SIBs on-demand should be delivered (i.e., via broadcast or via dedicated RRC signalling).

Q9: Do companies agree with Proposal 6?

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| --- | --- | --- |
| Company | Option | Comment |
| Samsung |  | In general agree with P6 if CSS is configured. For the case if CSS is not configured then dedicated signalling is the only option. |
| Ericsson | Yes | We already agreed on this principle (i.e., at least when CSS is configured). |
| Futurewei | Yes |  |

Regarding the issue raised by Lenovo, our understanding is that the proposal made is not strictly related to on-demand SIBs feature, but it will be going to affect the SIB procedure in general. For this reason, we believe that this is not the right place where this proposal should be made and our suggest is to not pursue it.

Regarding the final issue raised by LG, our understanding is that this topic will be discussed in the email discussion [108#61][R16]. Our suggestion is, therefore, to not have any proposal here and to discuss it during the email discussion.

# 3 Conclusion

According to the contributions submitted regarding this topic, the following proposals are made:

# 4 References

1. [R2-2000228](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109_e/Docs//R2-2000228.zip), Remaining Issues of On Demand SI Procedure in RRC Connected, Samsung Electronics Co., Ltd, RAN2#109-e, Electronic Meeting, February 2020

1. [R2-2000478](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109_e/Docs//R2-2000478.zip), Remaining open issues on on-demand request in Connected mode, Intel, RAN2#109-e, Electronic Meeting, February 2020

1. [R2-2000500](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109_e/Docs//R2-2000500.zip), On-demand SI support for EN-DC SCG, vivo, RAN2#109-e, Electronic Meeting, February 2020

1. [R2-2000607](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109_e/Docs//R2-2000607.zip), Discussion on open issues in On Demand SI, Apple, RAN2#109-e, Electronic Meeting, February 2020

1. [R2-2000667](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109_e/Docs//R2-2000667.zip), Remaining issues on on-demand SI in connected, ZTE Corporation, Sanechips, RAN2#109-e, Electronic Meeting, February 2020

1. [R2-2000878](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109_e/Docs//R2-2000878.zip), Open issues list for on-demand SIB, Ericsson, RAN2#109-e, Electronic Meeting, February 2020

1. [R2-2000972](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109_e/Docs//R2-2000972.zip), Discussion on SI request enhancement for Connected UEs, Huawei, HiSilicon, RAN2#109-e, Electronic Meeting, February 2020

1. [R2-2001154](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109_e/Docs//R2-2001154.zip), Discussion on open issues of on-demand SI procedure in connected, Lenovo, Motorola Mobility, RAN2#109-e, Electronic Meeting, February 2020

1. [R2-2001522](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109_e/Docs//R2-2001522.zip), Resolving open issues for on-demand SI, LG Electronics France, RAN2#109-e, Electronic Meeting, February 2020