**3GPP TSG RAN WG1 #104bis-e R1-210xxxx**

**e-Meeting, April 12th – 20th, 2021**

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**Source:** Moderator (LG Electronics)

**Title:** Feature lead summary for AI 8.11.1.2 Inter-UE coordination for Mode 2 enhancements

**Document for:** Discussion and information

1. **Contents to be discussed in Tuesday’s GTW (Apr. 13th)**

After reviewing contributions submitted in this meeting, FL observed that the following two approaches can be considered for the inter-UE coordination.

* *Approach 1: Inter-UE coordination to help UE-B’s resource selection procedure*
  + *UE-A explicitly sends the set of resources preferred and/or non-preferred for UE-B’s transmission*
    - *The information includes time-and-frequency resources preferred and/or non-preferred for UE-B’s transmission*
  + *SCI or higher layer signaling is used to transmit the coordination information*
  + *Request signaling or pre-defined event/condition triggers the transmission of coordination information*
* *Approach 2: Inter-UE coordination to confirm a validity of UE-B’s selected/reserved resources*
  + *UE-A implicitly sends the set of resources non-preferred for UE-B’s transmission and/or the set of resources where the resource conflict is detected*
    - *The information includes the presence of expected/potential and/or detected resource conflict on UE-B’s transmission resource*
  + *PSFCH format is used to transmit the coordination information*
  + *Pre-defined event/condition triggers the transmission of coordination information*

Based on the observations mentioned above, the following draft proposals were made from FL’s perspective:

***FL’s proposal****:*

* *Support the following schemes of inter-UE coordination in Mode 2:*
  + *Inter-UE Coordination Scheme 1:* 
    - *UE-A sends to UE-B the set of resources preferred and/or non-preferred for UE-B’s transmission*
      * *The coordination information includes time-and-frequency resources preferred and/or non-preferred for UE-B’s transmission*
        + *FFS on details including a possibility of down-selection between the preferred resource set and the non-preferred resource set*
        + *FFS whether or not to introduce additional information*
      * *Down select to one among the following tree options for the container of coordination information*
        + *1st SCI*
        + *2nd SCI*
        + *Higher layer signaling (e.g., MAC CE, PC5 RRC)*
  + *Inter-UE Coordination Scheme 2:* 
    - *UE-A sends to UE-B the set of resources non-preferred for UE-B’s transmission and/or the set of resources where the resource conflict is detected*
      * *The coordination information includes the presence of expected/potential and/or detected resource conflict on UE-B’s transmission resource*
        + *FFS on details including a possibility of down-selection between the expected/potential conflict and the detected resource conflict*
        + *FFS whether or not to introduce additional information*
      * *PSFCH format is used to convey the coordination information*
        + *FFS on details including whether to (pre)configure separately PSFCH resource set from that of SL HARQ feedback*

***FL’s proposal****:*

* *For Inter-UE Coordination Scheme 1, at least the following information is used to determine the time-and-frequency resources preferred and/or non-preferred for UE-B’s transmission*
  + *UE-A’s sensing result* 
    - *FFS on details including how to obtain it*
  + *UE-A’s SL resources selected for multiple transmissions of different TBs*
  + *UE-A’s configured resources for UL*
* *For Inter-UE Coordination Scheme 2, at least the following information is used to determine the set of resources non-preferred for UE-B’s transmission and/or the set of resources where the resource conflict is detected*
  + *Time resource conflict between UE-B and other UE(s) in the same group*
    - *FFS on details including which information (e.g., destination ID) is used to determine it*
  + *UE-A’s sensing result* 
    - *FFS on details including how to obtain it*

***FL’s proposal****:*

* *Down select one or more of following options for determining UE-A (transmitting the inter-UE coordination information) and UE-B (receiving and using the inter-UE coordination information):*
  + *Option 1: UE-A is the intended receiver of UE-B*
  + *Option 2: UE-A (e.g., RSU, platooning header) and UE-B are determined by higher layer*
  + *FFS on applicable scenarios/inter-UE coordination schemes for each option*

1. **Email discussion before 1st check point (Apr. 15th)**

**First of all, as per Chairman’s guideline during Tuesday’s GTW session, we can have the email discussion with keeping the direction of draft proposal below (i.e., support two schemes of inter-UE coordination)**. From my perspective, the key point of Scheme 2 is that UE-A informs UE-B of the presence of expected/potential and/or detected resource conflict on the transmission resources indicated by UE-B’s SCI. This means that UE-A generates the coordination information after receiving the SCI transmitted from UE-B. On the other hands, in case of Scheme 1, UE-A can inform UE-B of the set of resources preferred and/or non-preferred for UE-B’s transmission even before receiving the SCI transmitted from UE-B.

***FL’s proposal****:*

* *Support the following schemes of inter-UE coordination in Mode 2:*
  + *Inter-UE Coordination Scheme 1:* 
    - *UE-A sends to UE-B the coordination information which includes the set of resources preferred and/or non-preferred for UE-B’s transmission* 
      * *FFS on details including a possibility of down-selection between the preferred resource set and the non-preferred resource set*
      * *Down select one or more of following three options for the container of coordination information*
        + *1st SCI*
        + *2nd SCI*
        + *Higher layer signaling (e.g., MAC CE, PC5 RRC)*
  + *Inter-UE Coordination Scheme 2:* 
    - *UE-A sends to UE-B the coordination information which includes the presence of expected/potential and/or detected resource conflict on the transmission resources indicated by UE-B’s SCI*
      * *FFS on details including a possibility of down-selection between the expected/potential conflict and the detected resource conflict*
      * *PSFCH format is used to convey the coordination information*
        + *FFS on details including whether to (pre)configure separately PSFCH resource set from that of SL HARQ feedback*

Please provide comment, if any, on the above draft proposal (**including applicable scenario(s) of each scheme**) **by April 14th, 11:59am UTC**. To prepare the updated draft proposal that will be used in Thursday’s GTW, it would be highly appreciated if companies make comments, if any, as soon as possible.

