**3GPP TSG RAN WG1 #106-e R1-2108266**

**e-Meeting, August 16 –27, 2021**

**Source: Moderator (OPPO)**

**Title: Moderator summary for [106-e-NR-R17-Sidelink-02] Reply LS to R1-2106413**

**Agenda item: 8.11.1.1**

**Document for:** **Discussion and Decision**

Introduction

This document provides discussion on the following approved email thread as part of RAN1#106-e Release 17 SL enhancement WI discussion.

[106-e-NR-R17-Sidelink-02] Reply LS to [R1-2106413](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_106-e/Docs/R1-2106413.zip) (LS on time gap information in SCI, RAN2) by August 20 – Kevin (OPPO)

Collection of outcomes

To be collected once agreement / conclusion is reached.

Discussion on SL HARQ RTT timer based on time gap information in SCI

## Round 1

**Background**: According to the received LS in [1], RAN2 made the following working assumption in RAN2#113bis.

19: Working assumption: SL HARQ RTT timer can be derived from the retransmission resource timing when the SCI indicates a retransmission resource. FFS whether explicitly configured SL HARQ RTT timer may be still required. If big problem is identified next meeting, we can revisit it.

This working assumption was made based on the assumption that the RX UE can determine the time location of the next retransmission resource(s) of the TX UE (assuming that resource reserved by SCI is not reselected by the TX UE due to e.g. pre-emption/UL-SL prioritization) based on the “time resource assignment” field in SCI. In RAN2#114, some companies believed this is not feasible, while others believed that the network always guarantees that this is feasible. RAN2 would therefore like to ask RAN1.

**Q1**: For R17 SL DRX design, from RAN1 perspective, whether it is feasible for the Rx-UE to determine the time location of the next retransmission resource(s) of the TX UE (assuming that resource is not reselected by the TX UE) based on the “Time resource assignment” field in SCI?

Based on moderator’s reading of company views expressed in the submitted contributions [2-15], the following main points are summarized.

* There is a common understanding / opinion that the Rx UE is able to determine the time location of the next retransmission resource(s) of the Tx UE (assuming that resource is not reselected by the Tx UE) based on the “Time resource assignment” field in SCI, at least for the following cases when
  + Rx UE knows the Tx resource pool configuration of Tx UE, since the “Time resource assignment” field in SCI is used for sensing but not for Rx UE receiving of data, because sensing is performed on the Tx pool.
  + There is no uncertainty in the timing of a retransmission due to, e.g., no 2nd or 3rd resources indicated in SCI, or possible reselection due to pre-emption.
  + A one-to-one mapping relationship can be established between the Tx and Rx resource pool, such that the Rx UE is aware of the exact set of the sidelink slots in the resource pool used by the Tx UE.
* In [7/LGE], it was pointed out there are some error cases in which the “*sldrx-HARQ-RTT-timer*“ would not work and they should be addressed/resolved before RAN2’s working assumption can be confirmed. Based on moderator’s understanding, these error cases not directly concerning / relating to the question asked by RAN2, which is about the “Time resource assignment” in SCI. It is recommended that these error cases should be raised directly in RAN2 to find a solution.
* In [15/Nokia, Nokia Shanghai Bell], it was pointed out when there is a many-to-one mapping of two or more TX pools to the RX pool, it is feasible for the Rx-UE to determine an earliest possible time location of the next retransmission resource(s) of the TX UE (assuming that resource is not reselected by the TX UE) based on the “Time resource assignment” field in SCI.

Then based on the above summary / observations, it is moderator’s opinion recommending to respond to RAN2 that it is it is feasible for the Rx-UE to determine the time location of the next retransmission resource(s) of the Tx-UE based on the “Time resource assignment” field in SCI under certain conditions. Please review the following proposed response and provide suggestion/modification (if any).

**Proposed response to Q1: In RAN1’s opinion, it is feasible for the Rx-UE to determine the time location of the next retransmission resource(s) of the Tx-UE based on the “Time resource assignment” field in SCI when the following conditions are met.**

* **A one-to-one mapping relationship between the Tx and Rx resource pools can be established, such that the Rx UE is aware of the exact set of the sidelink slots in the resource pool used by the Tx UE. This also implies that the Rx-UE knows the Tx resource pool configuration of the Tx-UE.**
* **There is no uncertainty in the timing of a retransmission due to, e.g., no 2nd or 3rd resources indicated in SCI, possible reselection due to pre-emption, or dropping SL retransmission(s) due to prioritization.**

