**#3GPP TSG RAN WG1 #103-e R1-200xxxx**

**e-Meeting, October 26th – November 13th, 2020**

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**Source:** Moderator (LG Electronics)

**Title:** Feature lead summary for AI 8.11.2.2 Feasibility and benefits for mode 2 enhancements

**Document for:** Discussion and information

1. **Email discussion**

As per Chairman’s guideline, the following email discussion was allocated for AI 8.11.2.2. Please provide your view on the questions in Section 1.1/1.2/1.3/1.4/1.5/1.6 **by November 4th, 3:00am UTC**. Based on the collected view, I’ll make a set of proposals that will be discussed and finalized **by November 5th**.

* + - * *[103-e-NR-Sidelink-Enh-03] Email discussion/approval for feasibility and benefits for mode 2 enhancements– Seungmin (LGE)*
* *1st check point: 11/5*
* *2nd check point: 11/10*
* *3rd check point: 11/12*

**1.1 How to define “A set of resources”?**

* + - * Q1: Do you agree the following proposal?
* When a set of resources determined at UE-A is sent to UE-B, at least the following types of “a set of resources” are supported.
  + Type 1: Resource set which is preferred for UE-B’s transmission
  + Type 2: Resource set which is preferred not to be used by UE-B’s transmission

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* + - * Q2: Which option(s) is(are) used for UE-A to determine “a set of resources”?
* Option 1: The set of candidate resources obtained after Step 7) in TS 38.214
* Option 2: The set of selected resources for UE-A’s PSCCH/PSSCH transmissions
* Option 3: The set of slots where UE-A cannot receive NR sidelink channel/signal
* Option 4: Others (please specifiy it)

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* + - * Q3: What is the detailed form to indicate the set of resources?
* Contiguous frequency domain resource vs. Non-contiguous frequency domain resource
* Contiguous time domain resource vs. Non-contiguous time domain resource’
* Reference point to indicate the time domain resource
* Etc

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**1.2 When does UE-A transmits “A set of resources” to UE-B?**

* + - * Q1: When does UE-A send “a set of resources” to UE-B?
* Option 1: Based on signaling of triggering or requesting
* Option 2: Based on a pre-defined or (pre)configured triggering condition(s)
* Option 3: Others (please specifiy it)

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* + - * Q2: For Option 1 in Q1, how does UE-B transmit the triggering/requesting message to UE-A in terms of container, contents, condition for transmitting it, resource used for its transmission, etc?

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* + - * Q3: For Option 2 in Q1, what is the detailed condition when UE-A sends the set of resources to UE-B?

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**1.3 How does UE-A transmit “A set of resources” to UE-B?**

* + - * Q1: Which option(s) is(are) used as the container when UE-A transmits “a set of resources” to UE-B?
* Option 1: MAC CE
* Option 2: PC5-RRC signaling
* Option 3: New 2nd SCI format
* Option 4: PSCCH
* Option 5: PSFCH
* Option 6: Others (please specifiy it)

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* + - * Q2: How does UE-A transmit the set of resources to multiple UE-Bs?
* Option 1: UE-A individualy transmits the set of resources to each UE-B
* Option 2: UE-A can simultaneously transmit the same set of resources to multiple UE-Bs
* Option 3: Others (please specifiy it)

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**1.4 When “A set of resources” provided by UE-A is valid at UE-B side?**

* + - * Q1: When does UE-B determine that “A set of resources” provided by UE-A is valid?
* Option 1: When the SL RSRP measurement based on RS used for transmitting the set of resources is larger than a certain threshold
* Option 2: When the geographical distance between UE-A and UE-B is smaller than a certain threshold
* Option 3: When the received set of resources is not outdated
* Option 4: When the ID(s) associated with the set of resources is matched
* Option 5: When the target cast type is matched
* Option 6: When UE-B has a packet to transmit
* Option 7: Others (please specifiy it)

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**1.5 How does UE-B take “A set of resources” into account in the resource selection for its own transmission?**