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| Company | Comment |
| vivo | We can support the proposal as the chairman’s guideline. Our favour is scheme 1. |
| NTT DOCOMO | We accept to support both as compromise while applicable scenario is not so different.  Our understanding is same as FL/companies that scheme 1 is proactive one and scheme 2 is reactive one. But this difference is from mechanism perspective. Not from scenario perspective. As scenario, scheme 1 would be used for periodic transmission due to the coordination latency. Connection Scheme 2 can be used for both aperiodic and periodic transmissions. Regarding connection/connection-less, both schemes are applicable for both, based on companies’ comments in GTW. Regarding backward compatibility, both schemes can be specified to consider this perspective. |
| FUTUREWEI | We are fine with the proposal in general. The applicable scenarios were clear: scheme 1 may be a normal coordination proactively, and scheme 2 can be complementary on top of that to react and recover from some exceptional situations. We disagree with the companies that say scheme 1 is a subset of scheme 2. Scheme 1 is especially important when one UE acts as a resource coordinating cluster head, such as for platooning or for public safety.  One necessary addition as discussed in the GTW is that a high-level bullet should be added: For each scheme, determine the conditions under which UE B must follow the coordination information and when UE treats the coordination information as a recommendation. This is not simply an "FFS details" of the mechanism of sending the coordination information. Some details are included in our comments for the later proposal.  For some other changes that were discussed on the GTW, we note that we are also OK to remove most or all of the FFS, as we can do this naturally as we progress the designs. For scheme 1, OK to simplify that the container if SCI and/or higher layer. |
| InterDigital | We support the proposal to include both Scheme 1 and Scheme 2. Each scheme can be applied in specific scenarios. For example, Scheme 1 can address issues such as hidden node and half-duplex (e.g., when UE A is the intended receiver). It also provides power saving benefit when UE B does not perform sensing. Scheme 1 can be used with an initial transmission of an aperiodic TB if PDB allows. Scheme 2 can improve reliability by indication of conflict on an announced resource reservation with low signaling overhead and latency. However, the announced reservation means that the UE B performs its own sensing and thus there is no power saving benefit with Scheme 2. Also, Scheme 2 does not apply to an initial transmission of an aperiodic TB. Therefore, both schemes should be supported. |
| Convida Wireless | We support the proposal to consider both Scheme 1 and Scheme 2. |
| Sony | We are OK with the chairman’s guideline though we prefer to option 1. We agree with other companies’ comments on the advantage of option 1 (e.g. solution for hidden node problem, power saving for UE-B). |
| Qualcomm | We provide results for Type C and Type B schemes, using techniques reclassified under both Schemes 1 and 2, with realistic assumptions and show that they are complementary and provide cumulative gains based on traffic type, distance, and PRR. Our results also showed that both schemes improved performance for both periodic and aperiodic traffic.  We also noted that Type C (now part of Scheme 2) also improved the performance of Rel-16 UEs in the pool. In our view, specifying complementary schemes is helpful to improve Mode 2 reliability but redundant schemes should be avoided.  As we discussed online, while we prefer and have evaluated certain variants of the schemes, we’re ok with the direction of the proposal as a way forward for RAN1 to start working on specifying the details of the schemes. As part of that goal, we think the FFSs on down-selection should be removed, otherwise, discussions would continue to focus on which schemes to remove/adopt instead of on developing complete schemes in the remaining WI time.  Online, a comment was made that Scheme 2 included three different types. We’d like to point out that for Type A, included in Scheme 1, there were hierarchical vs. distributed schemes; schemes that used SCI vs. schemes that used MAC-CE vs. schemes that used PC5-RRC (those aren’t merely signalling details but have different latency and impact the benefit and applicability of a scheme), and other variants. Both Schemes 1 and 2 should be treated similarly in the proposal in our view and prefer the path of not listing all the details at this point.  Higher layer signalling doesn’t need to be grouped together but can be listed separately, like SCI-1 and SCI-2.  We propose the following changes to the proposal:   * *Support the following schemes of inter-UE coordination in Mode 2:*   + *Inter-UE Coordination Scheme 1:*      - *UE-A sends to UE-B the coordination information which includes the set of resources preferred and/or non-preferred for UE-B’s transmission*        * *FFS on details ~~including a possibility of down-selection between the preferred resource set and the non-preferred resource set~~*       * *Down select one or more of following ~~three~~ options for the container of coordination information*         + *1st SCI*         + *2nd SCI*         + *MAC-CE*         + *PC5 RRC*         + *~~Higher layer signaling (e.g., MAC CE, PC5 RRC)~~*   + *Inter-UE Coordination Scheme 2:*      - *UE-A sends to UE-B the coordination information which includes the presence of expected/potential and/or detected resource conflict on the transmission resources indicated by UE-B’s SCI*       * *FFS on details ~~including a possibility of down-selection between the expected/potential conflict and the detected resource conflict~~*       * *PSFCH format is used to convey the coordination information*         + *FFS on details including whether to (pre)configure separately PSFCH resource set from that of SL HARQ feedback* |
| ZTE | According to the chairman’s guidance, it’s fine to define these two scheme in high level although there is not clear difference on the applicable scenario. In our views, it’s still preferred to refine the definition of solution from mechanism perspective, e.g., “conflict avoidance” or “conflict recover”. And decoupling of these two from scheme 2 is needed. |
| Sharp | We are fine with the general direction of the proposal to include both schemes. Regarding the container for scheme 2, we think it is too early to conclude now that a PSFCH format will be used to convey the coordination information. We think a formulation similar to the one for the container for scheme 1 should be used in the proposal. |
| Intel | Our preference is scheme #2. We can accept scheme #1 as a compromise if the discussion is limited to enhancements of semi-persistent resource allocation. In our view not-optimized latency of the Rel.16 resource selection procedure significantly diminishes potential benefits of scheme #1 especially for dynamic transmissions of a given TB.  For scheme#1, we would like to clarify whether it is assumed that SCIs can be transmitted w/o shared channel (i.e. SCI only) or not? |
| Panasonic | In scheme 1, several companies showed the PRR gain in Type A with the header UE schedules resources. It would be similar to mode 2d. If this hierarchical inter-UE coordination is assumed, who becomes header UE and how to construct the group should be considered and the gain is limited to UEs belonging to the header UE. On the other hand, Scheme 1 based on the UE-B is receiver of UE-A is also considered. For Scheme 1, before we agree it, the scenario should be clarified. For scheme 2, we support direction. For signaling format, the format would be similar to PSFCH but the name could be different. We suggest to change the 2nd sub-sub bullet to “the coordination information format is based on PSFCH format” |
| Samsung | We are not happy to introduce two schemes without pre-discussion and agreement on supporting scenario/use case/cast type for inter-UE coordination.  QC suggested to modify the original proposal as below but we think that it should be captured and discussed further.  For Scheme 1   * + - * *FFS on details including a possibility of down-selection between the preferred resource set and the non-preferred resource set*   For Scheme 2   * + - * *FFS on details including a possibility of down-selection between the expected/potential conflict and the detected resource conflict* |
| NEC | We support both scheme 1 and scheme 2. From our point of view, scheme 1 and scheme 2 can be applied for different scenarios. One question on scheme 2, PSFCH format is used to convey the coordination information from UE-A to UE-B, does this mean there must exist PSCCH/PSSCH receiving from UE-B? Our concern is for hidden node problems, UE-A can identify resource conflicts between UE-B and other UEs, what's the PSFCH resource for UE-A to UE-B? |

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| Xiaomi | *We support both Scheme, for Scheme 1, UE-A sends UE-B the set of resources explicitly, coordination message is a set of resource, UE-B can consider coordination message and sensed resource set by itself to do resource selection. For Scheme 2, UE-A sends UE-B the potential conflicted resource or detected conflicted resource implicitly, coordination message is an indication, coordination message indicates potential conflict resource or detected conflict resource. UE-B can make resource re-selection or retransmission when UE-B receives such coordination message.* |
| CMCC | We are OK to leave the two schemes for discussion for now, but Scheme 1 is more preferred.  To our understanding, when both UE-A and UE-B sense, the resource conflict indication of Scheme 2, including the post-collision, pre-collision, and half-duplex indication, caused by hidden node and half-duplex constraint issues, can be fully addressed by using Scheme 1. In addition, considering the case that only UE-A senses, where it acts as a scheduler/header to provide power saving gain for other UE-Bs, only Scheme 1 (set of preferred resources) works. |
| Mitsubishi | We prefer Scheme 1 and saw better results with a “non-preferred resources” strategy. This scheme seems to fully address the issues of hidden node/half duplex. We can further discuss whether scheme 2 brings some extra benefits when used in complement, as a compromise solution. |
| Fraunhofer | We are in general fine with the direction of the proposal by the FL, but are supportive of scheme 1. In scheme 1, both the preferred and not-preferred set of resources are beneficial for different scenarios, and we do not see the need for any further down-selection between them.  Apart from the advantages highlighted by the other companies, scheme 1 can provide power saving advantages to the UE. Scheme 2, on the other hand, triggers the UE to carry out resource reselection based on the indication, which requires the UE to have a full sensing result in order to reselect non-colliding resources. This results in scheme 2 not being able to work well with the power saving solutions discussed in Rel-17. |
| Spreadtrum | We support both Scheme 1 and Scheme 2. But in scheme 2, we think “PSFCH format is used to convey the coordination information” should be FFS. Firstly, “PSFCH format is used” means that Scheme 2 cannot be used when the resource pool is not configured with PSFCH. Secondly, PSFCH cannot carry enough information. We should discuss other details about scheme 2 before determining the container for scheme 2. |

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| Huawei, HiSilicon | In general, we question the necessity of producing a yet further classification of the designs, when the previous meetings already spent much time in creating Type A, B, C. By default, we shouldn’t disregard existing conclusions, especially when they have been LSd to other groups.  For both these potential schemes, we should be more closed-ended, i.e.:  *“~~UE-A sends to UE-B the coordination information which includes~~ The coordination information sent from UE-A to UE-B is the …”*  as otherwise we have to re-discuss how to constitute the coordination information.  In general, we consider that Type A resources are the best option, and Type B and C are a second priority – thus we could settle the downselection in scheme 1 as choosing the preferred resources now. However, if this is not the direction the group wishes to take, then we suggest deciding to have no down-selection in scheme 1, i.e. both preferred and non-preferred resources. The main reason for either of these routes is that scheme 1 covers a wider range of use cases than scheme 2 (which we were asked to discuss after the GTW).  In scheme 2, the final FFS can be removed for now, and those design details should emerge as the result of further discussions on how to use a PSFCH format, if scheme 2 is agreed to exist. It does seem necessary to keep the FFS on down-selection in scheme 2, because the use cases of the various possibilities have not been sufficiently analysed to agree them already now. E.g., we demonstrated in our paper that the half-duplex indication is almost never useful, because the probability in a groupcast option 1 of (i) two UEs choosing the same resource, together with (2) no other UE in a groupcast option 1 sending a NACK is jointly close to zero. |