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| --- | --- |
| **Company** | **Comments (suggestion/modification)** |
| vivo | Here are some comments:   1. The 1st condition seems to be misleading, e.g., implying that it is a special case. Actually, in the case of PSFCH is configured, the one-to-one mapping between Tx and Rx pools is the prerequisite, not an additional condition. On the other hand, even if PSFCH is not configured, many-to-one mapping can be supported only if almost all the parameters for the Tx and Rx resource pools (except the time domain bitmap) are the same, e.g., PSCCH (same MCS table, reserve bits, DMRS scrambling, …), 2nd SCI (alpha/beta for 2nd SCI, PTRS, xOverhead, …), PSSCH (RB, subchannel configuration, etc.), otherwise the Rx decoding would fail. Therefore, in NR, it is obvious that many-to-one mapping is actually a corner case, especially considering that HARQ feedback is the important and mandatory NR feature. 2. The 2nd bullet is not needed, because in the question RAN2 already clearly states that the assumption is “resource is not reselected by the TX UE”. |
| Xiaomi | From our understanding, “**A one-to-one mapping relationship between the Tx and Rx resource pools can be established**” does not include all the feasible cases. For example, even if there is many-to-1 mapping between Tx and Rx pool (e.g. when there is no PSFCH), if the Rx UE knows the configuration of each Tx pool, the Rx UE can still determine the time location of next transmission of Tx UE. Therefore, the 1st condition is suggested to be revised as:   * **The Rx UE is aware of the exact set of the sidelink slots in the Tx resource pool used by the Tx UE, e.g. when there is a one-to-one mapping relationship between the Tx and Rx resource pools, or when the Rx-UE knows the Tx resource pool configuration of the Tx-UE.**   We agree with vivo that the second bullet is not necessary as RAN2 has clearly precluded the case of resource reselection in the question. |
| Sharp | We share similar views as vivo and propose to remove the two conditions.  Besides, in 38.321, sub-clause 5.22.2.1, for SCI reception  The MAC entity shall:  1> for each PSCCH duration during which the MAC entity monitors PSCCH:  2> if a 1st stage SCI has been received on the PSCCH:  3> determine the set of PSSCH durations in which reception of a 2nd stage SCI and the transport block occur using the received part of the SCI;  It seems the RX UE is able to determine the time location of the retransmission resources, i.e. PSSCH durations. Thus, in our understanding, no conditions are needed. |
| ZTE,Sanechips | Perhaps a simplified version for the response is 'Yes'. Other than the conditions mentioned by FL, we have mentioned in our contribution R1-2108076 the following two cases when the resolution of the retransmission occasions from Rx perspective is necessary, yet it seems not easy to accommodate all conditions in a mutually exclusive way.   * When the inter-UE coordination is enabled. * When SL HARQ is enabled. |
| Panasonic | We support the main bullet and the 1st sub-bullet. The 2nd sub-bullet is not necessary |
| Lenovo&MM | We think we should directly reply to the LS, i.e., it is feasible or not. We don’t need to discuss any additional case, which is not mentioned in current LS.  So we support the main bullet as the proposal:  **In RAN1’s opinion, it is feasible for the Rx-UE to determine the time location of the next retransmission resource(s) of the Tx-UE based on the “Time resource assignment” field in SCI ~~when the following conditions are met.~~** |
| Apple | We agree with the main proposed response.  We think the second sub-bullet is unnecessary since the main bullet already covers the retransmission time resources.  Regarding the first sub-bullet, we agree with vivo that the one-to-one mapping between Tx resource pool and Rx resource pool is the general case, while the many-to-one mapping is the corner case. We are fine not including the first sub-bullet in the reply, as it was not asked by RAN2. |
| Qualcomm | Knowing where a retransmission, and a new TB for periodic reservations, is going to arrive is a very important part of ensuring that NR sidelink works correctly. Otherwise, the reservation-based system breaks and RAN1 has worked extensively on minimizing the cases where a reservation is changed.  We share the view that RAN1 should reply directly to the RAN2 question and not add details that RAN2 did not request. We support the wording proposed by Lenovo, removing the sub-bullets, or even a simple ‘yes’ as commented by ZTE. |
| Ericsson | We are OK with the proposed response to Q1 without the two sub-bullets.  In our view, it is only needed to respond whether it is feasible to obtain the timing from SCI without any extra explicit signalling. From RAN1 perspective the SL HARQ RTT parameter can be derived by using the corresponding frequency and time fields included in the 1st stage SCI. The corresponding fields include information about the time/frequency resources used by the current TB as well as information for the time/frequency resources to be used by up to 2 further retransmissions of the TB. |
| InterDigital | We support the proposal in principle but the list of conditions doesn’t need to be included in the reply LS as it is not even asked by RAN2. We can simply answer that it is feasible, and it was the intended design in Rel-16. |
| Samsung | We are O.K the main bullet and the 1st sub-bullet. However, the 2nd sub-bullet is not necessary. As commented by many companies, further simple answer by using the main bullet is O.K for us. |
| NTT DOCOMO | Agree with companies, i.e. OK without the two sub-bullets.  It seems that RAN2 understands the 2nd sub-bullet’s intention, based on ‘(assuming that resource is not reselected by the TX UE)’ in the question. The sub-bullet would be unnecessary. |
| CATT, GOHIGH | We propose to remove the first condition and keep the second.  In our view, “**A one-to-one mapping relationship between the Tx and Rx resource pools”** is not a condition, but a fact. Considering the higher-layer parameter *sl-DMRS-ScrambleID* is configured per SL resource pool, the Tx and Rx resource pool must always be one-to-one mapping. Otherwise, PSCCH cannot be decoded successfully due to the various understanding between Tx UE and Rx UE on the DMRS sequence, which is uniquely identified by the *sl-DMRS-ScrambleID*. Thus, the first condition is not needed.  For the second condition, we think the clarification given by FL is indeed needed here. In Q1, RAN2 just assumed that **resource is not reselected by the TX UE**. However, there are others cases that the timing of a retransmission is uncertainty, e.g., the SCI does indicate the next retransmission resource(s). Hence, the second condition here is necessary.  Furthermore, from RAN1’s perspective, the SCI-derived SL HARQ RTT timer may lead to some potential problems. For example, in pre-emption enabled scenarios, if pre-emption occurs and the reselected resource is in the SL HARQ RTT timer running duration (i.e. DRX inactive time) of the Rx UE, packet loss will occur. Therefore, we propose to revise the response as follows:  **In RAN1’s opinion, it is feasible for the Rx-UE to determine the time location of the next retransmission resource(s) of the Tx-UE based on the “Time resource assignment” field in SCI when the following condition~~s are~~ is met.**   * **~~A one-to-one mapping relationship between the Tx and Rx resource pools can be established, such that the Rx UE is aware of the exact set of the sidelink slots in the resource pool used by the Tx UE. This also implies that the Rx-UE knows the Tx resource pool configuration of the Tx-UE.~~** * **There is no uncertainty in the timing of a retransmission due to, e.g., no 2nd or 3rd resources indicated in SCI, possible reselection due to pre-emption, or dropping SL retransmission(s) due to prioritization.**   **RAN1 respectfully ask RAN2 to further consider a configured SL HARQ RTT timer at least for cases where there is some uncertainty in the timing of a retransmission.** |
