3GPP TSG RAN WG1 Meeting #101-e R1-200xxxx

e-Meeting, May 25th – June 5th, 2020

Agenda Item: 7.2.4.2.1

Source: Moderator (Ericsson)

Title: Thread 1 on Resource allocation for NR sidelink Mode 1

Document for: Discussion, Decision

# Thread 1

[101-e- NR-5G\_V2X\_NRSL-Mode-1-01] Email discussion/approval on remaining issues for dynamic and configured grant

* Dynamic grant: number of PUCCH resources per grant.
* Configured grant
  + Whether to use physical or logical slots.
  + Type-1: remaining details of frame indexing
  + Remaining details on HARQ process ID determination
* Processing times
  + Whether to support multiple UE capabilities or not and, if so, how many.
  + With lower priority, values for
    - PSCCH/PSSCH preparation time.
    - PSFCH to UL report time: working assumption (on N) and FFS (on X) from RAN1#100bis-e.
* Any issue related to this AI and the LS from RAN2 in [R1-2003256](file:///C:\Users\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2003256.zip).

By 6/1, with potential TPs by 6/4 – Ricardo (Ericsson)

## Q1. Dynamic grant: number of PUCCH resources per grant.

**Which of the following options is preferable:**

* **Opt. 1: One single PUCCH resource per DG, after the last granted resource (as indicated by PSFCH-to-PUCCH gap).**
* **Opt. 2: One PUCCH resource after each resource granted by the DG (as indicated by PSFCH-to-PUCCH gap).**

FL comments:

* The majority of companies have expressed their preference for Option 1 and consider Option 2 as an optimization.

Proposal:

* For a dynamic grant in Mode 1 when using SL HARQ feedback:
  + There is one PUCCH transmission occasion after the last resource in the set of resources provided by a dynamic grant.

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| **Company** | **Views** |
| Ericsson | Option 1. Introducing PUCCH further restricts the scheduling possibilities, which are already limited by the fact that the 1-3 resources must be within 32 slots.  The gNB can provide multiple DGs to have one PUCCH report per SL transmission. |
| Intel | Option 1. The single PUCCH resource can be allocated based on the indicated timing value and can accumulate the HARQ-ACK state available in this time instance, i.e. can report the result of all prior retransmissions.  It seems to us that Option 2 is an optimization. gNB can simply schedule one resource and wait for the feedback to allocate more resources. |
| NTT DOCOMO | Option 1. The single PUCCH resource after the last grant resource is enough.  Regarding option 2, even if PUCCH resource is provided per PSCCH/PSSCH resource, and NACK is received at the first PUCCH resource, what should gNB do? The UE still has further PSCCH/PSSCH resource to transmit the TB, then gNB does not need to provide new grant. That is, the NACK feedback is no gain. |
| OPPO | Option 2. UE can report ACK/NACK to gNB after per SL transmission. If ACK is received, gNB can have the flexibility to release or re-schedule the allocated resource for other purpose, resource efficiency can be improved. |
| CMCC | Option 1.  It can depend on gNB to schedule one, two or three resources and we share similar view with Intel that option 2 can be simply realized by scheduling only one resource using this grant and wait for SL HARQ feedback to determine whether additional resources needs to be allocated. |
| Apple | Option 1.  If sidelink HARQ-NACK is received for the initial PSSCH transmission, the report of sidelink HARQ-NACK to gNB does not necessarily trigger a new sidelink grant since the remaining PSSCH resources scheduled in the initial DCI can still be used for the sidelink retransmissions. |
| Sharp | Option 1.  We share similar thought with Intel, CMCC that option 2 can be realized by scheduling one SL resource and wait for the A/N.  There might be a typo in FL’s proposal “There is one PUCCH transmission occasion after the last resource in the set of resources provided by the dynamic grant”.  FL reply2:  That was a typo indeed. |
| Samsung | Option 2. UE transmits only 1 TB per DG, therefore once UE successfully transmits the TB, remaining resources scheduled by the DG will be wasted. It is beneficial to improve resource efficiency by support of releasing DG-scheduled resources with allocation of multiple PUCCH resources. |
| CATT | Supporting Option 1.  By knowing the maximum (re-)transmission number of a TB, UE can decide to report ACK/NACK on PUCCH. Each DG can schedule 1/2/3 SL transmissions. If gNB wants to have the real-time information on SL transmissions, it can schedule one transmission on SL each time. Furthermore, Option 1 is similar to CG that one PUCCH bit is reported after the last CG PSFCH reception in one period.  For option 2, the benefit is that gNB can have the real-time information of SL transmissions (1/2/3). The rest of the reserved resources can be released and scheduled to other TB as long as the gNB is informed with ACK on the PUCCH. However, there are some aspects needed to be considered. SL HARQ should be always enabled for each SL Tx. The SL transmissions should have to be separated with a time gap used for PUCCH reporting and waiting for potential new schedule signalling. It also requires frequent interaction between UE and Uu, which requires more PUCCH resources. |
| Huawei, HiSilicon | Opt. 2. “Early termination” behaviour has been supported in RAN2 spec, RAN1 should provide PUCCH resources after each SL transmission and associated PSFCH reception to make the whole function work well.  [HW, HiSi 2]  We are afraid current proposal cannot support the function has already specified in TS 38.321. As cited below, PSCCH duration(s) and PSSCH duration(s) for retransmission(s) are released when positive acknowledgement, i.e. ACK, is received. In this case, scheduled retransmission resource(s) will not be used by UE, however, if no PUCCH resource is provided after the SL transmission, UE has no way to report the release information to gNB. SL resources are wasted definitely.   |  | | --- | | **5.22.1.1 SL Grant reception and SCI transmission**  *if a configured sidelink grant is available for retransmission(s) of a MAC PDU which has been positively acknowledged as specified in clause 5.22.1.3.3:*  *3> clear the PSCCH duration(s) and PSSCH duration(s) corresponding to retransmission(s) of the MAC PDU from the configured sidelink grant.* |   On the other hand, companies comment that only single resource can be indicated and UE could wait for feedback. Actually, in our understanding it is not the initial motivation to schedule Nmax resources by one DCI. To achieve better scheduling efficiency and lower latency, more than one SL resources are scheduled by one DCI and based on this feature, PUCCHs resource can be allocated after each of them for having the potential SL resources release. |
| Spresdtrum | Option1.  Agree with Intel and CMCC. |
| MediaTek | Option 1.  Separate PUCCH resource for each granted SL resource seems like an optimization for resource efficiency by giving gNB the opportunity to release the rest of the SL resources after ACK is received. Option-2 is not needed. |
| Lenovo/MoTM | Support both options, since it is upto gNB configuration based on the availability of PUCCH resource.  For option 1 – It is very similar to CG  For Option 2 – Each of the resource indicated by DCI can be used for new TB based on the PSFCH feedback  RAN1 should define two different UE behavior for supporting option 1 and option 2. Additionally, for the first option 1 - UE can transmit new TB in the remaining resource if it receives early ACK in PSFCH. Additionally for option 2, ACK only PUCCH resource could be signaled in DCI as part of PUCCH resource optimization |
| vivo | Option1.  Agree with Intel and CMCC. Moreover, if option2 is allowed, gnb has to blind decode multiple PUCCH as it does not know which PUCCH will be transmitted. |
| ZTE, Sanechips | Option 1.  Option 2 has the additional issues and complexities on following:   * How to indicate multiple PUCCH resources; * How to arrange the timelines on Uu and SL for PUCCH and PSSCH/PSFCH. |
| Nokia, NSB | Option 1 |
| FUTUREWEI | Option 2 for similar reasons as Samsung |
| Qualcomm | Option 1. Only a single PUCCH resource is provided in a given DCI for Uu.  (we agree with the FL proposal) |