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| Fujitsu | Agree in principle. Both Scheme 1 and Scheme 2 should be supported. They can target different scenarios. Even for the same scenario, they may compensate each other.  As for the applicable scenario, in our view, it can be discussed from proactive/reactive, unicast/groupcast/broadcast, and periodic/aperiodic.  For Scheme 1, supporting aperiodic traffic may be subject to the processing latency. For Scheme 2, only the reactive manner can be supported. Therefore, we list the potential scenarios for Scheme 1 and Scheme 2 as follows.  Scheme 1:  - proactive manner and reactive manner  - periodic traffic  - unicast, groupcast, broadcast  Scheme 2:  - reactive manner  - periodic traffic, aperiodic traffic  - unicast, groupcast, broadcast  For the common part (reactive manner, periodic traffic) between Scheme 1 and Scheme 2, it can be studied whether one or both can be supported. |
| OPPO | We are also fine to define both schemes, by scheme 1 UE-A can assist UE-B to further filter out non-preferred resources during resource selection, and by scheme 2, UE-A can help UE-B to identify problems on already reserved/selected resources, the 2 schemes can complement each other. And in our understanding, the 2 schemes can be used separately and can also be used jointly.  However, as some companies already mentioned, the current 2 schemes actually include several variants, we see some overlapping among these variants in terms of applicable scenarios and performance. We do not think all the variants are needed for mode 2 enhancement and down-selection is needed.  As to Scheme 2, we have following comments:   * *Change “expected/potential and/or detected resource conflict on the transmission resources indicated by UE-B’s SCI” to “expected/potential resource conflict on the reserved/selected resources and/or detected resource conflict on UE-B already used resources”, as in scheme 2 there is no need to restrict on reserved resources only and “UE-B already used resources” is clearer for “detected resource conflict”.* * “*PSFCH format is used to convey the coordination information*” and the affiliated sub-bullet should be removed, we also think that it is too early to agree on using PSFCH to convey the coordination information, or only using PSFCH. |
| MediaTek | We are supportive of both schemes due to the different applicable scenarios/use cases.  For scheme 1, if it is to indicate the preferred resources by Rx UE (UE-A), the Tx UE (UE -B) can use the preferred resources for transmission directly even w/o sensing. Tx UE’s sensing itself can’t be better than Rx sensing due to reception on Rx UE.  For scheme 1, if it is to indicate the non-preferred resources by UE-A, it applies for the case that UE-C transmits SL data with SCI to UE-A and UE-A forwards UE-C SCI (if UE-C’s resources are preferred) to prevent UE-B from selection on the same resources. It can secure the UE-A’s reception and avoid the hidden node issue that UE-B can’t hear UE-C’s SCI, e.g., in the road intersection of the dense urban scenario with high building around.  For scheme 2, it is more for non-preferred resource indication. In this case, UE-B transmits the SL data with SCI to UE-A and UE-A can just use PSFCH format/resources to confirm whether the reserved resources are valid or acceptable. It is a simple and efficient way with the low overhead and low latency.  For scheme 2, another case is that UE-B may detect the PSFCH A/N reception status to determine whether to trigger resource reselection. Especially, it is useful to avoid consecutive collisions for periodic traffic due to the same selection of the periodic resources. UE-B may detect UE-A’s A/N reception status (A/N or DTX) especially for the initial transmissions to determine whether there are consecutive collisions. To be noted, the most of schemes may be triggered conditioned on the successful reception of SCI. So this scheme is complementary to others to secure the successful reception of SCI (at least for the periodic transmissions) and address the WI objectives and concerns raised by 5GAA LS.  More specifically, the proposal should further consider some criteria for down-selection, such as signalling overhead, performance, backwards compatibility.  Additionally, we propose to add PSFCH reception status for scheme 2, as below:   * + - * *FFS on details including a possibility of down-selection between the expected/potential conflict and the detected resource conflict*       * *PSFCH format/PSFCH reception status is used to convey the coordination information*         + *FFS on details including whether to (pre)configure separately PSFCH resource set from that of SL HARQ feedback* |
| Nokia, NSB | We support the direction of the proposal and prefer the changes suggested by Qualcomm.  We propose to add the following to Scheme 1:   * + *Inter-UE Coordination Scheme 1:*      - *UE-A sends to UE-B the coordination information which includes the set of resources preferred and/or non-preferred for UE-B’s transmission*        * *FFS on details including a possibility of down-selection between the preferred resource set and the non-preferred resource set*       * *Down select one or more of following three options for the container of coordination information*         + *1st SCI*         + *2nd SCI*         + *Higher layer signaling (e.g., MAC CE, PC5 RRC)*       * *FFS on details including whether to (pre)configure dedicated resources for transmission of coordination information.* |
| LG | We support this proposal.  In Scheme 1, considering signalling/latency overhead for coordination signalling, the UE-A needs to know coordination information to be sent in advance much before UE-B’s transmission. In other words, once the UE-A transmits the coordination information, the UE-B can use it for a long time.  In Scheme 2, UE-A can transmit the coordination information to UE-B after the UE-A receives SCI(s) from the UE-B. To be specific, the coordination signalling could be associated with each UE-B’s selected resources. In this case, even though another transmission that cause resource conflict suddenly occurs, the UE-A can transmit the coordination information to the UE-B. |
| Lenovo/MotM | We support both Scheme 1 and Scheme 2. One additional point in the last sub-bullet as FFS   * + - * *PSFCH format is used to convey the coordination information*         + *FFS on details including whether to (pre)configure separately PSFCH resource set from that of SL HARQ feedback*         + *FFS on details on using PSFCH resource of SL HARQ for conflict indication* |

***FL’s proposal****:*

* *For Inter-UE Coordination Scheme 1, at least the following information is used to determine the set of resources preferred and/or non-preferred for UE-B’s transmission (FFS whether to down-selection between the preferred resource set and the non-preferred resource set)*
  + *UE-A’s sensing result* 
    - *FFS on details including how to obtain it*
  + *UE-A’s SL resources selected for multiple transmissions of different TBs*
  + *UE-A’s configured resources for UL*
* *For Inter-UE Coordination Scheme 2, at least the following information is used to determine the presence of expected/potential and/or detected resource conflict on the transmission resources indicated by UE-B’s SCI (FFS whether to down-selection between the expected/potential conflict and the detected resource conflict)*
  + *Time resource conflict between UE-B and other UE(s) in the same group*
    - *FFS on details including which information (e.g., destination ID) is used to determine it*
  + *UE-A’s sensing result* 
    - *FFS on details including how to obtain it*

Please provide comment, if any, on the above draft proposal **by April 14th, 11:59am UTC**. To prepare the updated draft proposal that will be used in Thursday’s GTW, it would be highly appreciated if companies make comments, if any, as soon as possible.

