**3GPP TSG-RAN WG2 #110b-e *R2-200xxxx***

**E-meeting, June 2020**

Agenda Item: x.x.x.x

Source: OPPO

Title: Summary of [Post109bis-e][954][V2X] SIB12 Overhead Reduction (OPPO)

Document for: Discussion, Decision

# Introduction

RAN2 achieved following agreement at RAN2#109bis meeting:

Agreements on SIB12:

1: Introduce segmentation of SIB12 in RRC layer for both NR and LTE system.

Furthermore following email discussion is agreed to discuss potential optimization solution to reduce SIB12 size:

[Email discussion]: To discuss and conclude other options proposed in R2-2004075. If we cannot see majority companies’ views for each sub-options or if we cannot have reliable draft CR, we will rely on segmentation of SIB12 only in Rel-16 (OPPO)

# Discussion

The size of SIB12 is mainly affected by those IEs which are either too big or repeat too many times or both. How many times an IE will repeat depends on either the length of the list or how deep the IE is buried within the whole IE structures. Taking IE SL-QoS-Profile-r16 for example, it will repeat NrofSLRB-r16\* NrofSL-QFIs-r1 times (Note1). For IE SL-Priority-TxConfigIndex-r16 it will repeat NrofFreqSL-r16\* NrofSL-BWPs-r16\*( NrofTXPool-r16+1)\*8.

*Note: the parameter e.g.* **NrofSLRB-r16** *in the paper is the configured length of the IE list whose maximum number is* ***max*NrofSLRB-r16***. The same assumption is taken for other similar parameters.*



Figure 2-1 IE structure of SIB12 (partial IEs)

In Figure2-1 the IEs which impacts SIB12 size at most are listed. And the following table show the IE name, their repeat factors and estimated size:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **level 1 IE list** | **level n IE list** | **Size of IE list(bit)** | **Repeat factors** | **Minimum factors** | **Typical factors** |
| sl-FreqInfoList-r16 | IE size of sl-FreqInfoList-r16 except for below 5 IEs | 274 | 1 | 1 | 1 |
| 　 | SL-SyncConfig-r16 | 90 | NrofFreqSL-r16\*SL-SyncConfig-r16 | 1 | 4 |
|  | **SL-ResourcePool-r16(TX) except for** **sl-CBR-Priority-TxConfigList-r16** **and sl-ThresPSSCH-RSRP-List-r16** | **487** | **NrofFreqSL-r16\* NrofSL-BWPs-r16\*( NrofTXPool-r16+1)** | **2** | **5** |
|  | **sl-CBR-Priority-TxConfigList-r16** | **448** | **NrofFreqSL-r16\* NrofSL-BWPs-r16\*( NrofTXPool-r16+1)** | **2** | **5** |
|  | **sl-ThresPSSCH-RSRP-List-r16** | **496(Note1)** | **NrofFreqSL-r16\* NrofSL-BWPs-r16\*( NrofTXPool-r16+1)** | **2** | **5** |
| 　 | **SL-ResourcePool-r16(RX)** | **449** | **NrofFreqSL-r16\* NrofSL-BWPs-r16\*NrofRXPool-r16** | **1** | **1** |
| sl-UE-SelectedConfig-r16 | IE size of sl-UE-SelectedConfig-r16 except for below 3 IEs | 11 | 1 | 1 | 1 |
| 　 | sl-PSSCH-TxConfigList-r16  | 69 | PSSCH-TxConfig-r1 | 1 | 8 |
| 　 | sl-CBR-RangeConfigList-r16 | 7 | CBR-Config-r16\*CBR-Level-r16 | 1 | 64 |
| 　 | sl-CBR-PSSCH-TxConfigList-r16 | 46 | TxConfig-r16 | 1 | 16 |
| sl-NR-AnchorCarrierFreqList-r16 | 　 | 22 | FreqSL-NR-r16 | 1 | 1 |
| sl-EUTRA-AnchorCarrierFreqList-r16 | 　 | 14 | FreqSL-EUTRA-r16 | 1 | 1 |
| sl-RadioBearerConfigList-r16 | IEs except for below 2 IEs | 17 | NrofSLRB-r16 | 1 | 12 |
| 　 | **SL-QoS-Profile-r16**  | **129** | **NrofSLRB-r16\*NrofSL-QFIs-r1** | **1** | **48** |
| 　 | sl-PDCP-Config-r16  | 9 | NrofSLRB-r16 | 1 | 12 |
| SL-RLC-BearerConfig-r16 | 　 | 59 | SL-LCID-r16 | 1 | 12 |
| sl-MeasConfigCommon-r16 | 　 | 98 | NrofSL-ObjectId-r16 | 1 | 1 |
| sl-CSI-Acquisition -r16 | 　 | 1 | 1 | 1 | 1 |
| sl-ZoneConfig-r16 | 　 | 11 | 1 | 1 | 1 |
| sl-OffsetDFN-r16 | 　 | 11 | 1 | 1 | 1 |
| t400  | 　 | 4 | 1 | 1 | 1 |
| sl-MaxNumConsecutiveDTX-r16 |  | 3 | 1 | 1 | 1 |
| sl-SSB-PriorityNR-r16 |  | 3 | 1 | 1 | 1 |