## Q2. Configured grant. Whether to use physical or logical slots.

**Which of the following options is preferable:**

* **Opt. 1: The formula for determining the resources for CG Type-1 uses logical slots.**
* **Opt. 2: The formula for determining the resources for CG Type-1 uses physical slots.**

FL comments:

* The views are split 50/50.
* On the other hand, the periodicity and reservation are configured and signaled in terms of ms. The editor can decide whether to use logical or physical subframes. It should result in the same behavior given a configured periodicity.

Proposal:

* It is up to the editor to decide whether to use logical or physical slots in the formula for determining the resources for CG Type-1.

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| **Company** | **Views** |
| Ericsson | Logical slots as not all physical slots will be available for SL |
| Intel | Our preference is to align periodic slots determination with Mode-2. I.e. even if Option 1 is selected, there should be additional conversion step from ms to logical slots of the resource pool.  Otherwise, resource pool sharing between M1 and M2 will be problematic due to different interpretations of the signalled periodicity. |
| OPPO | Logical slots should be used.   * For SL CG type-1, the parameter “sl-TimeResourceCG-Type1” which is used to configure the N resources per SL CG period reuses the same mechanism as “Time resource assignment” in DCI, where it is based on logical slots within the resource pool. * The SL CG resource is associated to a resource pool. It is natural that the parameters in determine the resources should be based on logical slots. |
| CMCC | The *periodicity* and *timeDomainOffset* aredefined in physical slots.  Similar view with Intel to achieve common design for both mode-1 and mode-2. Moreover, defining the periodicity in physical slots would accommodate the latency requirement of the packet better.  [CMCC 2]  Share similar view with HW and vivo that RAN1 needs to make a conclusion. |
| Apple | Option 1. Not all physical slots are available for sidelink transmissions. |
| Sharp | We support to use logical slots (Opt.1) and share similar thought with Apple, OPPO and Ericsson. |
| Samsung | Mode 2 AI is discussing the conversion of periodicity to logical slots in [Mode-2-04]. We think the conclusion can be reused in Mode 1 to achieve a unified solution. |
| CATT | Supporting Option 2.  In mode 1, the resources are allocated by gNB which is always considering time domain resources as in physical unit. Similar indication mechanism as mode 2 is supported in Mode 1, which will be beneficial in resource pool sharing between Mode 1 and Mode 2. The conversion from physical slot to logical slot can be done by UE. |
| Huawei, HiSilicon | Opt. 2. To accommodate with traffic periodicity and service requirements, physical slots are used to determine the resources for CG type-1.  [HW, HiSi 2]  Similar comments with Vivo, RAN1 should have a definite conclusion on this slot definition. |
| Spreadtrum | Option2.  First, It has also been agreed that the CG periodicities supported are the same as for periodic resource reservation in mode 2. Physical time is used as the unit of the periodic resource reservation which is determined based on the traffic type. So, if logical slot is used, the periodic of the CG and the periodic of traffic may not match.  Second, the “Resource reservation period” field in SCI 0\_1 use physical time, and any conversion from logical slots will bring extra workload inevitably.  Therefore, option2 is preferable. |
| MediaTek | Option-1  Logical slots preferable. |
| vivo | Option2.  We share the same view as Huawei, CMCC and Spreadtrum. Last meeting, we agreed CG period shall reuse the supported reservation period which are in units of ms. And the corresponding parameter SLPeriodCG in RRC has already been defined in ms. So, it is natural to determine CG resource based on physical time. Using logical slots not only requires additional spec efforts but also leads to inconsistency between mode-1 and mode-2. We prefer a common framework.  We prefer to make the decision in RAN1. If the decision is up to 321 editor, we need to tell them that result of converting a period provided by RRC into the logical unit may change over time.  FL reply2:  I am afraid we will not reach a consensus in RAN1. |
| ZTE, Sanechips | Option 2 (physical slot).  Option 2 can avoid the periodicity translation and keep the period of CG more closer to the actual traffic period. |
| Nokia, NSB | Option 1 – logical slots  In our understanding both mode 1 and mode 2 will use logical slots. |
| FUTURESWEI | Option 1: when not all the physical slots are available for SL, using physical slots may lead to some CG resources being outside of the resource pool |
| Qualcomm | We prefer Option 2 (Physical slots)  On the latest proposal, wouldn’t the editor need RAN1 to agree on a method to ensure that the result is the same? |
| LGE | We prefer logical slots to be used for the formula. A similar conversion rule is used in LTE-V2X, so the conversion from logical slots to ms is not a big issue. Note that in Mode 2, the relevant mechanism is currently discussed. If we use physical slots, the periodicity in the resource pool may not be guaranteed.  In this sense, logical slot needs to be used and we don’t think it’s an issue of editor’s choice. |