| Huawei, HiSilicon | The two sub-bullets are miss-leading and not needed.   * First sub-bullet: It should be noted that sidelink communication is performed on resource pool basis, where transmission in a TX pool and reception in a RX pool. The TX and RX resource pool alignment (not only on time-freq resources, e.g.  how many subCHs, size of subCH, etc., but also on transmission parameters, e.g. PSSCH symbol length, DMRS pattern, PSFCH duration, etc.) is ensured by network configuration/pre-configuration in order to support sidelink communication between UEs. So it is questionable to use the sub-bullet as a prerequisite for sidelink communication, which is already guaranteed by network or pre-configuration. * Second sub-bullet is already excluded in the RAN2’s question “*(assuming that resource reserved by SCI is not reselected by the TX UE due to e.g. pre-emption/UL-SL prioritization)*”, so no need to include it as a condition.   We share the views that RAN1 should focus on what RAN2 asked and answer the question blow directly,  *Q1: For R17 SL DRX design, from RAN1 perspective, whether it is feasible for the Rx-UE to determine the time location of the next retransmission resource(s) of the TX UE (assuming that resource is not reselected by the TX UE) based on the “Time resource assignment” field in SCI?*  The answer is Yes, given that Rel-17 will reuse Rel-16 first stage SCI signalling, including time resource indication, such that a RX UE can know the position of retransmission upon detection of the first stage SCI (assuming that resource is not reselected by the TX UE). |
| Fujitsu | We agree the main bullet.  And for the 1st sub-bullet, we agree Vivo’s view that the one-to-one mapping b/w Tx resource pool and Rx resource pool should be a prerequisite. For instance, the main bullet and the 1st sub-bullet are the fundamental working principle for NR sidelink, without them, there will be potential misalignment b/w UEs about the resource reservation, which may cause the UEs cannot perform sensing, reception and HARQ-ACK feedback correctly.  The 2nd sub-bullet is not required since RAN2 has already put the assumption of “no uncertainty” in the question. |
| Spreadtrum | We should only response to what RAN2 asked. So we support the main bullet without the two sub-bullets. |
| OPPO | In our view, if we only reply “yes” to RAN2, the RAN2 colleagues may misunderstand that Rx UE is able to determine the time location of re-transmission by “time resource assignment” field in all cases and scenarios. Actually, Rx UE cannot derive the time location of re-transmission resources without the knowledge of Tx pool. Therefore, we propose to keep the conditions at least in the first bullet in the proposed response.  In addition, the one to one mapping relationship between Tx pool and Rx pool is just one of the cases that the knowledge of Tx pool can be achieved by RX UE and other cases like network configuration are precluded by the first condition, so we suggest to rephrase the first condition as:   * **The Rx UE is aware of the exact set of the sidelink slots in the resource pool used by the Tx UE, e.g. the one-to-one mapping relationship between the Tx and Rx resource pools can be established.**   Finally, we also propose to add a note that the first condition is not always applied from RAN1’s perspective. For example, Tx pool A and Tx pool B with same parameters except the bitmap indicating the slots belong to each Tx pool and the two Tx pools map into one Rx pool. |
| Sony | We are OK with the simple answer, i.e. main bullet without two sub-bullet. We can directly answer to the RAN2 question on whether it is feasible. |
| LG Electronics | We also oppose simply answering “Yes” to RAN2’s question, and RAN1 should inform RAN2 under what conditions it is feasible for RX UE to determine the time location of next retransmission resource(s) of TX UE (assuming that resource is not reselected by the TX UE) based on the “Time resource assignment” field in SCI. Otherwise, as already commented by OPPO, a problem will arise in which RAN2 considers that such an assumption holds true in all cases/scenarios and proceeds with SL DRX design.  We would like to emphasize that according to the current specification, if RX UE does not have the knowledge about TX UE’s resource pool, it cannot derive the exact set of SL slots in the resource pool used by TX UE.  Therefore, our proposal is as follows. Note that only one-to-one mapping relationship between TX pool and RX pool cannot always guarantee that RX UE is aware of the exact set of SL slots in the resource pool used by the TX UE.   * *In RAN1’s opinion, it is feasible for the Rx-UE to determine the time location of the next retransmission resource(s) of the Tx-UE based on the “Time resource assignment” field in SCI when the following condition is met:* * *The Rx UE is provided with information of the exact set of the sidelink slots in the resource pool used by the Tx UE.* |
| Nokia, NSB | The first sub-bullet, possibly with some refinement as proposed by LG and others, is required in our view; answering just “yes” would be misleading, since in Rel-16 it is not required than an RX UE (which does not need to perform sensing in a pool configured as RX pool) be able to determine the slot of the next ReTX, and a mapping of multiple TX pools to a single RX pool is therefore possible (provided all pool parameters apart from bitmap are identical and PSFCH is not configured). |
| MediaTek | We prefer to send a simpler answer. We can include the main bullet without the conditions in our reply; or we can simply respond ‘yes’. |
| Intel | We would like to point out another possible situation when the retransmission resource does not match to what was signalled in prior SCI.  According to agreements and MAC specification, a UE should select retransmission resources so that they can be reserved by a prior SCI. This in general eliminates almost all cases (except pre-emption and prioritization) when the retransmission resource is unknown from a prior SCI. However, it was also agreed and captured in MAC specification, that if a UE could not find such a retransmission resource, this condition can be violated. In particular, there could be either no further resource reserved by an SCI, or there could be additional resource inserted between reserved resources.  3> if one or more HARQ retransmissions are selected:  4> if there are available resources left in the resources indicated by the physical layer according to clause 8.1.4 of TS 38.214 [7] for more transmission opportunities:  5> randomly select the time and frequency resources for one or more transmission opportunities from the available resources, according to the amount of selected frequency resources, the selected number of HARQ retransmissions and the remaining PDB of SL data available in the logical channel(s) allowed on the carrier by ensuring the minimum time gap between any two selected resources in case that PSFCH is configured for this pool of resources, and that a retransmission resource can be indicated by the time resource assignment of a prior SCI according to clause 8.3.1.1 of TS 38.212 [9];  5> consider a transmission opportunity which comes first in time as the initial transmission opportunity and other transmission opportunities as the retransmission opportunities;  5> consider all the transmission opportunities as the selected sidelink grant;  3> else:  4> consider the set as the selected sidelink grant;  3> use the selected sidelink grant to determine PSCCH duration(s) and PSSCH duration(s) according to TS 38.214 [7].  NOTE 3B: If retransmission resource(s) cannot be selected by ensuring that the resource(s) can be indicated by the time resource assignment of a prior SCI, how to select the time and frequency resources for one or more transmission opportunities from the available resources is left for UE implementation by ensuring the minimum time gap between any two selected ‎resources in case that PSFCH is configured for this pool of ‎resources.  In the figure below we illustrate potential case allowed by specification. Here the UE at t1 decided to transmit resource r0 and reserve resource r1, while resource r2 is pre-selected. At time t2, the UE re-evaluates resource r2, and due to identified resource set properties can only select a new resource between r0 and r1, in r2’. The new resource r2’ will be the next retransmission resource instead of resource r1. Note, re-evaluation before r1 is allowed and is up to UE implementation.    In summary, before positively answering the LS question, we would like to discuss companies understanding about the example above. If the example above is valid, we would like to either add it to the exceptions, or to fix this behaviour by specification. |
| Futurewei | We are ok with the simple answer without the conditions in the subbullets. As the question from RAN2 is on SL HARQ timer, for HARQ case, the TX and RX resource pool alignment is prerequisite for the PSFCH configuration/resource mapping. Therefore, the first sub-bullet is not necessary. The second subbullet is unnecessary as RAN2 already excludes the case of resource reselection in the question. |
| Convida Wireless | We are fine with the main bullet in the proposed response. We may not need to provide further details for the response in this reply LS. The sub-bullets under the main bullet may not be necessary at this point. |