* + - * Q1: Which option(s) is(are) supported for UE-B to take “A set of resources” into account in the resource selection for its own transmission?
* Option 1: UE-B triggers the resource re-selection
* Option 2: UE-B determines the candidate resources that can be used for its PSCCH/PSSCH transmission, based on its sensing results by using Rel-16 Mode 2 procedure and the set of resource provided by UE-A
* Option 3: UE-B determines the candidate resources that can be used for its PSCCH/PSSCH transmission, based on the set of resource provided by UE-A
* Option 4: Up to UE-B’s implementation

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**1.6 Other aspects for “Inter-UE coordination”**

* + - * Q1: In case when it is necessary to discuss/specify additional aspects other than those in Section 1.1/1.2/1.3/1.4/1.5, please specify it in details.

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1. **Appendix A -** Summary of contributions
   * + - Q1: When does UE-A trigger or transmit the assistance information?

* Explicit Trigger-based based coordination procedures [2] [3] [4] [6] [7] [11] [12] [13] [16] [18] [20] [21] [22] [36] [23] [24] [27] [28] [30] [14]
  + Explicit triggering message includes the parameters associated with the sensing procedure of the Tx UE [2] [6] [7] [21] [30] [14]
* Event-trigger based coordination procedures [2] [3] [6] [10] [11] [12] [16] [18] [20] [32] [23] [24] [27] [28] [30] [14]
  + Based on observed collisions [3] [6] [10] [12] [18] [32]
  + Based on observed half-duplex problem [10] [12] [32]
  + Based on interference measurement [6] [10] [11] [18]
  + UE-A triggers its resource (re)selection procedure [10]
  + When UE-A transmitting the inter-UE coordination is in proximity [11] [20]
    - * Q2: How does UE-A generate the assistance information?
* Definition of “a set of resources”
  + Resource set which is preferred for UE-B’s transmission [1] [2] [3] [4] [6] [7] [10] [11] [13] [15] [16] [18] [20] [21] [32] [36] [23] [24] [27] [28] [30] [37] [38] [14]
  + Resource set which is preferred not to be used by UE-B’s transmission [1] [3] [4] [6] [7] [10] [11] [15] [16] [18] [20] [32] [35] [36] [23] [24] [27] [28] [30] [31] [37] [14]
* Other information in the assistance information
  + Type indicator for a set of resources [4] [10] [16] [18] [23]
  + Associated RSRP [6] [10] [16] [30]
  + Associated RX priority [6] [10] [16] [30]
  + Triggering resource (re)selection [29] [36] [24]
* Consideration aspects when determining the set of resources
  + Hidden-node problem [1] [2] [3] [4] [6] [7] [10] [11] [15] [21] [32] [35] [36] [23] [28] [30] [31] [38] [14]
  + Half-duplex problem [1] [2] [3] [4] [6] [7] [10] [11] [32] [35] [36] [23] [30] [31] [14]
  + Exposed-node problem [1] [2] [3] [6] [11] [15] [14]
    - Objection: [10] [33] [31]
  + Persistent collision [1] [2] [3] [6] [10] [11] [23] [14]
  + Avoiding PSFCH TX/TX or PSFCH TX/RX collisions [4] [10] [35]
  + Near-far problem [35]
    - * Q3: How does UE-A transmit the assistance information?
* Container
  + SCI format 1-A [1] [11] [32] [25]
  + New 2nd SCI format [5] [6] [10] [11] [13] [18] [32] [25] [28] [14]
  + MAC CE [6] [10] [32] [24] [25] [37]
  + PC5-RRC [21] [33] [24] [37] [14]
  + PSFCH [24] [25] [36] [29]
* Retransmission of the inter-UE coordination information [10] [32]
  + - * Q4: When does UE-B use the received assistance information for resource (re)selection procedure?
* Target cast type
  + Unicast [2] [3] [4] [5] [6] [7] [10] [12] [13] [19] [20] [21] [22] [29] [33] [24] [27] [30] [34] [37] [14]
  + Groupcast [3] [4] [6] [10] [12] [13] [19] [20] [21] [22] [29] [33] [24] [27] [30] [34] [37]
  + Broadcast [3] [4] [6] [10] [12] [19] [20] [22] [29] [33] [30] [37]
* When UE-A transmitting the inter-UE coordination is in proximity [6] [10] [18] [35]
  + Based on geographical distance
  + Based on RSRP measurement
* When UE-B triggers resource (re)selection procedure [10]
  + - * Q5: How does UE-B use the received assistance information for resource (re)selection procedure?
* Combine UE-B’s sensing results and resource set provided from UE-A [2] [3] [6] [9] [10] [11] [16] [17] [18] [29] [24] [28] [30] [34] [14]
  + During determination of candidate resource set [2] [4] [6] [9] [10] [11] [18] [14]
    - Union of preferred resource set based on inter-UE coordination from UE-A and UE-B’s candidate resource set [2]
    - Intersection of preferred resource set based on inter-UE coordination from UE-A and UE-B’s candidate resource set [2] [6] [10]
  + During determination of selected resource set [4] [9] [10] [18] [14]
  + After determination of selected resource set [9]
* Use resource set provided from UE-A directly [2] [3] [4] [16] [17] [18] [30] [34] [14]
  + This is out of scope [10] [29]
* Update excluded resources associated with non-monitored slot at UE-B side based on the inter-UE coordination information [6] [10]
* It is up to UE-B how to use it [13] [21] [37]
  + - * Further consideration on skipping the transmission of inter-UE coordination information [6] [10] [32]
      * Further consideration on validity check for the inter-UE coordination information [10] [13] [18]
      * Further consideration on how to guarantee the minimum ratio of candidate resources over a resource selection window [10]
      * Further consideration on dedicated resources for inter-UE coordination information and its request [36]
      * Mode 2 enhancements other than inter-UE coordination
* Further consideration that UE-A transmits SL HARQ-ACK feedback on behalf of another UE [6] [36] [23]
* Further consideration that UE-A forwards TB(s) received from another UE [6] [23]
* Further consideration on mixture of blind retransmission and HARQ-ACK feedback-based retransmission [7] [35] [36]
* Further consideration on interference sum to decide the excluded resources [10]
* Further consideration on TX power of UE performing a resource (re)selection procedure [10]
* Further consideration on prioritizing earlier resources for resource selection [26] [35] [36]
* Further consideration on handling half-duplex problem based on the SCI transmitted by the intended RX UE [26]
* Further consideration on groupcast HARQ-ACK feedback enhancement [36]