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| Company | Comment |
| vivo | Comment 1  For scheme 1, the 2nd and 3rd sub-bullet is trying to include semi-static resource for UE-A transmission. We think both semi-static and dynamic resource for UE-A’s transmission can be considered to determine type A resource, since dynamic resource can be known to UE-A in advance. Therefore, we suggest following modification.   * UE-A’s SL resources selected for TB transmission * UE-A’s scheduled resource for UL transmission   Comment 2  For scheme 2, The first bullet is trying to describe TX/RX or TX/TX overlap of SL transmissions, it includes UE-A indicates conflict between UE-B and other UEs in the same groupcast group as described in the bullet. Moreover, UE-A can also indicate conflict between UE-B and UE-A as pair-UE. Furthermore, the conflict between LTE SL transmission and NR SL transmission should be considered as well to avoid inter-RAT overlapping. We suggest to add the missing cases.  Comment 3  For scheme 2, if our understanding is correct, the second bullet is trying to describe the resource collision judgement. In our understanding, UE-A needs to decode 2nd SCI to acquire destination ID of UE-B’s transmission, which is beyond sensing concept. It is suggested to modify as “UE-A’s SCI decoding and/or measurement result”  Comment 4  For scheme 2, UL transmission needs to be taken into account for resource conflict judgement as proposed by companies, we suggest to add another bullet accordingly. |
| NTT DOCOMO | On scheme 2,  Firstly, 1st bullet and second bullet should be wrote from the same level. If information of the first bullet is obtained from sensing result, the second bullet includes it. We feel it is better to update the classification.  For the 1st bullet, we have two comments. First one is that ‘other UE’ should include UE-A as well. This should be clarified as a note. Second comment is that ‘in the same group’ is unclear for us. Now main bullet intends any cast type. If that part is intended for groupcast, it should be clearly mentioned.  For the 2nd bullet, we think ‘Time-and-frequency resource conflict between UE-B and other UE(s)’ is accurate one, for same level as the first bullet.  In addition, we have same view as vivo’s comment 4. UL transmission should be included in scheme 2 as well as scheme 1. |
| FUTUREWEI | We are ok with the proposal. |
| InterDigital | We agree with the proposal for Scheme 1. For Scheme 2, we’d like to suggest to add information about resources subject to half-duplex issue at UE A and SL/UL conflict into the minimum set of information for Scheme 2 as well (they are currently spelled out in Scheme 1 proposal). In our view, these information are helpful in both schemes, albeit in Scheme 1 the resources are explicitly indicated and in Scheme 2 the resources are indirectly used to determine the conflict. |
| Convida Wireless | We are fine with the proposal. |
| Sony | We are fine with the proposal. |
| Qualcomm | We’d prefer to discuss this proposal after the discussion on Proposal 1 concludes.  Similar to Proposal 1, we’d like to remove the FFSs on down-selection to move the discussion forward.  The second sub-bullet for Scheme 1 isn’t very clear. Does it only apply to periodic reservation? We show in our simulation results that indicating the initial transmission of a TB as a non-preferred resource is very beneficial to performance in aperiodic transmissions.  Why is the third sub-bullet for Scheme 1 limited to configured UL resources instead of also including dynamically scheduled resources? We would like to discuss this point further.  The text on Scheme 2 limits its applicability to groupcast, which isn’t case.  The first sub-bullet for Scheme 2 excludes collisions and only includes half-duplex.   * *For Inter-UE Coordination Scheme 1, at least the following information is used to determine the set of resources preferred and/or non-preferred for UE-B’s transmission ~~(FFS whether to down-selection between the preferred resource set and the non-preferred resource set)~~*   + *UE-A’s sensing result*      - *FFS on details ~~including how to obtain it~~*   + *UE-A’s SL resources selected for ~~multiple~~ at least an initial transmission~~s~~ of ~~different~~ a TB~~s~~*   + *UE-A’s configured resources for UL* * *For Inter-UE Coordination Scheme 2, at least the following information is used to determine the presence of expected/potential and/or detected resource conflict on the transmission resources indicated by ~~UE-B’s~~ SCI ~~(FFS whether to down-selection between the expected/potential conflict and the detected resource conflict)~~*   + *Time resource conflict ~~between UE-B and other UE(s) in the same group~~*     - *FFS on details ~~including which information (e.g., destination ID) is used to determine it~~*   + *Time-frequency resource conflict*     - *FFS on details*   + *UE-A’s sensing result*      - *FFS on details ~~including how to obtain it~~* |
| ZTE | For the inter-UE coordination scheme-1, we are supportive on this bullet. And it should be noticed that combination of the items in the sub-bullet should not be precluded.  For inter-UE coordination scheme-2, the usage of each item for corresponding determination (e.g., *expected/potential and/or detected resource conflict*) is related to the decision on how to select the UE-A/B. Potential combination of items may not be needed. |
| Sharp | On scheme 1, “the following information” should not be restricted to only “resources”. Other information should also be considered, e.g. constraints on the resources as requested by UE-B.  On scheme 2, we think determination of “other UE(s)” should be further studied. For example, it can simply say “*Time resource conflict for UE-B, FFS definition of conflict*”. |
| Intel | For scheme#1, we prefer to keep it more general, i.e. *FFS information used to determine the set of resources preferred and/or non-preferred for UE-B’s transmission*  Otherwise the statement “UE-A’s SL resources selected for multiple transmissions of different TBs” needs more clarification. We would like to better understand the meaning of *selected* resources. Is that about resources used for transmission/ reserved resources or/ selected but not reserved? Is that about candidate resource set or subset of resources for transmission? Finally, is that for transmission of multiple TBs by UE-A or UE-B?  For scheme #2, is there any specific reason to remove statement “UE-A’s SL resources selected for multiple transmissions of different TBs”. We think it needs to be clarified. In our view. if UE-A target RX of UE-B it can also inform UE-B about sidelink conflict in reception e.g. on resources reserved by UE-B for transmission towards UE-A. |
| Panasonic | For scheme 2, 1st bullet is also sensing results. 2nd bullet could be sub-bullet of 1st bullet. |
| Samsung | As we commented above, we think that FFS parts deleted by QC is necessary  In addition, we are not yet clear about the below information should be supported in scheme 1. So, we suggest it as FFS   * + *FFS: UE-A’s configured resources for UL* |
| NEC | Fine with scheme 1.  For scheme 2, *detected resource conflict on the transmission resources indicated by UE-B’s SCI*, we think this can solve hidden node problems of UE-B and other UEs, so why only restrict time resource in the first bullet? We think it could simply be resources conflicts. Secondly, what does the "same group" here means? We prefer *Resource conflict between UE-B and other UE(s)* |

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| Xiaomi | In *Scheme 1 and Scheme 2, we support the sub-bullet: UE-A’s sensing result. In Scheme 1, for the resources preferred/ non-preferred for UE-B’s transmission, UE-A can reuse the existing resource selection procedures step1 to determine a candidate resource.In Scheme 2, UE-A detect expected/potential and/or detected resource conflict by sensing and RSRP measurement.* |
| CMCC | Support in principle.  Regarding Scheme 1, we share similar view as vivo that it should be UE-A’s reserved resources for TB transmission, no need to limit as multiple reservations for periodic transmissions. |
| Fraunhofer | We are supportive of the FL’s proposal, with a few clarifications.  It should be clarified that scheme 1 is applicable for both periodic and aperiodic transmissions. For scheme 2, we prefer that the 2 sub-bullets are clearly differentiated since the time resource conflict is detected by UE-A only after decoding the 2nd stage SCI, as mentioned by Vivo in comment 3. |
| Spreadtrum | For scheme 2, we have two comments.  1st bullet is one case of 2nd bullet. Time resource conflict between UE-B and other UE(s) in the same group is also sensing results of UE-A. So, 1st bullet in scheme 2 can be deleted.  In addition to the conflicts sensed by UE-A, conflicts between UE-B and UE-A should also be considered. |
| Huawei, HiSilicon | The “FFS details including how to obtain it” seems possible to remove, since in this objective we’re not supposed to be re-designing the sensing procedures. If the FFS has another meaning, it needs to be explained/reworded.  For Scheme 1, we suggest to add FFS to “*FFS: UE-A’s configured resources for UL*” since it may need further discussion. For example, if UE-A is not UE-B’s receiver, this information is not relevant.  For Scheme 2, “in the same group” can be clarified as “in the same groupcast option 1 group”. |
| Fujitsu | Agree the first bullet. For the second bullet, “*Time resource conflict between UE-B and other UE(s) in the same group”*, directly mentioning half-duplex would be clearer, i.e.,   * + *Time resource conflict (half duplex) between UE-B and other UE(s) in the same group* |
| OPPO | We are basically fine with the proposal, however,   * For “UE-A’s configured resources for UL”, it seems only including resources indicated by configured UL grant, but in our view dynamically scheduled UL resources should also be included. * For “Time resource conflict between UE-B and other UE(s) in the same group”, if our understanding is correct, this means half duplex between UE-B and another group member in groupcast, but we think half duplex between UE-B and its unicast peer should also be included.   In general, we have following suggested revisions:   * *For Inter-UE Coordination Scheme 1, at least the following information is used to determine the set of resources preferred and/or non-preferred for UE-B’s transmission (FFS whether to down-selection between the preferred resource set and the non-preferred resource set)*   + *UE-A’s sensing result*      - *FFS on details including how to obtain it*   + *UE-A’s SL resources selected for multiple transmissions of different TBs*   + *UE-A’s UL resources indicated by DCI and RRC signaling* * *For Inter-UE Coordination Scheme 2, at least the following information is used to determine the presence of expected/potential resource conflict on the reserved/selected resources and/or detected resource conflict on UE-B already used resources (FFS whether to down-selection between the expected/potential conflict and the detected resource conflict)*   + *Half duplex between UE-B and its targeted receiver(s)*     - *FFS on details including which information (e.g., destination ID) is used to determine it*   + *UE-A’s sensing result*      - *FFS on details including how to obtain it* |
| MediaTek | Regarding to scheme 2, reception status at UE-B for UE-A’s PFSCH A/N transmission should be added especially to address the consecutive collision cases for the periodic traffic. If UE-A can’t hear SCI from UE-B due to (periodic) resource collision, UE-A can’t send A/N to UE-B, i.e., DTX instead of A/N, for the initial transmission in case of the periodic traffic.   * *For Inter-UE Coordination Scheme 2, at least the following information is used to determine the presence of expected/potential and/or detected resource conflict on the transmission resources indicated by UE-B’s SCI (FFS whether to down-selection between the expected/potential conflict and the detected resource conflict)*   + *Time resource conflict between UE-B and other UE(s) in the same group*     - *FFS on details including which information (e.g., destination ID) is used to determine it*   + *UE-A’s sensing result*      - *FFS on details including how to obtain it*   + *PSFCH A/N receptions status at UE-B, e.g., the number of consecutive DTXs for UE’A PSFCH A/Ns corresponding to the initial transmissions.* |
| Nokia, NSB | For scheme 2, detection of time resource conflicts should not be limited to “UE(s) in the same group”  We propose to add the following:   * *For Inter-UE Coordination Scheme 1, at least the following information is used to determine the set of resources preferred and/or non-preferred for UE-B’s transmission (FFS whether to down-selection between the preferred resource set and the non-preferred resource set)*   + *UE-A’s sensing result*      - *FFS on details including how to obtain it*   + *UE-A’s SL resources selected for multiple transmissions of different TBs*   + *UE-A’s configured resources for UL*   + *Set of resources (preferred or non-preferred) indicated by UE-B* |
| LG | For both schemes, it would be important to consider processing time budget. To be specific, there will be processing time to prepare the coordination information, and the factors of generating coordination information needs to be known to UE-A before that time. For instance, UE-A needs to receive UL grant T ms (processing time) before the transmission of the inter-UE coordination. Otherwise, the UE-A cannot consider dynamic PUSCH to determine non-preferred resource or resource conflict on UE-B’s reserved resources.  In our understanding, if the processing time budget could not be fulfilled, some portion of the listed information may not be used to determine the coordination information.  At this moment, we can add “subject to processing time budget” to each main bullet. |
| Lenovo/MotM | We are fine with the proposal and would like to add a new bullet on top of scheme 1:   * + *UE-A’s SL resources selected for multiple transmissions of same TB* |