## Round 2

Moderator’s response based on Round 1 comments:

* The original intention of the proposed response in round 1 is to take into consideration of all points raised in the submitted Tdocs. Admittedly, the condition listed in the second bullet is already eliminated in the RAN2’s original LS (i.e., out of scope for consideration).
* For the first bullet in the proposed response, it seems like many companies think it is also unnecessary or even wrong, and that it should be removed. On the other hand, there are also companies thinks there are exceptional cases when the Rx-UE cannot reliably determine the time location of the next retransmission resource(s) based on the “Time resource assignment” field in SCI. As the moderator, I would like to be sure that the answer response we give to RAN2 is technically correct and considered its potential impact. That is, let me start with some background understanding of so called “one-to-one”/ “many-to-one” mapping relationship between Rx and Tx resource pools.
  + In LTE sidelink, one of main reasons why Rx and Tx pools are separately configured was due to the support of many-to-one resource pool mapping. That is, a Rx pool can contain / cover multiple Tx pools, for example, in inter-cell and partial coverage SL communications such that different cell could configure its own Tx pool, and a Rx pool of a cell can cover Tx pool of its own cell and a Tx pool of a neighbour cell for reception. These Tx pools could be TDM’ed, completely orthogonal or partially overlapped. As one can imagine, the same configuration manner can be applied in partial coverage case for IC and OOC UEs to communicate with each other without Tx interference. Even within a same cell, a Rx pool can be configured to cover Mode 1 and Mode 2 Tx pools for SL UEs to receive all transmissions.
  + In NR sidelink, this separation of Rx and Tx pool configuration is retained for the same purpose of supporting many Tx pool to one Rx pool mapping. For example, one Tx pool can take the odd number of slots and another Tx pool takes even number of slots, and a Rx pool covers both. In this case, a time resource assignment indicating the next resource is 3 slots away in a Tx pool, but in fact it is 6 slots away in the Rx pool. In 38.331, up to 16 ~~T~~Rx pools with only 8 ~~R~~Tx pools can be configured. So one-to-one mapping relationship is not always assumed. Having said this, if many-to-one mapping relationship should be supported and configured in a deployment (e.g., without PSFCH resources configured), all Tx parameters mentioned in many of above responses should be aligned between the Tx and Rx pools.
  + Furthermore, the time and frequency resource assignment fields in 1st stage SCI are only meant for the purpose of sensing in a Tx pool. Note that, UE performs the sensing operation only on a Tx pool indicated by the UE higher layer. For data reception, a Rx UE receiving SL transmissions should only rely on source ID, destination ID and HARQ process number in 2nd stage SCI in order for the Rx UE to perform receiver combining during decoding. Since reserved resources can always be re-selected, the Rx UE cannot rely on 1st stage SCI for data reception.
  + Therefore, it is moderator’s understanding that if we provide a simple response answer to RAN2 containing just a ‘yes’ or ‘it is feasible…’, it implies that one-to-one mapping relationship between Rx and Tx pool is always assumed / valid. To this end, I have provided two options of possible response answer to RAN2 below. Please indicate which one is your choice and feel free to make suggestion for modifications.
  + @Intel, regarding the provided example in your Round 1 response, I believe this fall under the category of a resource being re-selected, which has already been covered as an exceptional case in RAN2’s LS. Let’s hear views from others regarding this.