Table2-1

*Note1: the size is calculated assuming CBR-Level-r16=8 (maxCBR-Level-r16=16)*

*Note2: the IE sizes in table 2-1 are adjusted according to endorsed 38.331 CR in R2-2004072*

# Optimization of SIB12 size issue

As indicated in table 2-1, the IEs in **bold red** are either of big size and/or repeated many times. Following parameters are assumed to estimate the SIB12 size:

|  |  |
| --- | --- |
| **Configured** parameters | Typical values |
| NrofFreqSL-r16 | 1 |
| NrofSL-BWPs-r16 | 1 |
| NrofTXPool-r16 | 4 |
| NrofRXPool-r16 | 1 |
| NrofSLRB-r16 | 12 |
| NrofSL-QFIs-r1 | 4 |
| SL-LCID-r16 | 12 |

Table 2.1-1

The corresponding repeat factors are listed in the column “typical factors” of table 2-1. Based on this assumption SIB12 is estimated as 17360 bits. If some measures e.g. proposal 1/2/3 from paper [2] are taken into account then the SIB12 size can be reduced to be 8022 assuming:

1, IE SL-QoS-Profile-r16 is 33 bits assuming standardized PQI instead of non-standardized PCI is configured and IE sl-GFBR-r16 and sl-MFBR-r16 are both reduced from 33 bits to 6 bits as indicated in draft CR [4]

2, Table plus index approach is taken for IE SL-QoS-Profile-r16 where the length of the table is 16

3, IE SL-ThresPSSCH-RSRP-List-r16 and SL-CBR-Priority-TxConfigList-r16 is configured as cell level IE hence only one instance is counted instead of 5

The idea from [3] is to preconfigure *sl-RadioBearerConfigList-r16* and *sl-RLC-BearerConfigList-r16*, in that case the SIB12 size can be further reduced to 6474 bits.

Figure 2.1-1 SIB12 size reduction

The outcome in Figure2.1-1 shows there is a big room for size optimization. In future the number of SLRB may not increase dramatically but the number of frequencies and the number of BWP per frequency will like increase when more spectrum are available for sidelink operation. In that case SIB12 size will increase mainly because of IE like TX resource pool.

**Q1: Do you agree that SIB12 size need be optimized?**

If you disagree, please elaborate your detail reason

|  |  |  |
| --- | --- | --- |
| Company | Agree/disagree | comments |
| Ericsson | Disagree | Our view is that the segmentation introduced for SIB12 it solve the problem. Optimizing the size of SIB12 is an optimization that is not required at this stage, considering that we have only one meeting left to close the release and freeze the ASN.1. This mean that whatever is not done/agree in the next meeting, it will result in a painful not backward compatible change that we want to avoid.We believe that the optimization of SIB12 can be left to TEI17 or Rel-17. Since this topic it deserve an extensive discussion and an impact analysis of all the mentioned options, there is no rush to have a not so efficient solution now. |
| MediaTek | Yes | As discussed in RAN2#109bis-e, we consider it important not only to make it physically possible to deliver the SIBs over the air (which segmentation can do), but to restrain the total size for overhead and acquisition reasons.We don’t think this issue can be left to Rel-17, because Rel-16 UEs still need to be able to interpret SIB12. If we e.g. raise some IEs from resource pool level to cell level in Rel-17, we would still have to signal them at resource pool level for the benefit of Rel-16 UEs. |
| Qualcomm | See comments | Since RAN2 has agreed to segmentation, we have a solution to SIB12 size. Given the limited time, we recommend not pursuing further optimizations at this point. Discussion of additional optimizations can be deprioritized until remaining open issues have been resolved.  |
| Futurewei | Low priority for Rel-16 | While we appreciate the downside of current SIB12 structure, we don’t think the limited time remaining in Rel-16 would afford us a thorough consideration in optimizing SIB12. We are, hence, only open to some low hanging fruit, i.e., some targeted, high impact (on size reduction) modification, if it can be agreed without consuming too much RAN2 time.Given the segmentation approach is supported for SIB12, further optimization of SIB12 can be postponed to Rel-17. Therefore, any effort on SIB12 optimization in Rel-16 should be of low priority. |
| Intel | Disagree | We tend to agree with the comments made by Ericsson and Qualcomm that since we already discussed and agreed to segmentation (even if it is subpotimal) and the fact that we have very little time to discuss detailed solutions, we can deprioritize optimization discussions to future releases |

# Options to reduce SIB12 size

The key IE impacting SIB12 size are SL-QoS-Profile-r16, sl-CBR-Priority-TxConfigList-r16 and sl-ThresPSSCH-RSRP-List-r16 etc. During offline discussion [1] there are several solutions are listed on the table and they are not exclusive with each other by the nature.