***FL’s proposal****:*

* *Down select one or more of following options for determining UE-A (transmitting the inter-UE coordination information) and UE-B (receiving and using the inter-UE coordination information):*
  + *Option 1: UE-A is the intended receiver of UE-B*
  + *Option 2: UE-A (e.g., RSU, platooning header) and UE-B are determined by higher layer*
  + *FFS on applicable scenario(s)/inter-UE coordination scheme(s) for each option*

Please provide comment, if any, on the above draft proposal **by April 14th, 11:59am UTC**. To prepare the updated draft proposal that will be used in Thursday’s GTW, it would be highly appreciated if companies make comments, if any, as soon as possible.

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| Company | Comment |
| vivo | We support the proposal, but the example in option 2 can be removed (e.g., RSU, platooning header), anyway the applicable scenario is FFS. |
| NTT DOCOMO | We are OK with the proposal. Note that the FFS is important since this aspect will be dependent on the actual mechanism of inter-UE coordination. At least different option might be taken between scheme 1 and scheme 2. |
| FUTUREWEI | Since both 1 and 2 can be supported, we suggest remove the words “Down select” in the main bullet and rephase it as “One or more of following options are supported …..” |
| InterDigital | We support the proposal |
| Convida Wireless | We are Ok with the proposal. |
| Sony | We support both options 1 and 2. We agree with FUTUREWEI’s suggestion to rephrase the main bullet. |
| Qualcomm | We’d prefer to discuss this proposal after the discussion on Proposal 1 concludes.  The listed options seem to focus only on unicast transmissions. For some coordination schemes, any UE can provide the coordination information since this information would constructively combine from multiple sources.   * *Down select one or more of following options for determining UE-A (transmitting the inter-UE coordination information) and UE-B (receiving and using the inter-UE coordination information):*   + *Option 1: UE-A is the intended receiver of UE-B*   + *Option 2: UE-A (e.g., RSU, platooning header) and UE-B are determined by higher layer*   + *Option 3: UE-A is not an intended receiver of UE-B*   + *FFS on applicable scenario(s)/inter-UE coordination scheme(s) for each option if needed* |
| ZTE | Option-1 should be supported at least.  For the Option-2, the assistant information from other UEs than the intended receiver may not be well matched with the realistic condition for final transmission, the benefits of this scenarios is limited. Also prefer to remove the example in Option-2. |
| Sharp | We agree with other companies that examples are part of applicable scenarios and should be removed in the proposal. |
| Intel | We suggest adding Option 3 to address at least unicast scenarios:  Option 3: UE-A is not an intended/target RX of UE-B   * + FFS conditions to provide feedback |
| Panasonic | How UE-A and UE-B are determined is depending on whether UE-A and UE-B know UE-B and UE-A has capability of inter- UE coordination or not. The capability of inter-UE coordination could be exchanged by application layer and PC5-RRC. PC5-RRC is limited to unicast. When UE-A and UE-B exchange the capability by application layer or PC5-RRC, UE-A and UE-B can be determined by above option 1 and option 2. If the capability is not exchanged, how to operate option 1 without the capability exchange should be considered. Therefore, this determination of UE-A and UE-B should be considered with how to exchange the capability of inter-UE coordination. |
| Samsung | O.K with current proposal but we do not support all options at this stage. We think that at least Option 1 needs to be supported. As QC suggested, Option 3 can be included and further discussion is necessary. In Option 3, UE-A can be multiple. |
| NEC | Option 1 says UE-A is the intended receiver of UE-B, while we are also discussing how to determine UE-B, we think it’s still not clear how to determine UE-B in option 1. Or, do we assume that every UE in R17 which has data to transmit is UE-B and need to receive "a set of resources"? If no, we think we need also to discuss how to determine UE-B in option 1 for example, condition-based, high layer indicated, etc.; If yes, in option 2, we don't need to say that UE-B is determined by high layer.  Option 2 fine.  In addition, we also think UE-A can be determined for example condition based or signing request from other UEs when it’s not an intended receiver of UE-B. |

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| Xiaomi | *We support option1, for option1, it is necessary to design detailed criteria to determine UE-A and UE-B, meanwhile, option1 will not bring higher layer singnal overhead.* |
| CMCC | Support, and we think that both options should be supported.  In addition, regarding option 2, we think that the determination of UE-A and UE-B should not be limited to just higher layer, it can have more flexibility, e.g., let UE-B assign proper UE to be UE-A, or allow a UE voluntarily act as UE-A. |
| Mitsubishi | Generally fine, but Option 1 as currently stated seems very oriented “unicast”. In multicast/broadcast, it might not be useful to have all intended receivers provide feedback, so we propose the following modification:   * + *Option 1: UE-A is among the intended receiver(s) of UE-B*     - *FFS which UEs among the intended receivers of UE-B act as UE-A*   Please note that the FFS point is the follow-up of the conclusion in RAN1#103e “*When UE-A sends ”A set of resources” to UE-B, including which UE(s) sends it”*  We are open at supporting both options. |
| Fraunhofer | We are supportive of both options and, as mentioned by Futurewei, we do not see the need for any further down-selection among the options. |
| Spreadtrum | For option 2, UE-A may be not only RSU and platooning header, but also other non-intended receiver UE. So, we think that option 2 can be changed to:  Option 2: UE-A is not the intended receiver of UE-B.  FFS the determination of UE-A. |
| Huawei, HiSilicon | Both options are valid in realistic deployment scenarios and can be supported.  For Option 2: there are hierarchical scenarios (e.g., platooning, RSU, etc.) in realistic deployment. In such scenarios, the UE higher in the hierarchy (i.e., UE-A) can coordinate multiple UEs lower in the hierarchy (i.e., UE-B). This can avoid interference completely within this group and achieve higher reliability. Such gains have already been validated by simulations (e.g., our Tdoc R1-2102324). In addition, for some public safety and commercial use cases, the devices in these cases may choose not to perform sensing for power saving, or choose to not have the ability to perform sensing for device simplification. Thus, only UE-A senses is an attractive mechanism in these cases.  For Option 1: if UE-A is the intended receiver of UE-B, UE-A can send the resources to be used to UE-B due to, e.g., half-duplex constraint, collision, etc., which is not known to UE-B.  Since there is already an FFS to study the applicable scenario(s)/inter-UE coordination scheme(s) for each option, maybe we can do the following change to have better progress   * *~~Down select one or more of~~ Support the following options for determining UE-A (transmitting the inter-UE coordination information) and UE-B (receiving and using the inter-UE coordination information):* |
| Fujitsu | Agree |
| OPPO | We prefer to add one more option:   * + *Option 3: packet priority and PDB of a UE.*   As inter-UE coordination would introduce considerable complexity at UE-A and signaling exchange between UE-A and UE-B, this mechanism should be used only for high priority transmission for which reliability requirement is high. And in scheme 1, some time is needed for UE-B to obtain the coordination information, hence the scheme is only possible when PDB is sufficient. |
| MediaTek | In case of SCI forwarding (UE-A forwards the peer Tx UE-C’s SCI for reception protection), it is not necessary that UE-A should be the receiver of UE-B.  So there is no need for such restriction. Instead, we can focus on the discussion of the applicable scenarios, use cases and trigger conditions. |
| Nokia, NSB | No need to downselect at this stage, several options can be further considered. Agree with adding Qualcomm’s option 3. |
| LG | We think that both options could be applied to both schemes. Even for scheme 2, to alleviate signalling flooding, Option 2 could be used as well. |
| Lenovo/MotM | We support the both proposal as it is complementary techniques serving different use cases, no need for downselection |

***FL’s proposal****:*

* *When UE-B receives the inter-UE coordination information from UE-A, down select one or more of following options for UE-B’s to take it into account in the resource selection for its own transmission:*
  + *Inter-UE Coordination Scheme 1*
    - *Option 1-1: UE-B determines candidate resource set to be used for its transmission resource selection based on both UE-B’s Rel-16 Mode 2 sensing result and the received coordination information*
    - *Option 1-2: UE-B determines candidate resource set to be used for its transmission resource selection based only on the received coordination information*
    - *Option 1-3: UE-B determines resource(s) to be re-selected among its selected resources based on the received coordination information*
  + *Inter-UE Coordination Scheme 2*
    - *Option 2-1: UE-B determines resource(s) to be re-selected among its resources indicated by UE-B’s SCI based on the received coordination information*
    - *Option 2-2: UE-B determines resource(s) to be retransmitted among its resources indicated by UE-B’s SCI based on the received coordination information*
  + *FFS on details including applicable scenario(s)/condition(s) for each option*

Please provide comment, if any, on the above draft proposal **by April 14th, 11:59am UTC**. To prepare the updated draft proposal that will be used in Thursday’s GTW, it would be highly appreciated if companies make comments, if any, as soon as possible.