**Proposed response to Q1 (II):**

* + - * **Option 1: In RAN1’s opinion, it is feasible for the Rx-UE to determine the time location of the next retransmission resource(s) of the Tx-UE (assuming that resource is not reselected by the TX UE) based on the “Time resource assignment” field in SCI.**
      * **Option 2: In RAN1’s opinion, it is feasible for the Rx-UE to determine the time location of the next retransmission resource(s) of the Tx-UE (assuming that resource is not reselected by the TX UE) based on the “Time resource assignment” field in SCI with an assumption that the Rx-UE has sufficient knowledge on the slot configuration information of the Tx pool (e.g., a one-to-one mapping relationship between the Tx and Rx pools can be established).**

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| **Company** | **Option 1 or 2** | **Comments (suggestion/modification)** |
| OPPO | Option 2 | As commented in Round 1, if we simply make a response “yes” to RAN2, that will lead to the misunderstanding that it is feasible to derive the time location of re-transmission resources from “Time resource assignment” field in all cases. In addition, the many to one mapping relationship between Tx pools and Rx pool is allowed when multiple Tx pools are configured with same parameters except the bitmap indicating the set of sidelink slots. In our view, it is not a corner case. Therefore, our preference is Option 2. |
| Xiaomi | Option 2 | We share the view as OPPO, and we also do not think multiple Tx pools sharing the same Rx pool is a corner case. This kind of configuration is allowed in the current specification. Compared with opiton2, option 1 only provides partial facts, which would be misleading. |
| Ericsson | Option 1 | We should simply provide the answer to the question by RAN2 and not discuss any extra cases. |
| Lenovo&MM | Option 1 |  |
| Panasonic | Option 2 |  |
| CATT, GOHIGH | Option 1 with comments | We admit that RAN2’s original LS has already eliminated the cases related to the resource reselection of TxUE. However, in our view, RxUE can determine the time location of the next retransmission resource(s) based on the SCI indication, only if **there is no uncertainty in the timing of a retransmission,** which is provided by FL in round 1, instead of **resource is not reselected by the TX UE**, which is captured in Q1 from RAN2.  As mentioned by Intel and our discussion paper([R1-2106923](file:///C:\3GPP\RAN1_Meetings\Tdocs\2021\R1-2106923.zip)), the MAC specification has already captured the following note which indicates there are indeed some cases that the retransmission resource cannot be indicated by a prior SCI.   |  | | --- | | NOTE 3B: If retransmission resource(s) cannot be selected by ensuring that the resource(s) can be indicated by the time resource assignment of a prior SCI, how to select the time and frequency resources for one or more transmission opportunities from the available resources is left for UE implementation by ensuring the minimum time gap between any two selected ‎resources in case that PSFCH is configured for this pool of ‎resources |   According to our understanding, except for re-selection, the above mentioned case may also occur due to the lack of candidate resources that the Tx UE can only select a retransmission resource which is beyond the indication scope of the prior SCI (i.e. 32 slots). Thus, in order to make the answer more accurate, we suggest adding back the original second sub-bullet. The revised option 1 is as follows:   * + - * **Option 1: In RAN1’s opinion, it is feasible for the Rx-UE to determine the time location of the next retransmission resource(s) of the Tx-UE (assuming that resource is not reselected by the TX UE) based on the “Time resource assignment” field in SCI when the following conditions is met.**       * **There is no uncertainty in the timing of a retransmission due to, e.g., no 2nd or 3rd resources indicated in SCI, possible reselection due to pre-emption, or dropping SL retransmission(s) due to prioritization.** |
| Intel | Comments | We still think our example is valid and is not covered by RAN2 exceptional cases. The example can be classified as part of re-evaluation, and it is not caused by re-selection of already reserved resource by pre-emption or prioritization.  Note, RAN2 LS text is highlighted below:  This working assumption was made based on the assumption that the RX UE can determine the time location of the next retransmission resource(s) of the TX UE (assuming that resource reserved by SCI is not reselected by the TX UE due to e.g. pre-emption/UL-SL prioritization) based on the “time resource assignment” field in SCI. In RAN2#114, some companies believed this is not feasible, while others believed that the network always guarantees that this is feasible. RAN2 would therefore like to ask RAN1  In the provided example from Round 1, the initially considered ReTX resource r1 is not reselected, but a new resource r2’ is added before it.  Considering the example from Round 1 is valid, the answer to LS should be ‘it is not feasible’. Alternatively, specification can preclude the mentioned example, and then it becomes ‘feasible’. |
| vivo | Option 1 | We think option 1 is simple and good enough, while option 2 still seems to not reflect the discussion.  Regarding the usage of multiple TDM Tx pools having (almost) same configuration, it is essentially a semi-static manner of resource partition. The investigation in Rel-16 shows that the performance is worse than dynamic resource sharing in an aggregated pool. Thus, we still think this is a corner case.  If further clarification is needed, maybe the following one is better:  Option 3: In RAN1’s opinion, it is feasible for the Rx-UE to determine the time location of the next retransmission resource(s) of the Tx-UE (assuming that resource is not reselected by the TX UE) based on the “Time resource assignment” field in SCI with an exceptional case when the Rx UE does not have sufficient knowledge on the Tx pool. |