## Q3. Configured grant. Type-1: remaining details of frame indexing

**Regarding the remaining details of frame indexing for Type-1 configured grant:**

* **Which frame indexing should be used?**
* **How does it work for the asynchronous case if the gNB is aware of the timing difference between Uu and SL?**
* **How does it work for the asynchronous case if the gNB is not aware of the timing difference between Uu and SL?**

FL comments:

* Most companies propose to use SFN timing.
* The FL’s opinion is that the solution does not work for the asynchornous case if the gNB is not aware of the timing difference between Uu and SL.

Proposal:

* For configured grant type-1, SFN indexing is used.

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| **Company** | **Views** |
| Ericsson | In our view, a virtual frame indexing is necessary. The virtual frame indexing is given by the time reference This can be used in both cases.  For the asynchronous case if the gNB is aware of the timing difference between Uu and SL, both SFN and virtual indexing work fine. The gNB can keep track of the scheduling internally.  For the asynchronous case if the gNB is not aware of the timing difference between Uu and SL, SFN does not work well. The gNB cannot keep track of the scheduling. It is necessary to correct the grant with a term T\_TA/2, in the same way as for DG. |
| Intel | Agree with Ericsson’s arguments and conclusions. |
| OPPO | * In LTE-V2X SPS mechanism, there is no for SPS resources. We should follow legacy LTE-V2X mechanism.   Furthermore, according to 38.321-g00, a parameter ‘*timeReferenceSFN*’ is used to determine the UL CG resource, where   * + *timeReferenceSFN*: SFN used for determination of the offset of a resource in time domain. The UE uses the closest SFN with the indicated number preceding the reception of the configured grant configuration.   For SL CG type-1, the same parameter can be used to determine the SL CG resource, no necessary to introduce the parameter .   * For question 2 and 3, we think gNB should be aware the timing difference between Uu and SL. Otherwise, it is hardly for gNB to determine the SL transmission timing. Furthermore, it cannot determine the timing of PUCCH, which is determined by the time resource of PSFCH.   In LTE-V2X, it is also assumed that eNB should be aware of the timing difference between SL and Uu. This can be seen from the sync resource configuration, highlight part copied below. In NR-V2X, we can follow the same assumption. |
| CMCC | SFN is used for frame indexing and SL slots of SL CG is the first SL slot of the corresponding resource pool that starts no earlier than , where is the corresponding Uu slot index in the Nth periodicity.  In our view, gNB should know the timing offset between SFN and DFN to guarantee the understanding of resource pool configuration and SL resource scheduling is aligned between gNB and UE.  [CMCC 2]  Fine with the proposal and the clarification from HW. |
| Sharp | As summarized by FL, what really matters for this issue lies on whether gNB knows the timing difference. If gNB is aware of it, it doesn’t even matter which frame indexing is used, as either option would be common understanding for gNB and UE. If gNB is not aware of the timing difference, compensating the timing with ‘–T\_TA/2’ is not enough. The compensation of ‘–T\_TA/2’ is only to align to the DL timing at gNB. After UE determines CG resource(s) in SL carrier, with only ‘–T\_TA/2’, still it cannot reflect the timing difference which would mean neither SFN nor virtual index works. Hence, we suppose that to ensure the gNB get knowledge of the timing difference between SL timing and Uu timing is the foundation and accordingly SFN/DFN is enough.  Regarding the comments and proposal from FL, do we assume gNB knows the offset? Are we going to add some description into the specs that gNB knows the timing difference? How about the async case?  FL reply2:  My understanding is that we are not assuming anything and we are not capturing anything in the spec other than what is being agreed. |
| CATT | * SFN is used for frame indexing and SL slots in CG. * As it is analysed in our contribution, gNB should know the timing offset between SFN and DFN, and gNB knows this information indeed. With the asynchronization assumption, the timing mismatch between SFN and DFN will lead to time domain resources ambiguity when indicating PUCCH resources. |