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| Company | Comment |
| vivo | For scheme 1 option 1, we should avoid to mention Rel-16 mode 2 sensing, since we have partial sensing and random selection in Rel-17, ‘UE-B’s Rel-16 Mode 2 sensing result’ can be replaced by ‘UE-B’s autonomous resource selection procedure’  For scheme 1 option 3, it is not sure whether autonomously selected resource come first or the suggested resource come first, it is better not to mention re-selection of the autonomously selected resource. We prefer more general wording for option 3, e.g., UE-B determines transmission resource from autonomously selected resource and/or coordination information |
| NTT DOCOMO | We are generally fine with the current proposal, but one comment.  Regarding scheme 2, it seems that option 2-1 intends pre-collision indication and option 2-2 does post-collision indication. They are possibly supported in current situation. So no down-selection between option 2-1 and option 2-2 should also be possible. |
| FUTUREWEI | As comment before, for each scheme, one critical issue should be discussed first before discussing the list options here. Upon receiving the coordination information, UE B can 1) use the coordination information in a strictly following manner, e.g., select resource from preferred resource set from UE A either with or without its own sensing results, or 2) use the coordination information in a recommendation manner, e.g., select recourse based on its own sensing results if there is a conflict between its sensing results and received coordination information. We support to adopt both. FFS the conditions for UE B using 1) or 2). This shall be another proposal or a high-level bullet item.  As for the proposal, since listed options may not be mutually exclusive, we suggest remove “down select” from the main bullet. Maybe add “FFS down select one or more of the options below” in the end of main bullet. |
| InterDigital | We agree with proposals for Scheme 1 and Option 2-1 for Scheme 2. However, we need further clarification regarding what Option 2-2 means. Specifically, we are not sure how to interpret “resource(s) to be retransmitted”. Does it mean UE-B determines which resources to be used as reserved? Or “resources to be retransmitted” has anything to do with HARQ or blind retransmissions? Note Option 2-1 includes cases in which UE-B re-select all reserved resources or some of the reserved resources based on the information provided in the received coordination message. In the latter case, when UE-B determines which reserved resources to be re-selected, the rest of the reserved resources will be kept, i.e., used as reserved. We would thus like Option 2-2 to be re-formulated/clarified to have a better understanding for the discussion. |
| Convida Wireless | We are generally fine with the FL’s proposal. For Inter-UE Coordination Scheme 1  Option 1-2: UE-B determines candidate resource set to be used for its transmission resource selection based only on the received coordination information, does this include UE-B follows exactly the resources that are indicated by UE-A ‘s indication? Some clarification may be good. |
| Sony | We are fine with the proposal basically.  But for the main bullet, since it is unclear for us, we suggest to modify it to “support one or more of following options for UE-B’s resource selection for its own transmission when UE-B receives the inter-UE coordination information from UE-A:”. |
| Qualcomm | We’d prefer to discuss this proposal after the discussion on Proposal 1 concludes. |
| ZTE | W.r.t UE-B’ behaviour on how to use the received assist information, it should be up to UE-B’s implementation and there is no need to specify it. |
| Sharp | We agree with FUTUREWEI on discussing the high level principles of using the coordination information first before going to the details. |
| Intel | In Option 2-2, resources cannot be retransmitted. We suggest updating the wording.  *Option 2-2: UE-B determines resource(s) with sidelink conflict(s) and decides whether/how to perform sub-sequent retransmissions for a TB with sidelink conflict detected* |
| Panasonic | For scheme 2, whether UE-B reselect resource/retransmit data or not is up to UE-B’s decision. For option 2-2, it is also related to maximum the number retransmission in UE-B. |
| Samsung | Depending on which option is supported in the previous proposal, we may need to consider other options in this proposal. For example, if UE-A is not an intended receiver of UE-B and if UE-A are multiple then we may need to consider additional options for scheme 1. So, we think that this proposal should be discussed after decision of supporting scenario/use case/cast type for inter-UE coordination. |
| NEC | We agree in principle. And also kindly request clarification on "resource(s) to be retransmitted" in option 2-2. |

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| Xiaomi | *We are fine with FL proposal. In Scheme 1, option1-1 should be supported. In option1, UE-B consider coordination message and sensed resource set by UE-B’s Rel-16 Mode 2 procedure to determine candidate resource set, meanwhile, considering the definition of the set of resources, UE-B can choose union set or intersection set.*  *In Scheme 2, option2-1 option2-2 should be supported, option2-1 can trigger re-selected resource when UE-B receive coordination information to indicate potential resource conflict, option 2-2 can trigger retransmission for groupcast option1 when UE-B receives coordination information to indicate detected resource conflict.* |
| CMCC | To our understanding, how UE-B takes the set of resources into account is dependent on the definition of the set of resources and the target scenario/issue. To be specific, consider that the set of preferred resources in Scheme 1, in case that only UE-A senses, then Option 1-2 should be adopted. On the other hand, consider that the set of non-preferred resources in Scheme 1, Option 1-1 or 1-3 can be used regarding when the UE-B receives the coordination message informed by UE-A. |
| Mitsubishi | Generally OK. At least option 1-1 should be supported. |
| Fraunhofer | We support the three options under scheme 1. The options are not really alternatives to each other and are dependent on the type of resource set, and the availability/usability of UE-B’s sensing results. Hence, we support Futurewei and Sony’s suggestion to remove “down-selection”.  For scheme 2, option 2-2 is unclear since the UE would re-use the same indicated resources for retransmissions, which could result in further collisions that were already detected. |
| Spreadtrum | We are fine with the proposal. |
| Huawei, HiSilicon | We suggest this is an opportunity for RAN1 to clarify a little around the meaning of “determines”:  *Option 1-1: UE-B’s transmission resource is (re-)selected based on both UE-B’s sensing result and the received coordination information*  *Option 1-2: UE-B’s transmission resource is given by only the received coordination information.*  *Option 1-3: (can be removed after re-phrasing option 1-1 as above, because its selected resources are by definition based on sensing results).*  The scheme 2 options seem problematic, because option 2-2 suggests that resources can be re-transmitted. It would be cleaner to simplify as:  *UE-B’s resource reservation in SCI is re-selected based on the received coordination information*  At this stage, it seems each option may have different applicable scenarios and are not entirely mutually exclusive. So we suggest to remove “*down select one or more of following options*” in the main bullet, and instead add a “FFS: *down select one or more of above options*” as a sub-bullet. |
| Fujitsu | For Option 2-2, “among its resources indicated by UE-B’s SCI” is not accurate. The resources to be retransmitted (i.e., retransmission resources) do not have to be indicated by UE-B’s SCI. The same wording as Option 1-3 can be used, i.e.,   * + - *Option 2-2: UE-B determines resource(s) to be retransmitted among its selected resources ~~resources indicated by UE-B’s SCI~~ based on the received coordination information* |
| OPPO | Regarding Option 2-1 we have similar comments as above, the “resources” should not be restricted to reserved resources only:   * + - *Option 2-1: UE-B determines resource(s) to be re-selected among its reserved/selected resources based on the received coordination information*   We are fine with other options. |
| MediaTek | It is unclear for scheme 2 about “…*among its resources indicated by UE-B’s SCI”* in Option 2-1 and 2-2, does it imply UE should re-select the resources among the indicated resources? If not, maybe we can remove it. And if 1 bit of PSFCH can only indicate acceptable or not acceptable for the reserved resources, UE-B can’t know which reserved resource can be reused/re-selected. UE-B may perform re-selection anyway.  Besides, Option 2-2 seems not necessary. re-selection can be triggered for either retransmission or new transmission. There is no need of any restriction. |
| Nokia, NSB | In Option 2-2, the wording "*resource(s) to be retransmitted*" doesn't seem to make sense, since the resources do not get retransmitted, something gets retransmitted ON resources.  Moreover, restricting to "*among its resources indicated by UE-B’s SCI "* may not be always sufficient, e.g., if the conflict indication is only processed after the last resource indicated in the most recent SCI. |
| LG | In our understanding, depending on the condition (e.g. whether candidate resource ratio > X%, or processing time budget,…), UE-B may or may not use the coordination information. In this case, we can rephrase “*for UE-B’s to take it into account*” into “when UE-B takes it into account”. |
| Lenovo/MotM | On scheme 1 we think both power saving UE and non-power saving UE should be considered, e.g., for power saving UE random resource selection may be performed.  For scheme 1 no need to down select as it serves different use cases  option 1-1 can be useful for UEs performing sensing so joint selection of resource increases PRR  option 1-2 can be useful for power sensitive UEs where RSU is performing sensing and indicating the candidate resource  option 1-3 depends on the content of the coordination information (eg., non-preferred resource) and reception timing of the coordination information. UE can perform re-selection of the selected resource based on the coordination info |