| LG Electronics | Option 2 with modification | First of all, in terms of understanding the current specification, we share the same view with OPPO.  For Option 1, we would like to emphasize that there is no way in the current specification for the Rx UE to be always aware of the exact set of the sidelink slots in the resource pool used by the Tx UE. This is very clear fact. Then we really don’t understand why RAN1 has to simply answer RAN2 that it is feasible for the Rx UE to determine the time location of the next retransmission resource(s) of the Tx UE (assuming that resource is not reselected by the Tx UE) based on the “Time resource assignment” field in SCI.  Regarding the current version of Option 2, the wording of “one-to-one mapping” itself does not mean that the Rx UE is aware of the exact set of the sidelink slots in the resource pool used by the Tx UE. In this sense, it would be better to remove the example in parentheses. Also **even if Rx UE has the knowledge on the information of Tx UE’s pool configuration, all problem are not solved**. **This is because DFN/SFN index used for applying the bitmap of pool could not be aligned between Tx UE and Rx UE** (e.g., when Tx UE and RX UE have different sync sources, the timing of frame/slot boundary could be aligned between Tx UE and Rx UE, but the DFN/SFN index may not). Considering this aspects, our suggested modification is as follows:   * ***In RAN1’s opinion, it is feasible for the Rx-UE to determine the time location of the next retransmission resource(s) of the Tx-UE (assuming that resource is not reselected by the TX UE) based on the “Time resource assignment” field in SCI with an assumption that the Rx-UE has knowledge on the information of the set of the sidelink slots in the resource pool used by the Tx UE.*** |
| InterDigital | Option-1 |  |
| Nokia, NSB | Option 2 | LGE’s modified Option 2 is also acceptable.  As discussed in the previous round, we don’t think that the simple answer “feasible” as in Option 1 is correct; whether it is feasible depends on RX UE’s knowledge of TX pool configuration. |
| Apple | Option 1 |  |
| Sony | Option 2 |  |
| NTT DOCOMO | Option 1 | Simple answer is much better. At least the current option 2 is a bit lengthy and might lead to misreading. vivo’s Option 3 is better if the information is really needed. |
| Sharp | Option 1 | In Rel16 NR V2X, RX UE is able to determine the time domain location of PSFCH defined on top of TX pool, which leads to interpretation that RX UE is able to determine the slots of the TX pool and accordingly the TRIV field. Note that no such channel like PSFCH is specified in LTE V2X.  As for LGE’s comments that “SFN/DFN index can be not aligned”, we wonder if two resource pools are both configured with PSFCH and with the same periodicity(as OPPO mentioned, same configuration except for the time domain bitmap), the PSFCH periodicity of the RX pool cannot be determined, since it may already be not periodic resources any longer. |
| Futurewei | Option 1 | The configuration and alignment of Tx pool and Rx pool are necessary for the Rx-UE to receive the data on the physical resources. Option 1 is a simple reply to RAN2’s questions. If most companies have concerns on the many-to-one mapping, we are ok with the modified proposal by LG. |
| Spreadtrum | Option 1 |  |
| Samsung | Option 1 |  |
| Qualcomm |  | We agree that there could be the case of TDMed Tx where the Rx UE cannot determine the location of a retransmission from the TDRA field. However, as pointed out by vivo and others this is a very specific scenario and could be avoided by configuration since configuration supports up to 16 Rx pools but only up to 8 Tx pools.  If RAN1 mentions the exceptional case in the reply LS, it should be clarified that it is a case that can be resolved by configuration (e.g. Option 3’ below). Since the issue can be avoided by configuration, we’re also ok with Option 1.  Option 3’: In RAN1’s opinion, it is feasible for the Rx-UE to determine the time location of the next retransmission resource(s) of the Tx-UE (assuming that resource is not reselected by the TX UE) based on the “Time resource assignment” field in SCI with an exceptional case when the Rx UE does not have sufficient knowledge on the Tx pool. However, this exceptional case can be avoided by configuration. |
| Convida Wireless | Option 1 | We prefer option 1. |
| Huawei, HiSilicon | Option 1 | Network configuration on resource pool is not part of the LS.  In addition, as mentioned by companies, mode 2 is reservation-based resource selection, where a UE’s reservation in SCI for next transmission is assumed to be reliable thus other UEs can exclude the reserved resources based on the SCI detection, otherwise, the current mode 2 RA breaks. It is not necessary to assume those conditions that SCI reservation can or cannot work beyond Rel-16, nor was this asked by RAN2. Hence only option 1 is needed. |
| MediaTek | Option 1 | We prefer Option 1. If not, Option 3’ suggested by QC is also acceptable.  To us, the ‘assumption’ phrasing in Option 2 makes the response sound somewhat unclear. In our view, this is a corner case hence determination by Rx-UE will be feasible in most cases. |
| ZTE,Sanechips | Option 1 | Similar view as previous round |