1. **Reference**
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6. R1-2007771 Inter-UE Coordination Mode 2 Kyocera Corporation
7. R1-2007788 Considerations on inter-UE coordination for mode 2 enhancements Fujitsu
8. R1-2007834 Discussion on feasibility and benefits for mode 2 enhancements CATT
9. R1-2007880 Enhancement of Mode 2 Latency Performance ITRI
10. R1-2007893 Feasibility and benefits for mode 2 enhancements TCL Communication Ltd.
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14. R1-2008190 On Feasibility and Benefits for Mode2 Enhancements Samsung
15. R1-2008240 Inter-UE coordination in mode 2 of NR sidelink OPPO
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17. R1-2008447 Discussion on Inter-UE Coordination for Mode 2 Resource Allocation Apple
18. R1-2008499 Discussion on V2X mode 2 enhancements ASUSTeK
19. R1-2008757 Resource Allocation Enhancements for Mode 2 Fraunhofer HHI, Fraunhofer IIS
20. R1-2008820 Views on inter-UE coordination for mode 2 enhancements Zhejiang Lab
21. R1-2008861 Inter-UE coordination for enhanced resource allocation Mitsubishi Electric RCE
22. R1-2008879 Inter-UE coordination in mode-2 ZTE Corporation, Sanechips
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31. R1-2009122 NR SL Mode 2 enhancement for reliability improvement InterDigital, Inc.
32. R1-2009126 Mode 2 enhancements in sidelink Panasonic Corporation
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