| Huawei, HiSilicon | SFN is used to determine the slots for configured grant type 1.  For question 2 and 3, we share the similar understanding of OPPO and other companies, gNB should be aware of the time offset between Uu and SL.  [HW, HiSi 2]  We are fine with the proposal basically, but just one simple clarification that the CG SL slot within a resource pool is also determined as first SL slot after the Uu slot determined by the SFN? Because we have an FFS from previous meeting and we are not sure the relationship of it and this proposal.   |  | | --- | | Agreements:   * For dynamic grant and configured grant type-2, the slot of the first sidelink transmission is the in the first SL slot of the corresponding resource pool that starts not earlier than (working assumption for the formular) where TDL is starting time of the slot carrying the corresponding DCI, TTA is the timing advance value and *m* is the slot offset (based on the SL numerology) between DCI and the first sidelink transmission scheduled by DCI, Tc is as defined in 38.211, and Tslot is the SL slot duration.   + FFS the case of CG type 1   FFS the application of the above formula to cross-RAT scheduling. | |
| Spreadtrum | SFN should be used for Type-1 configured grant. And TX UEs do the actual SL transmissions by applying T\_TA/2.  For the asynchronous case, When the UE selects GNSS as the synchronization reference source, the DFN used for V2X sidelink communication is derived from the current UTC time, by the following formulae:  *DFN= Floor (0.1\*(Tcurrent –Tref–offsetDFN)) mod 1024*  *SlotNumber=* Floor *((Tcurrent –Tref–offsetDFN)\**2μ*)* mod *(*10*\**2μ*)*  *offsetDFN* is configured through RRC by gNB. So, we think that gNB knows the timing offset between SFN and DFN. |
| MediaTek | SFN is used for frame indexing. In our view, gNB needs to know the timing difference between Uu and SL for proper Mode-1 operation, as pointed out by several companies. |
| vivo | **Which frame indexing should be used?**  SFN is used for frame indexing. Similar to LTE SPS.  **How does it work for the asynchronous case if the gNB is aware of the timing difference between Uu and SL?**  In this case, gnb can coordinate the SL pool configuration and CG configuration, so it works properly as in the sync case  **How does it work for the asynchronous case if the gNB is not aware of the timing difference between Uu and SL?**  Same view as other companies, gNB needs to know the timing difference if CG type1 is configured, otherwise it does not know where the CG resource is. If gnb does not know where granted CG resource is, then resource allocated may not be appropriate and PUCCH reporting is broken.  If we assume the timing must be known to gnb in this case, I think we need to made a conclusion or to capture this in the spec.  FL reply2:  I don’t think we need to capture anything. If the timing is known then the gNB will be able to do some things and if it is not, it will not. |
| ZTE, Sanechips | ***For the 1st question***, we prefer to use SFN for frame indexing.  ***For the 2nd and 3rd questions***, in order to guarantee the common understanding of the resource timing between gNB and UE, the DFN of mode 1 UE can be derived from SFN, regardless whether gNB is aware of the timing difference between Uu and SL.  The mode 1 UE is synchronized to either gNB or GNSS. When synchronized to gNB, SFN is used as DFN; when synchronized to GNSS, according to current spec and agreements,  “*DFN= Floor (0.1\*(Tcurrent –Tref–offsetDFN)) mod 1024*  *SlotNumber=* Floor *((Tcurrent –Tref–offsetDFN)\**2μ*)* mod *(*10*\**2μ*)*”  We can see that the 1ms boundary is aligned between SFN and DFN , which makes it feasible for in-coverage UE, even when synchronizing to GNSS, to have its DFN number and slot number derived from SFN. In this way gNB and UE can have consistent understanding about the sidelink resource and the misalignment between SFN and DFN needs not to be considered any more. |
| FUTUREWEI | For Q1, in our view, there is no need to compensate for TA, and SFN can be used  In addition, in our view, the gNB is aware of the time offset between Uu and SL for proper operation |
| Qualcomm | We share the views that using SFN is sufficient and that the gNB should be aware of the timing difference.  (We’re ok with the proposal) |
| LGE | We cannot agree that gNB always knows the timing difference between UL and SL without additional e.g. feedback mechanism. In this sense, we should consider the asynchronous case and the solution would be to use a virtual frame. We propose the following.   * SFNv=0 is the earliest SL physical slot that is not earlier than SFN=0. * *timeDomainOffset=0* is the earliest SL logical slot that is not earlier than SFNv=0. * *periodicity* is the period in SL logical slot.   The actual SL transmission occurs at, where is the timing of the CG type-1 resource. |

## Q4. Configured grant. Remaining details on HARQ process ID determination

**Remaining details on HARQ process ID determination**

* FL proposal: discuss this together with the reply to the RAN2 LS. See Q8-1.

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| **Company** | **Views** |
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## Q5. Processing times. Whether to support multiple UE capabilities or not and, if so, how many.