LS reply to R2-2106623 (R1-2106413) based on outcome of Section 3

* Observing from the preferences and comments received in Round 2, there is still large divergence of views on not only the response answer to reply to RAN2 but also the technical reasons behind the preferred response.
* In summary,
  + For those think it is NOT feasible for the Rx-UE to determine the time location of the next retransmission resource(s) of the TX UE (assuming that resource is not reselected by the TX UE) based on the “Time resource assignment” field in SCI are due to the following mentioned reasons:
    - SL transmission dropping due to prioritization
    - Due to re-evaluation, a re-selected resource is earlier than a reserved resource
    - Many-to-one mapping between Tx and Rx resource pools when PSFCH is not configured
    - DFN/SFN index mis-alignment when Tx and RX have different sync sources.
  + For those think it is feasible are due to the following reasons:
    - A corner case to have multiple Tx pool covered by a Rx pool, and all having the same configuration parameter settings and no PSFCH is configured
    - The configuration and alignment of Tx pool and Rx pool are necessary for the Rx-UE to receive the data on the physical resources.
    - For the case of TDMed Tx where the Rx UE cannot determine the location of a retransmission from the TDRA field can be avoided by configuration.
    - Mode 2 is reservation-based resource selection, where a UE’s reservation in SCI for next transmission is assumed to be reliable thus other UEs can exclude the reserved resources based on the SCI detection, otherwise, the current mode 2 RA breaks.
* Since we have had two rounds of discussion and many technical issues are raised, it is observed further discussion will not bring us forward in concluding one way or another.
* In RAN2’s LS, it is explicitly requested for RAN1 to feedback on Q1. Therefore, the following conclusion and response answer is proposed by the moderator.
  + **Proposed conclusion**: There is no consensus in terms of technical understanding on the question asked by RAN2 in R1-2106413.
  + **Proposed response to RAN2**: After extensive discussion in RAN1, there is no consensus on the feasibility asked in Q1 from RAN2.

Summary of contributions

* [2/Samsung]: Yes. There is a one-to-one mapping between the signal slot resources of the Tx pool of the Tx UE and the Rx pool of the Rx UE. Therefore, the RX UE knows the TX timing.
* [3/CATT, GOHIGH]:

***Proposal 1****: If the SCI does indicate the next retransmission resource(s) and the reserved resource(s) is assumed not to be re-selected, the Rx UE can determine the time location of the next retransmission resource(s) of the Tx UE based on the “Time resource assignment” field in SCI.*

***Observation 1****: If SL HARQ RTT timer is entirely derived from the SCI indication, packet loss may occur for e.g. pre-emption enabled scenarios.*

***Observation 2****: There are indeed some cases in which the retransmission resource(s) may not be indicated by the “Time resource assignment” of a prior SCI.*

***Proposal 2****: An explicitly configured SL HARQ RTT timer is still required, at least for cases where there is some uncertainty in the timing of a retransmission for a HARQ process.*

***Proposal 3****: Reply LS to RAN2.*

* *From RAN1’s perspective, if the SCI does indicate the next retransmission resource(s) and the reserved resource(s) is assumed not to be re-selected, the Rx UE can determine the time location of the next retransmission resource(s) of the Tx UE based on the “Time resource assignment” field in SCI.*
* *For cases where there is some uncertainty in the timing of a retransmission for a HARQ process (e.g. due to no retransmission resource indicated in the SCI, or possible reselection by the Tx UE), the Rx UE uses a configured SL HARQ RTT timer.*
* *RAN1 respectfully asks RAN2 to take the above information into account.*
* [4, 5/OPPO]: It is RAN1’s understanding that when a SL resource pool is configured with PSFCH resources, there is a one-to-one mapping between a TX and RX pool. As such, it is feasible for the Rx-UE to determine the time location of the next retransmission resource(s) of the TX UE (assuming that resource is not reselected by the TX UE) based on the “Time resource assignment” field in SCI. Otherwise, not.
* [6/Qualcomm]: Yes, it is feasible for the Rx-UE to determine the time location of the next retransmission resource(s) of the TX UE (assuming that resource is not reselected by the TX UE) based on the “Time resource assignment” field in SCI.
* [7/LGE]:

***Observation 1****: At least the following issues should be addressed/resolved before the working assumption in LS [1] is confirmed:*

* *When the next retransmission resource(s) are farther than 31 slots from the time of SCI reception and these are not indicated through the SCI, whether/how to apply* *sldrx-HARQ-RTT-timer for this case?*
* *Under a situation where the SCI decoded at the 1st resource indicates the 2nd/3rd resources and the sldrx-HARQ-RTT-timer is applied between the 1st resource and the 2nd resource, if the SCI decoding fails on the 2nd resource (due to e.g., the reselection of 2nd resource based on the pre-emption procedure), whether/how to apply sldrx-retransmission-timer for this case?*
* *If the sldrx-HARQ-RTT-timer is applied after the time of SCI reception until the time of next retransmission resource indicated by the SCI, there may be no available candidate transmission resource (that does not exceed the PDB of MAC PDU) to be used for the pre-emption based reselection of the next retransmission resource after its time point. How to resolve this problem?*