1. **Summary of contributions**

* How UE-A and UE-B are determined
  + Option 1: UE-B is a PSCCH/PSSCH TX UE for data transmission, and UE-A is the intended receiver of UE-B [OPPO,3] [Spreadtrum,4] [vivo,5] [Fraunhofer,12] [CMCC,14] [Xiaomi,16] [Intel,17] [Samsung,20] [Sony,22] [LG,24] [Lenovo,29] [DCM,30]
  + Option 2: UE-A and UE-B are determined via higher layer (e.g. application layer) [Huawei,1] [vivo,5] [Apple,18] [Sony,22] [LG,24]
  + Option 3: UE-A is pre-defined, and UE-B is UEs that can receive inter-UE coordination information from other UE [LG,24]
* How/when UE-A determines the contents of “A set of resources”, including consideration of UL scheduling?
  + Type of “A set of resources”
    - For Type A and/or Type B
      * based on its sensing result of UE-A [Huawei,1] [Nokia,2] [OPPO,3] [vivo,5] [MediaTek,8] [Fujitsu,9] [Fraunhofer,12] [CMCC,14] [ZTE,15] [Xiaomi,16] [Intel,17] [Apple,18] [InterDigital,28] [Lenovo,29]
      * based on UE-A’s transmission [vivo,5] [Fraunhofer,12] [ZTE,15] [Apple,18] [Qualcomm,19] [LG,24] [NEC,27]
        + SL transmission [vivo,5] [Qualcomm,19] [LG,24]
        + UL transmission [vivo,5] [LG,24]
      * based on UE-A’s decision in higher layer [Huawei,1] [LG,24]
      * based on semi-static information [Intel,17] [LG,24]
    - For Type B and/or Type C
      * based on expected/potential resource conflict [vivo,5] [MediaTek,8] [Fujitsu,9] [Fraunhofer,12] [Xiaomi,16] [Intel,17] [Apple,18] [Qualcomm,19] [LG,24] [NEC,27] [DCM,30] [Ericsson,34]
        + PSSCH TX and PSSCH RX [vivo,5] [Intel,17] [Apple,18] [LG,24] [DCM,30]
        + PSSCH TX and PSSCH TX [vivo,5] [Apple,18] [LG,24]
        + PSFCH TX and PSFCH RX [vivo,5] [Apple,18] [DCM,30]
        + PSFCH TX and PSFCH TX [vivo,5] [Apple,18] [DCM,30]
        + SL TX and UL TX [vivo,5] [Intel,17] [LG,24] [DCM,30]
        + SL RX and UL TX [vivo,5] [Intel,17] [LG,24] [DCM,30]
      * based on detected resource conflict [Intel,17] [Apple,18] [Qualcomm,19] [LG,24] [NEC,27] [Ericsson,34]
        + PSSCH TX and PSSCH RX [Intel,17] [Apple,18] [Qualcomm,19] [LG,24]
        + PSSCH TX and PSSCH TX [Apple,18] [Qualcomm,19] [LG,24]
        + PSFCH TX and PSFCH RX [Apple,18]
        + PSFCH TX and PSFCH TX [Apple,18]
        + SL TX and UL TX [Intel,17] [Qualcomm,19] [LG,24]
        + SL RX and UL TX [Intel,17] [Qualcomm,19] [LG,24]
  + Other information in the inter-UE coordination information
    - For Type A and/or B
      * Recommended TX parameters [MediaTek,8]
      * Sensing information [Fujitsu,9] [Apple,18] [Hyundai,32] [ASUSTeK,33]
      * Source ID of UE-B [Fujitsu,9] [Hyundai,32]
      * Destination ID associated with UE-B [Fujitsu,9] [Hyundai,32]
      * Resource conflict type [Fujitsu,9] [Apple,18]
      * Indication of information type (e.g. Type A or Type B) [Fraunhofer,12] [Convida,25]
      * Indication about the intended recipient UE [Fraunhofer,12] [LG,24]
      * Resource pool index [Fraunhofer,12]
    - For Type B and/or Type C
      * Resource conflict type (e.g., resource collision or half-duplex restriction) [Intel,17] [LG,24]
      * Indication of information type (e.g. Type B or Type C) [Intel,17] [LG,24]
* When UE-A sends ”A set of resources” to UE-B, including which UE(s) sends it
  + For Type A and/or Type B
    - Explicit Trigger-based based coordination procedures [Huawei,1] [Nokia,2] [OPPO,3] [Spreadtrum,4] [vivo,5] [CATT,7] [Fujitsu,9] [FUTUREWEI,10] [Zhejiang Lab,11] [Fraunhofer,12] [Mitsubishi,13] [CMCC,14] [ZTE,15] [Xiaomi,16] [Apple,18] [Samsung,20] [ITL,21] [Sony,22] [LG,24] [Sharp,26] [NEC,27] [InterDigital,28] [Lenovo,29]
      * Information carried by the explicit triggering
        + the parameters related to the sensing procedure of UE-B [Huawei,1] [Nokia,2] [OPPO,3] [CATT,7] [Fujitsu,9] [Fraunhofer,12] [ZTE,15] [Xiaomi,16] [InterDigital,28] [Lenovo,29]
        + A set of preferred or non-preferred resources determined at UE-B [Nokia,2] [OPPO,3]
      * Container of the explicit triggering
        + SCI format [Huawei,1] [OPPO,3] [Fujitsu,9] [FUTUREWEI,10]
        + PSFCH format [Apple,18]
        + Higher layer signaling [OPPO,3] [Fujitsu,9] [LG,24]
    - Event-trigger based coordination procedures [Huawei,1] [Fujitsu,9] [FUTUREWEI,10] [Zhejiang Lab,11] [Fraunhofer,12] [Mitsubishi,13] [CMCC,14] [Xiaomi,16] [ITL,21] [Sony,22] [LG,24] [NEC,27] [InterDigital,28] [Lenovo,29]
      * Based on (pre)configured periodicity [Huawei,1] [ITL,21] [LG,24]
      * Based on RSRP measurement [MediaTek,8] [CMCC,14] [ITL,21]
      * Based on distance between UE-A and UE-B [Mitsubishi,13] [CMCC,14] [Xiaomi,16] [ITL,21]
      * When the coordination information is updated for UE-B [LG,24]
      * Based on decision in higher layer [LG,24]
      * Based on congestion status [LG,24]
      * Based on SL HARQ-ACK state at UE-A side [Lenovo,29]
  + For Type B and/or Type C
    - Explicit Trigger-based based coordination procedures [Intel,17]
      * Container of the explicit triggering
        + 1st SCI format [Intel,17]
    - Event-trigger based coordination procedures
      * Based on detection of resource conflict [Spreadtrum,4] [vivo,5] [MediaTek,8] [Fujitsu,9] [Xiaomi,16] [Intel,17] [Apple,18] [LG,24] [InterDigital,28] [Lenovo,29]
    - Validity check of transmitting inter-UE coordination information
      * Based on distance between UE-A and UE-B(s) [Intel,17] [LG,24]
      * Based on RSRP from UE-A to UE-B(s) [Intel,17] [LG,24] [Lenovo,29]
      * Based on L2 ID(s) from UE-B [Huawei,1] [LG,24]
      * Based on distance between UE-Bs [LG,24]
      * Based on communication range requirement [LG,24]
* How UE-A sends ”A set of resources” to UE-B, including container used for carrying it, implicitly or explicitly or both
  + For Type A and/or Type B
    - 1st SCI format [Nokia,2] [Spreadtrum,4] [MediaTek,8] [FUTUREWEI,10] [Xiaomi,16] [Lenovo,29]
    - 2nd SCI format [Huawei,1] [OPPO,3] [Spreadtrum,4] [vivo,5] [CAICT,6] [MediaTek,8] [Fraunhofer,12] [CMCC,14] [Xiaomi,16] [Samsung,20] [Sony,22] [Lenovo,29]
    - Higher layer signaling (e.g. MAC CE and/or PC5-RRC) [OPPO,3] [Spreadtrum,4] [vivo,5] [MediaTek,8] [Fraunhofer,12] [ZTE,15] [Intel,17] [LG,24] [NEC,27] [Lenovo,29]
    - PSFCH format [OPPO,3] [Sony,22]
  + For Type B and/or Type C
    - PSFCH format [vivo,5] [CAICT,6] [MediaTek,8] [Xiaomi,16] [Intel,17] [Apple,18] [LG,24] [NEC,27] [Lenovo,29] [DCM,30]
      * Priority is inherited by the priority indicated by TX UE [Intel,17] [LG,24] [Lenovo,29]
  + Further consideration of using a single signaling to transmit one or multiple “set of resources” to multiple of UEs [OPPO,3] [LG,24]
  + Retransmission of the inter-UE coordination information
  + Further consideration on whether shared or dedicated resource is used for inter-UE coordination signaling [Nokia,2]
* How/when/whether UE-B receives “A set of resources” and takes it into account in the resource selection for its own transmission
  + For Type A and/or Type B
    - How UE-B performs resource (re)selection procedure upon receiving the inter-UE coordination information
      * Combine UE-B’s sensing results and resource set provided from UE-A [Huawei,1] [OPPO,3] [vivo,5] [CATT,7] [FUTUREWEI,10] [Fraunhofer,12] [CMCC,14] [Xiaomi,16] [Apple,18] [ETRI,23] [LG,24] [Convida,25] [NEC,27] [InterDigital,28] [Lenovo,29] [Hyundai,32]
      * Use resource set provided from UE-A without a consideration of UE-B’s sensing results [Huawei,1] [vivo,5] [FUTUREWEI,10] [Fraunhofer,12] [Apple,18] [ETRI,23] [Convida,25] [InterDigital,28] [Hyundai,32]
      * Reselect UE-B’s reserved resources [OPPO,3] [Apple,18] [LG,24] [Lenovo,29]
      * It is up to UE-B how to use it [Zhejiang Lab,11] [ZTE,15] [Samsung,20]
    - Cast type of UE-B that can use inter-UE coordination information
      * Unicast [Huawei,1] [OPPO,3] [Spreadtrum,4] [vivo,5] [Fujitsu,9] [Fraunhofer,12] [Mitsubishi,13] [Xiaomi,16] [Samsung,20] [ETRI,23] [LG,24] [Convida,25] [Lenovo,29]
      * Groupcast with HARQ-ACK feedback Option 1 [Spreadtrum,4] [vivo,5] [Fujitsu,9] [Fraunhofer,12] [Mitsubishi,13] [Samsung,20] [LG,24] [Convida,25] [Lenovo,29]
      * Groupcast with HARQ-ACK feedback Option 2 [Huawei,1] [OPPO,3] [Spreadtrum,4] [vivo,5] [Fujitsu,9] [Fraunhofer,12] [Mitsubishi,13] [Samsung,20] [ETRI,23] [LG,24] [Lenovo,29]
      * Broadcast [Spreadtrum,4] [vivo,5] [Fujitsu,9] [Mitsubishi,13] [LG,24] [Convida,25] [Lenovo,29]
    - Validity check of the received inter-UE coordination information at UE-B side
      * Based on RSRP in coordination information [Fujitsu,9]
      * Based on distance between UE-A and UE-B [Fujitsu,9] [Fraunhofer,12] [Mitsubishi,13] [LG,24]
      * Based on RSRP from UE-A to UE-B [Fraunhofer,12] [LG,24]
      * Based on information about target UE of the inter-UE coordination information [Fraunhofer,12] [LG,24]
      * Based on whether the indicated resource set is inside UE-B’s selection window
  + For Type B and/or Type C
    - How UE-B performs resource (re)selection procedure upon receiving the inter-UE coordination information
      * UE-B performs retransmission on the already selected resource(s) [Intel,17] [Qualcomm,19]
      * UE-B reselect all or a subset of its own selected resource(s) [vivo,5] [MediaTek,8] [Fujitsu,9] [Intel,17] [LG,24] [NEC,27] [DCM,30]
      * Continue to use the selected resource(s) [Intel,17]
      * Skip all or a subset of its own selected resource(s) [Intel,17]
      * Further consideration on what is the non-preferred resource set for the resource conflict indication [LG,24]
    - Cast type of UE-B that can use inter-UE coordination information
      * Unicast
      * Groupcast with HARQ-ACK feedback Option 1 [Fujitsu,9] [Qualcomm,19]
      * Groupcast with HARQ-ACK feedback Option 2
      * Broadcast
    - Validity check of the received inter-UE coordination information at UE-B side
      * Resources for initial transmission of UE-B [LG,24]
      * Resources for retransmission of UE-B of which HARQ-ACK state is not ACK [LG,24]
      * Based on HARQ-ACK state at UE-B side [LG,24]
      * Based on the number of (re)transmission of the same TB at UE-B side [LG,24]
* Others
  + Further consideration of indication to UE-A of ID(s) used by UE-B and the intended receiver(s) of UE-B’s transmission [Nokia,2]
  + Further consideration of congestion control for inter-UE coordination signaling [Fujitsu,9] [Zhejiang Lab,11] [Intel,17] [LG,24]
  + Further consideration on the unmonitored slot at UE-B side [Fujitsu,9] [LG,24]
  + Further consideration on the impact on Rel-16 UE sharing the same resource pool with UEs using inter-UE coordination operation [Samsung,20] [Panasonic,31]
  + Further consideration on SL DRX to determine “A set of resources” at UE-A side [ASUSTeK,33]