**Do you think it is necessary to introduce different capabilities for the processing times used in Mode 1? If so, what should the different capabilities distinguish.**

**NOTE: This does not preclude nor mandate that different capabilities are defined for the processing times used in Mode 2.**

FL comments:

* Some companies what to distinguish between minimum PSFCH to UL report gap and minimum PDCCH-toPSCCH/PSSCH gap.
  + For the minimum PSFCH to UL report gap, all companies agree that no further values are necessary.
  + For the minimum PDCCH-toPSCCH/PSSCH gap, the majority of companies are supportive of having a single value.

Proposal:

* For the minimum PSFCH to UL report gap that the UE expects, no values other than Tprep (agreed in RAN1#100bis-e) are introduced.
* For the minimum PDCCH-to-PSCCH/PSSCH gap that the UE expects, a single value is introduced.

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| **Company** | **Views** |
| Ericsson | At this point a single capability seems enough. |
| Intel | First, we would lie to split discussion between Tprep already defined for PSFCH-to-PUCCH preparation and the processing/preparation time to be defined for PDCCH-to-PSCCH/PSSCH.  For the PSFCH-to-PUCCH in our understanding it may be dominated by PSFCH processing, which is the same for both Mode-1 and Mode-2. In Mode-2 this parameter would impact system performance, thus no need to have different capability between UEs.  For PDCCH-to-PSCCH/PSSCH, we consider the value very similar to UL N2, which has two different capabilities. It is straightforward to reuse these numbers in SL and provide possibility for faster dynamic SL scheduling with Cap#2. |
| NTT DOCOMO | Before answering this question, let me ask for clarification that which capability is the target. We cannot find any related capability in UE feature AI. Or the intention is to introduce one capability and to share it between mode 1/mode 2? Or same capability as Uu?  FL reply:  My understanding of the position of the proponents of having multiple capabilities is to have at least two possibilities for PDCCH-to-PSCCH/PSSCH |
| OPPO | Tends to agree with Intel’s analysis. The capability should be discussed for PDCCH-PSCCH/PSSCH, and PSFCH-PUCCH separately. For the former case, we can reuse N2 in NR Uu. Considering in general, vehicle has higher processing capability, we can support cap#2 in NR SL. For the latter case, we have agreed Tprep in last meeting, and only one capability is enough in NR SL. |
| Apple | A single UE capability is preferred. |
| Samsung | We prefer a single UE capability in this stage. |
| CATT | Agree with that the processing time for PDCCH-PSCCH/PSSCH and processing time for PSFCH-PUCCH should be discussed separately. |
| Huawei, HiSilicon | No need. Only UE capability 1 for processing times is supported. The motivation for having two different UE capabilities in NR Uu is to support self-contain cases and have a quick HARQ-ACK feedback to gNB. However, in SL, similar cases are not practical. The timing of SL HARQ-ACK information reporting to gNB is not only determined by processing time, but also the resource pool configuration, such as PSFCH periodicity, minimum time gap. Therefore, we cannot see the obvious motivation and significant benefits for supporting multiple UE capabilities. |
| MediaTek | Single capability is preferred. |
| Lenovo/MotM | A single UE capability is preferred |
| vivo | We prefer single capability for PSFCH-PUCCH processing. |
| ZTE, Sanechips | No strong preference. Either single capability or reuse the similar definition on Uu (as defined in 38.214 6.4). |
| Nokia, NSB | Single capability |
| FUTUREWEI | We prefer single capability |
| Qualcomm | We prefer to have a single capability  (ok with the proposal in general, but the gap value needs to be in ms or be SCS dependent if in slots) |

## Q6. Processing times. With lower priority, values for PSCCH/PSSCH preparation time.

**Do you agree to reuse the PUSCH preparation times from TS 38.214 Section 6.4 (capability 1, Table 6.4-1) for PSSCH preparation as in the following proposal.**

FL comments:

* One company raised the point that in 38.214 Section 6.4, the preparation time is given by the choice of that leads to the largest value. I think we should follow that approach here too.
* Leaving aside the issue of having multiple capabilities, which is under discussion, there are no fundamental objections. After concluding Q5, we can replace the FFS by a list of values (if multiple capabilities are supported) or remove it altogether.

Proposal:

* For dynamic grant in Mode 1, a UE does not expect to be scheduled to perform a SL transmission earlier than after the end of the scheduling PDCCH.
  + - is 10, 12, 23, and 36 for equal to 0, 1, 2, and 3, respectively.
      * FFS other values of based on the discussion on capabilities (Q5).
    - *µ* corresponds to the one of (*µDL*, *µSL*) resulting in the largest *Tproc.*
    - = 1
    - (parameters as defined in 38.211)