***Proposal 1****: Adopt the following as RAN1’s feedback to RAN2’s question in LS [1]:*

* *According to the current specification, the RX UE is not aware of the exact set of the sidelink slots in the resource pool used by the TX UE and thus it is not feasible for the RX UE to determine the time location of the next retransmission resource(s) of the TX UE (assuming that resource is not reselected by the TX UE) based on the “Time resource assignment” field in SCI. If the RX UE is provided with information of the exact set of the sidelink slots in the resource pool used by the TX UE (e.g., by being allowed to assume that the configuration of the resource pool used by the TX UE is the same as that of the resource pool used by the RX UE for reception), such determination becomes feasible.*
* [8, 9/Apple]:

***Observation 1:*** *There is no ambiguity between Tx UE and Rx UE on the time location of the next retransmission resources, when the transmitting resource pool and receiving resource pool have the same configuration on time resources.*

***Proposal 1:*** *RAN1 to reply to RAN2 that it is feasible for the Rx-UE to determine the time location of the next retransmission resource(s) of the TX UE (assuming that resource is not reselected by the TX UE) based on the “Time resource assignment” field in SCI.*

* [10/Xiaomi]: No, it is not always feasible. From RAN1 perspective, the “Time resource assignment” field in SCI is used for sensing but not for Rx-UE receiving. To determine the time location of the next retransmission resource, the Rx-UE must know the Tx resource pool configuration of Tx UE. However, it is not mandatory for Rx-UE to know Tx resource pool configuration from sidelink receiving perspective.
* [11/vivo]: Yes, the Rx UE can determine the time location of the resource that can be used for the next retransmission of the Tx UE based on the “Time resource assignment” field in SCI, in case the resource is not reselected by the Tx UE.
* [12, 13/Ericsson]: From RAN1 perspective, it is feasible to determine the time location of the time location of the next retransmission resource(s) by using the information contained in the SCI. The first stage SCI contains information regarding the frequency and time resources used for the current TB, as well as information about the time and frequency resources of up to two further retransmissions of the TB. Therefore, using this information, i.e., the information contained in the SCI, it is possible to obtain the value required for the SL HARQ RTT without any additional indication.
* [14/Nokia, Nokia Shanghai Bell]: Reply to RAN2 as follows:

In case of one-to-one mapping between TX pool and RX pool, it is feasible for the Rx-UE to determine the time location of the next retransmission resource(s) of the TX UE (assuming that resource is not reselected by the TX UE) based on the “Time resource assignment” field in SCI.

In case of many-to-one mapping of two or more TX pools to the RX pool, it is feasible for the Rx-UE to determine an earliest possible time location of the next retransmission resource(s) of the TX UE (assuming that resource is not reselected by the TX UE) based on the “Time resource assignment” field in SCI.

* [15/Huawei, HiSilicon]: It is feasible for a RX UE to determine the time location of the next retransmission resource(s) of the TX UE (assuming that resource is not reselected by the TX UE) based on the “Time resource assignment” field in SCI.

References

1. [R1-2106413](C:\\3GPP\\RAN1_Meetings\\Tdocs\\2021\\R1-2106413.zip) LS on time gap information in SCI RAN2, OPPO

1. [R1-2106850](C:\\3GPP\\RAN1_Meetings\\Tdocs\\2021\\R1-2106850.zip) Draft reply LS on time gap information in SCI Samsung
2. [R1-2106923](file:///C:\3GPP\RAN1_Meetings\Tdocs\2021\R1-2106923.zip) Discussion on LS from RAN2 on time gap information in SCI CATT, GOHIGH
3. [R1-2107226](file:///C:\3GPP\RAN1_Meetings\Tdocs\2021\R1-2107226.zip) Discussion on time gap information in SCI OPPO
4. [R1-210](file:///C:\3GPP\RAN1_Meetings\Tdocs\2021\R1-2107227.zip)7227 Draft reply LS on time gap information in SCI OPPO
5. [R1-2107304](file:///C:\3GPP\RAN1_Meetings\Tdocs\2021\R1-2107304.zip) [Draft] Reply to RAN2 LS on time gap information in SCI Qualcomm
6. [R1-2107532](file:///C:\3GPP\RAN1_Meetings\Tdocs\2021\R1-2107532.zip) Discussion on LS on time gap information in SCI LG Electronics
7. [R1-2107700](file:///C:\3GPP\RAN1_Meetings\Tdocs\2021\R1-2107700.zip) Draft Reply LS on Time Gap Information in SCI Apple
8. [R1-2107703](file:///C:\3GPP\RAN1_Meetings\Tdocs\2021\R1-2107703.zip) Discussion on RAN2 LS on Time Gap Information Apple
9. [R1-2107891](file:///C:\3GPP\RAN1_Meetings\Tdocs\2021\R1-2107891.zip) [Draft] Reply LS on time gap information in SCI Xiaomi
10. [R1-2107957](file:///C:\3GPP\RAN1_Meetings\Tdocs\2021\R1-2107957.zip) [DRAFT] Reply LS on time gap information in SCI vivo
11. [R1-2108130](file:///C:\3GPP\RAN1_Meetings\Tdocs\2021\R1-2108130.zip) [Draft] Reply LS on time gap information in SCI Ericsson
12. [R1-2108135](file:///C:\3GPP\RAN1_Meetings\Tdocs\2021\R1-2108135.zip) Discussion on RAN2 LS on time gap information in SCI Ericsson
13. [R1-2108181](file:///C:\3GPP\RAN1_Meetings\Tdocs\2021\R1-2108181.zip) Discussion of RAN2 LS on time gap information in SCI Nokia, Nokia Shanghai Bell
14. [R1-2108185](file:///C:\3GPP\RAN1_Meetings\Tdocs\2021\R1-2108185.zip) Discussion on RAN2 LS on time gap information in SCI Huawei, HiSilicon