Option 1: To introduce table + index approach for e.g. SL-QoS-Profile-r16

Option 2: To adjust the granularity of value range for e.g. sl-GFBR-r16 and sl-MFBR-r16

Option 3: To modify the depth of the IE within ASN.1 structure e.g. to configure sl-CBR-Priority-TxConfigList-r16 and/or sl-ThresPSSCH-RSRP-r16 per cell IEs or per BWP or per frequency IE

Option 4: to preconfigure IE e.g. for SL-QoS-Profile-r16

Option 5: to preconfigure IE but with default value in case of absence in the SIB e.g. for SL-QoS-Profile-r16

All the solutions try to keep balance between signalling overhead and flexibility.

**Q2: Among listed 5 options, which option(s) do you prefer? Please also explain which IE(s) do you prefer for that selected option**

|  |  |  |
| --- | --- | --- |
| Company | preferred option(s) | Detail explanation |
| MediaTek | Versions of 1/3/5, with comment (apologies for length) | We have some doubts about option 2 because it reduces the signalling flexibility; it would be OK to investigate but may be difficult to agree in the limited time available. And we think option 4 is too dependent on predicting all possible service configurations; we should keep the ability to signal a “custom” configuration when needed.Regarding the problematic IEs one by one:* For SL-QoS-Profile-r16, we are not sure if it’s a huge problem in the SIB, because as noted by some companies previously, mode 2 operation for idle/inactive UEs cannot really support GBR services. We see some benefit in a table+index approach for this IE, but it may not be the most critical item.
* For sl-CBR-Priority-TxConfigList-r16 and sl-ThresPSSCH-RSRP-r16, it would be necessary to confirm with RAN1 if we can change these to be per cell/BWP/frequency. We assume companies will coordinate internally so that this issue is not a surprise to RAN1 and an understanding can be reached in the May meeting cycle. If the IEs cannot be raised to cell level, we see three options:
	+ Option 5 above, with preconfiguration as a default value and signalling the IEs when they need to be different from the default.
	+ Signal the IEs at cell level as default values, and include the whole IE per pool only when it diverges from the default value (like option 5, but with cell-level signalling instead of preconfiguration).
	+ Table+index approach: Signal a list of values for these IEs at cell level, and signal indices into the list per pool (option 1 described above).
* We should also look at SL-PSFCH-Config, a 275-bit string that needs to be included for each resource pool with PSFCH. This probably cannot be raised to cell level, but we could use a table+index approach. Furthermore, even though RAN1 described it as a fixed-length BIT STRING, we understand that it could be coded as variable length (1..275), since the number of PRBs used for PSFCH cannot be larger than the actual size of the pool. This would save significant overhead for smaller pools.
	+ Further optimisations for this IE could be considered, e.g. indicating a range of PRBs rather than a bitmap (but this assumes that the PRBs for feedback are always contiguous, which would require RAN1 to take the decision). As noted above, a table+index approach could be implemented, but it may have limitations for this IE, since pools of different sizes in the frequency dimension will never have the same string for the PRB bitmap.
 |
| Qualcomm | Option 1, 4, 5 | Of the suggested options, our preference is to allow pre-configuration. Option 3 is not extensible to future releases, given multiple frequencies may be supported. More generally, as RAN2 has agreed to support SIB12 segmentation, given the limited time remaining to close the release, we don’t think these optimizations need to be pursued at the present time.  |
| Futurewei | 1/3/5 | We don’t think it is wise to limit the signaling flexibility/granularity without comprehensive consideration, e.g., to consult other WGs by LS, which seems not feasible at the very late stage of Rel-16.This leaves elegant ASN.1 structure optimization as best possibility in Rel-16. This should be of low priority, and really straightfoward for easy agreement. |
| Intel | 4/5 | If we do need to make some optimizations, we think pre-configuration seems to be easiest to consider. Other solutions either require input from other WGs or require more extensive discussion. So, while we think at this stage that segmentation would have to suffice, if there is a majority support for performing further optimizations, pre-configuration can allow to alleviate some of the burden. |

# Conclusion

We have the following proposals:

[Proposal 1 xxx.](#_Toc39666495)

# Reference

[1] R2-2004075 [AT109bis-e][704][V2X] SIB12/28 (OPPO) OPPO

[2] R2-2002651 Open issues on system information OPPO

[3] R2-2002828 Further Discussion on RRC Remaining Issues CATT

[4] R2-2002652\_38331\_CRyyyy\_(REL-16)\_Correct to fix SIB12 size issue for NR V2X.docx OPPO