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| **Company** | **Views** |
| Ericsson | Agree |
| Intel | Given our answer in Q5, in addition to the provided N2 values we would like to support another capability which is 5, 5.5, 11 (for FR1) for 15, 30, 60 kHz respectively.  For , we see the motivation to set it at least to 1, since the first symbol can contain shared channel. However, it may need to be further increased e.g. by a 1-2 symbols in order to accommodate preparation of both PSCCH and PSSCH.  FL reply:  When proposing d2,1=1, my intention was to reuse the PUSCH preparation times when the first symbol does not carry DMRS. |
| NTT DOCOMO | We are OK to reuse N2.  BTW, Q6 is PSCCH/PSSCH preparation time and Q7 is PSFCH to UL report time, right?  FL reply:  See my reply to Q6 |
| OPPO | Agree. |
| CMCC | Agree. |
| Apple | Agree |
| Samsung | Agree |
| CATT | Agree. |
| Huawei, HiSilicon | Agree to reuse the PUSCH preparation time in NR Uu with capability 1 only. |
| Spreadtrum | Agree. |
| MediaTek | Agree. |
| vivo | Generally fine with the proposal. But we would like to ask for clarification: whether the effect of the -TA/2 compensation is included in the ?  BTW, I think the title of Q6 is wrong, this question is related to PDCCH-PSCCH/PSSCH processing, right?  FL reply:  On the first issue, my understanding is that everything is included.  On the second issue, I had mixed up the titles for Q6 and Q7. I have now corrected it. Thanks. |
| ZTE, Sanechips | Two comments.  1). The proposal seems to assume single capability is agreed in Q5. In case of two capabilities, we share the view from Intel to include {5, 5.5, 11}.  2). To follow the principle in 38.214 section 6.4, we think the reference SCS should be , or equivalently the whole formula is:  FL reply:  On the first comment, let’s discuss that under Q5. For the time being we keep the FFS.  On the second comment, you have a good point. Thanks. |
| FUTUREWEI | Agree with the proposal |
| Qualcomm | We agree with the proposal |
| LGE | It seems that there is a conflict between the part marked with cyan and the part marked with grey. In other words, if the part with cyan is agreed, could you clarify the reason why the part marked with grey (i.e., FFS point) is necessary?  Proposal:   * For the minimum PSFCH to UL report gap that the UE expects, no values other than Tprep (agreed in RAN1#100bis-e) are introduced. * For the minimum PDCCH-to-PSCCH/PSSCH gap that the UE expects, a single value is introduced.   Proposal:   * For dynamic grant in Mode 1, a UE does not expect to be scheduled to perform a SL transmission earlier than after the end of the scheduling PDCCH.   + - is 10, 12, 23, and 36 for equal to 0, 1, 2, and 3, respectively.       * FFS other values of based on the discussion on capabilities (Q5).     - *µ* corresponds to the one of (*µDL*, *µSL*) resulting in the largest *Tproc.*     - = 1     - (parameters as defined in 38.211) |

## Q7. Processing times. With lower priority, values for PSFCH to UL report time: working assumption (on N) and FFS (on X) from RAN1#100bis-e.

**Do you agree on confirming the working assumption below? What should the value of X be and why?**

Agreements:

* A UE does not expect to be scheduled to transmit the UL report corresponding to a PSFCH reception earlier than Tprep after the end of the PSFCH.
  + This includes the effect of time advance.
  + Tprep = (N+X) ∙ (2048+144) ∙ k ∙ 2 –μ ∙ T\_c where:
    - Working assumption: N is 14, 18, 28 and 32 corresponds to the SCS configuration μ of 0, 1, 2 and 3, μ = min(μ\_SL, μ\_UL)
    - k = T\_s / T\_c (parameters as defined in 38.211)
    - FFS X (including the possibility of value 0)

FL comments:

* There is no objection to confirming the WA.
* Most of the replies propose using X=0.

Proposal:

* Confirm the following working assumption from RAN1#100bis-e:
  + Working assumption: N is 14, 18, 28 and 32 corresponds to the SCS configuration μ of 0, 1, 2 and 3, μ = min(μ\_SL, μ\_UL)
* X=0 for the expression of Tprep agreed in RA1N#100bis-e under AI 7.2.4.2.1

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| **Company** | **Views** |
| Ericsson | The WA can be confirmed  X=0. X must be a fixed value so that the gNB and the UE have a common understanding of the minimum gap. |
| Intel | Agree to let X = 0 |
| NTT DOCOMO | Agree X=0.  Regarding N value, we are not sure why these values are valid. But if majority companies support the current values, then we are OK. |
| OPPO | Confirm the WA with X=0. |
| Apple | Confirm the WA.  The introduction of X is to allow UE a longer time to handle multiple PSFCH receptions. Hence, for a large number of PSFCH receptions, X can be 1.  We notice from RAN2 agreement that gNB does not know sidelink group size. Hence, we think X is set to 1 for sidelink groupcast, and X is set to 0 for sidelink unicast.  FL reply:  With the current agreements, the gNB has no means to tell if a grant (DG or CG) is used for a unicast or groupcast transmission. |
| Samsung | Confirm the WA with X=0. |
| CATT | Confirm the WA with X=0. |
| Huawei, HiSilicon | Confirm the work assumption with X equals to 0 or 1. Specifically, X is determined by the number of simultaneous PSFCH receptions in the last PSFCH slot associated with the PUCCH, which X can be 0 for and 1 for .  Take an example that total 20 UEs in a group, one UE may have to receive 19 PSFCHs in a PSFCH slot if GC HARQ option 2 is used. The number of PSFCH receptions could be multiple of 19 if PSFCH periodicity is larger than one. So it is necessary to give more time for UE to process SL HARQ-ACK and report to gNB when the number of PSFCH receptions are large.  FL reply:  With the current agreements, the gNB has no means to tell how the UE will use the grant. In light of this, we must consider the worst case scenario when agreeing to a value for Tprep.  [HW, HiSi 2]  We notice the group size conclusion from RAN2, however, we think somehow the number of PSFCH receptions can be derived by the UE capability reporting. If the UE has reported a capability with large number of PSFCH receptions, for example more than 30 PSFCHs in a slot, gNB could add more symbols on the preparation time and UE will also follow the same timing to report SL HARQ-ACK information to gNB. This will avoid potential problem when the “strong” capability UE to receive quite many PSFCHs in the same time. Therefore, the number of PSFCH receptions can be derived by the UE capability of 15-11 it reported, i.e. the N value, if UE reports a value larger than 30, X = 1. Otherwise, X = 0. |
| Spreadtrum | Agree X=0. |
| MediaTek | Confirm the WA. OK with X=0. |
| vivo | Confirm the WA with X=0. Gnb has no idea how large the group is and how many PSFCH will be received by the TX UE, it cannot adapt the timing indication to the changed requirement. And I think the title of Q7 is also wrong processing.  FL reply:  Yes, I had mixed up the titles for Q6 and Q7. I have now corrected it. Thanks. |
| ZTE, Sanechips | Agree to fix X to zero. |
| Nokia, NSB | Confirm; X=0 |
| FUTUREWEI | X=0 |
| Qualcomm | We agree that the actual processing time depends on the number of received PSFCHs. However, the gNB doesn’t know how many PSFCHs are received because it doesn’t know the group size, or even the cast type.  X should be a fixed value (could be directly incorporated into N). We’re ok with fixing X to either 0 or 1. |