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34. R1-2103648 Discussion on V2X mode 2 enhancements ASUSTeK
35. R1-2103705 Mode 2 enhancements using Inter-UE coordination Ericsson
36. **Appendix**

**4.1 Conclusions made in RAN1#103-e meeting**

* ***Conclusion****:*
  + *The schemes of inter-UE coordination in Mode 2 are categorized as being based on the following types of “A set of resources” sent by UE-A to UE-B:*
    - *UE-A sends to UE-B the set of resources preferred for UE-B’s transmission*
      * + *e.g., based on its sensing result*
    - *UE-A sends to UE-B the set of resources not preferred for UE-B’s transmission*
      * + *e.g., based on its sensing result and/or expected/potential resource conflict*
    - *UE-A sends to UE-B the set of resource where the resource conflict is detected*
    - *FFS: details of resource conflict, e.g., including type of resource conflict*
    - *FFS: details of sensing operation at UE-A side*
    - *FFS: which type(s) of resource set information is(are) beneficial/feasible to which cast type(s)*
    - *Note: these different types may be used in combination with each other*
  + *From RAN1 perspective, further study on the feasibility/benefit of inter-UE coordination is required*
  + *Send an LS to RAN plenary*
    - *Final LS in* [*R1-2009841*](file:///C:\Users\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_103\Docs\R1-2009841.zip)
* ***Conclusion****:*
  + *For the schemes of inter-UE coordination identified as feasible/beneficial, at least the following aspects are further discussed.*
    - *How/when UE-A determines the contents of ”A set of resources”, including consideration of UL scheduling*
    - *When UE-A sends ”A set of resources” to UE-B, including which UE(s) sends it*
    - *How UE-A and UE-B are determined*
    - *How UE-A sends ”A set of resources” to UE-B, including container used for carrying it, implicitly or explicitly or both*
    - *How/when/whether UE-B receives “A set of resources” and takes it into account in the resource selection for its own transmission*
    - *How/whether to define the relationship between support/signaling of inter-UE coordination and cast type*

**4.2 Conclusions made in RAN1#104-e meeting**

* ***Conclusion****:*
  + *RAN1 concludes that the inter-UE coordination in Mode 2 is feasible, and is beneficial (e.g., reliability, etc.) compared to Rel-16 Mode 2 RA, and thus recommends specification of the feature.*
    - *The detailed observations can be found in the attachment of the LS*
* *Draft LS in* [*R1-2102165*](file:///C:\Users\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_104\Docs\R1-2102165.zip)*, along with the attachment* [*R1-2102166*](file:///C:\Users\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_104\Docs\R1-2102166.zip)*, is approved (with a typo fix)* 
  + *Final LS in R1-2102168*