## Q8-1. Any issue related to this AI and the LS from RAN2 in R1-2003256.

**Regarding the first action in the LS from RAN2 in R1-2003256, do you agree with the following conclusion:**

Proposed conclusion:

* RAN1 sees no problem in using the IIoT equation for HARQ process ID determination for NR sidelink with the following changes:
  + CURRENT\_symbol should be replaced by CURRENT\_slot
  + *periodicity* should be expressed in slots
* RAN1 will decide whether to include the potential agreements from Q2 and Q3 after concluding on these issues.
* RAN1 notes that the following agreement made in RAN1#100bis-e results in periodicities being configured in terms of ms:

Agreements:

• For CG, the periodicities supported are the same as for periodic resource reservation in Mode-2 (i.e., the list given by SL-ResourceReservePeriod-r16)

FL comments:

* The proposed conclusion is generally agreeable. However, the following points have been raised:
  + The slot determination in Q2/Q3 is related to this topic.
  + The periodicities supported for CG are expressed in terms of ms not in slots.
  + There is one concern with the applicability of the solution for the asynchronous case if virutal indexing is not usedin Q3.
* My suggestion would be to inform RAN2 about the agreements in Q2 and Q3 and also the agreement from last meeting.

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| **Company** | **Views** |
| Ericsson | We think that the conclusion is fine. However, it is necessary to clarify that CURRENT\_slot refers to the slot number using the indexing discussed in Q3. Without a virtual indexing, the the asynchronous case where the gNB is not aware of the timing difference between Uu and SL does not work. |
| Intel | Agree with the principle of the formula, i.e. same HARQ ID for slots within a configured grant period, with modulo operation over the number of configured HARQ processes, plus a configuration specific ID offset.  However, the slot determination in Q2 and Q3 needs to be carefully considered, i.e. same approach should be used to determine the range of slots with a given HARQ ID |
| OPPO | Agree with the principle of the formula. The parameter periodicity in the formula should be based on logical slots. The N (N = 1,2, or 3) resources within a SL CG period should have the same HARQ process number. The HPN of each SL CG resource is determined by the formula respectively. |
| CMCC | Generally fine with the conclusion with consideration of consensus of Q2/Q3. |
| Apple | We think the proposed conclusion is fine.  Since multiple configured sidelink grants are supported, the HARQ process ID offset per configured sidelink grant can be applied, similar to IIoT case. |
| Sharp | Agree with the formula in principle. Same as Q2, we propose to adopt logical slots within the resource pool for the formula. |
| Samsung | We agree with the principle of the formula. In addition, NR sidelink support allocation of up to 3 resources in one period per CG, and the up to 3 resources should use same HPN, similarly as the case of multiple transmission occasions in IIoT. |
| CATT | Agree with the conclusion with following clarifications:   * The “slots” used here is in logical or physical slots? It is related to Q2/Q3. |
| Huawei, HiSilicon | Agree to reuse the equation, but *periodicity* should be expressed in ms. According to the following agreements for the periodicity of configured grant made in RAN#100bis-e:  Agreements:   * For CG, the periodicities supported are the same as for periodic resource reservation in Mode-2 (i.e., the list given by SL-ResourceReservePeriod-r16)   The units of periodic resource reservation in Mode-2 is ms, same time unit is applied for HARQ process number dermination.  FL reply:  We can inform RAN2 of the agreement and they can do the translation.  [HW, HiSi 2]  So shall we simply change the second bullet from “in slots” to “in ms”? We think it would be more straightforward. |
| Spreadtrum | Agree with the conclusion. But periodicity should be expressed in physical slots. |
| MediaTek | Agree with the proposed conclusion. |
| vivo | The proposed conclusion is fine. |
| ZTE, Sanechips | Agree. *periodicity* should be further clarified (physical slot vs. logical slot) depending on outcome of Q2. |
| FUTUREWEI | Agree with the proposed conclusion |
| Qualcomm | We agree with the proposal in general. The periodicity could be expressed in ms or in physical slots (if the latter is agreed in Q2).  (we’re ok with the proposal) |
| LGE | Agree with the proposed conclusion, but we don’t think HARQ process ID offset for IIoT is necessary for SL. There is CG index for SL, which should be able to do the same role of HARQ process ID offset for IIoT.  We agree with the FL suggestion that the agreement on Q2/Q3 needs to be informed to RAN2. Regarding the agreement in the last meeting, it does not necessarily mean that the periodicity should be expressed in ms. Rather, I think the agreement means the both the periodicity and the reservation period are equivalent in effective value. |

## Q8-2. Any issue related to this AI and the LS from RAN2 in R1-2003256.

**Regarding the second action in the LS from RAN2 in R1-2003256, do you have any concern with the working assumption?**

FL comments:

* There are no concerns with having a common configuration for DG and CG.
  + Additional clarification: the LS from RAN2 was on distinction between DG and CG not Mode 1 and Mode 2. Somehow I got confused when writing this and no one noticed. I have now fixed it.
* Most companies think that the range should be configured independently for each MCS table.
* Given that this has RRC impact, we may consider replying to this part of the LS earlier.

Proposed conclusion:

* In the reply to the LS from RAN2 in R1-2003256, include the following text: ”RAN1 has no concern with having a common configuration for DG and CG type 1/2. However, RAN1 believes that it is necessary to define one range for each configured MCS table.”

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| **Company** | **Views** |
| Ericsson | We have no concern with having a common configuration for Mode 1 and Mode 2. However, we believe that it is necessary to define one range per MCS table. It is otherwise not possible to configure the restrictions in a meaningful way. |
| Intel | Agree with Ericsson |
| NTT DOCOMO | Agree with Ericsson. MCS range should be defined per MCS table. |
| OPPO | Agree with Ericsson |
| CMCC | Agree with Ericsson. |
| Apple | Agree with Ericsson. |
| Sharp | Agree with Ericsson. |
| Samsung | Agree with Ericsson. |
| CATT | Agree with Ericsson.  The MCS range should be defined per MCS table. |
| Huawei, HiSilicon | Agree with Ericsson. |
| Spreadtrum | Agree with the WA. |
| MediaTek | Agree with Ericsson. |
| vivo | Agree with Ericsson. |
| ZTE, Sanechips | No concern on the working assumption. |
| FUTUREWEI | Agree with Ericsson |
| Qualcomm | We agree that there should be a range defined per MCS table and that the same range could be used for both DG and CG.  However, the restriction applies only to Mode 1 and not Mode 2, per the agreement from RAN1 98bis:  Agreements:   * In Mode-1, for a UE, for each of the configured MCS tables (for both DG & CG):   + If no MCS is configured, UE autonomously selects MCS from the full range of values     - Up to UE implementation     - FFS details for the MCS table   + If a single MCS is configured, the MCS is used by the UE   + If a range of two or more MCSs are configured, UE autonomously selects the MCS from the configured values     - Up to UE implementation   (we disagree with the proposal. The question in the LS and the RAN1 are about DG and CG, not Mode 1 and Mode 2. We propose to update the wording as “There are no concerns with having a common configuration for configured grant type 1/2 and dynamic grant ~~Mode 1 and Mode 2~~.”)  FL reply2:  Yes, you are right. I got confused when preparing the summary. Somehow no one noticed until now. |
| LGE | We don’t think that RAN1 agreed that multiple MCS tables can be configured for a single Mode 1 grant. Is this correct understanding? |

## Q8-3. Any issue related to this AI and the LS from RAN2 in R1-2003256.

**Regarding the third action in the LS from RAN2 in R1-2003256, do you think that feedback should be conveyed to RAN2? If so, what feedback?**

FL comments:

* Most companies believe that there is no need to provide feedback to RAN2 on the third action.

Proposed conclusion:

* In the reply to the LS from RAN2 in R1-2003256, no feedback is provided on the third action.

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| **Company** | **Views** |
| Ericsson | No need for feedback |
| Intel | No need for feedback |
| NTT DOCOMO | No need for feedback |
| OPPO | The interpretation of the parameters, such as periodicity is based on logical slots within the resource pool that the SL CG is associated to, should be informed to RAN2.  FL reply:  RAN2 will have our agreements. It does not seem necessary to include them here too, does it? |
| CMCC | No need for feedback |
| Apple | No need for feedback |
| Sharp | No need for feedback |
| Samsung | No need for feedback |
| CATT | No need for feedback |
| Huawei, HiSilicon | No concern on the RAN2 work assumption. |
| Spreadtrum | No need for feedback |
| vivo | No concern on the RAN2 work assumption. |
| ZTE, Sanechips | No need for feedback. |
| FUTUREWEI | No need for feedback |
| Qualcomm | No need for feedback |

## Q9. Other issues.

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| **Company** | **Views** |
| Spreadtrum | For sidelink CG type-2 transmission, it has been agreed on how to determine the first slot, which is the first SL slot of the corresponding resource pool that starts not earlier than , and then the subsequent slots are derived accordingly. Since we propose to use physical slots as the unit of the periodicity, the subsequent slots should be derived based on the physical slot that starts not earlier than , rather than the first SL slot of the resource pool.  To be specific, for CG type-2, the first slot in each CG period is the first SL slot of the corresponding resource pool that starts not earlier than .  FL reply:  See m updated proposal for Q2/Q3. |
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