**#3GPP TSG RAN WG1 #102-e R1-20xxxxx**

**e-Meeting, August 17th – 28th, 2020**

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**Source:** Moderator (LG Electronics)

**Title:** FL summary#1 for AI 8.11.2.2 Feasibility and benefits for mode 2 enhancements

**Document for:** Discussion and decision

1. **Email discussion**

As per Chairman’s guideline, the following email discussion was allocated for AI 8.11.2.2.

* + - * **[102-e-NR-SL\_enh-02] Email discussion/approval using the summary as a starting point, focusing on high-level concepts for 8.11.2.2 – Seungmin (LGE)**
* **To start from 8/21 till 8/27**

When considering the relevant objective below, it would be desirable to focus on discussing high-level concepts for “Inter-UE coordination” in this meeting. Based on the outcome of email discussion, in the next meeting, RAN1 can discuss/conclude details and send LS to RAN (subject to decision of September RAN meeting). Please provide your view on the questions in Section 1.1/1.2/1.3/1.4 **by 8/26 (Wednesday)**. Based on the collected view, I’ll make a set of proposals that will be discussed and finalized **by 8/27**.

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| *2. Resource allocation enhancement:** *Specify resource allocation to reduce power consumption of the UEs [RAN1, RAN2]*
	+ *Baseline is to introduce the principle of Rel-14 LTE sidelink random resource selection and partial sensing to Rel-16 NR sidelink resource allocation mode 2.*
	+ *Note: Taking Rel-14 as the baseline does not preclude introducing a new solution to reduce power consumption for the cases where the baseline cannot work properly.*
* *Study the feasibility and benefit of the enhancement(s) in mode 2 for enhanced reliability and reduced latency in consideration of both PRR and PIR defined in TR37.885 (by RAN#91), and specify the identified solution if deemed feasible and beneficial [RAN1, RAN2]*
	+ *Inter-UE coordination with the following until RAN#90.*
		- *A set of resources is determined at UE-A. This set is sent to UE-B in mode 2, and UE-B takes this into account in the resource selection for its own transmission.*
	+ *Note: The study scope after RAN#90 is to be decided in RAN#90.*
	+ *Note: The solution should be able to operate in-coverage, partial coverage, and out-of-coverage and to address consecutive packet loss in all coverage scenarios.*
	+ *Note: RAN2 work will start after [RAN#89].*
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**1.1 How to define “A set of resources” in Mode 2**

* + - * Q1: Do you agree that the followings can be considered? If you want to add other options, please specify it.
* Resource set recommended by UE-A
	+ e.g.,
		- TX resource set which can be used by UE-B
		- Preferred RX resource set of UE-A

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**1.2 When UE-A transmits “A set of resources” to UE-B in Mode 2**

* + - * Q1: Do you agree that the followings can be considered? If you want to add other options, please specify it.
* When requested by UE-B
* When satisfying the pre-defined condition

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**1.3 Which container is used to transmit “A set of resources” to UE-B in Mode 2**

* + - * Q1: Do you agree that the followings can be considered? If you want to add other options, please specify it.
* PSSCH
	+ MAC message
	+ PC5-RRC signaling
* New 2nd SCI format
* New physical channel

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**1.4 How to use “A set of resources” for UE-B in Mode 2**

* + - * Q1: Do you agree that the followings can be considered? If you want to add other options, please specify it.
* Take it into account to make a candidate TX resource set in the resource selection procedure
* Take it into account to decide selected resources for PSCCH/PSSCH TX

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

* + - * Q1: What other aspects (other than those in Section 1.1/1.2/1.3/1.4) are needed to be discussed?

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1. **Appendix A -** Summary of contributions
	* + - Targeting scenario
* Problems to be considered
	+ Hidden-node problem [1] [3] [4] [6] [8] [9] [12] [14] [19] [20] [26] [27]
		- Example of related scenario:
			* UE-A transmits PSCCH/PSSCH to UE-B.
			* UE-C transmits PSCCH/PSSCH to UE-B.
			* UE-A and UE-C cannot recognize each other.
	+ Exposed-node problem [1]
		- Example of related scenario:
			* UE-A transmits PSCCH/PSSCH to UE-C.
			* UE-B transmits PSCCH/PSSCH to UE-D.
			* UE-A and UE-B are close each other.
			* UE-C and UE-D cannot recognize each other.
	+ Half-duplex problem [1] [3] [4] [5][6] [8] [9] [12] [14] [26] [27]
		- Example of related scenario:
			* UE-A transmits PSCCH/PSSCH to UE-B in slot i.
			* UE-B transmits PSCCH/PSSCH to UE-C in slot i.
	+ Persistent collision [2] [4] [9] [12] [20]
		- Example of related scenario:
			* UE-A transmits PSCCH/PSSCH with period of N slots from slot i.
			* UE-B transmits PSCCH/PSSCH with period of N slots from slot i.
	+ PSFCH collision problem [3] [25]
		- Example of related scenario:
			* UE-A transmits PSCCH/PSSCH to UE-B and expects to receive the corresponding PSFCH in slot i.
			* UE-A receives PSCCH/PSSCH from UE-C and is expected to transmit the corresponding PSFCH in slot i (and/or UE-A receives PSCCH/PSSCH from UE-D and is expected to transmit the corresponding PSFCH in slot i).
* Cast type to be considered
	+ Broadcast: [6] [17] [20]
	+ Groupcast: [3] [4] [6] [8] [17] [18] [20] [21]
	+ Unicast: [3] [4] [6] [8] [17] [18] [20] [21]
		- * How to define “A set of resources”
* e.g.
	+ Selected resources of UE-A [2] [5][6] [9] [10] [11] [18] [21] [22]
	+ Set of SL resources where UE-A can or cannot perform SL RX [3] [4] [5][6] [8] [9] [12] [26]
	+ Set of SL resources suggested by UE-A [3] [5][9] [13] [15] [20] [22] [24] [26] [27] [28]
	+ Sensing results of UE-A [5][6] [7] [8] [9] [10] [12] [14] [19] [20] [21] [22] [25] [26]
	+ Indication for release of reserved resources [5][8][9]
	+ Recommendation of transmission characteristics [9] [26] [27]
	+ Resource re-selection triggering for UE-B [3] [8][13] [20] [26]
	+ Selected resources for UE-B [1] [3] [7] [8] [23]
		- * When UE-A transmits “A set of resources” to UE-B
* e.g.
	+ Request of UE-B [1] [6] [27]
	+ Event-triggered [1] [6] [27]
		- * Which container is used to transmit “A set of resources” to UE-B in Mode 2
* e.g.
	+ New 2nd SCI format [2] [9] [12] [16] [24] [27] [28]
	+ PSSCH [9] [12] [15] [16] [18] [24] [27] [28]
		- MAC message
		- PC5-RRC signal
	+ New physical channel [9] [28]
		- * How to use “A set of resources” for UE-B
* e.g.
	+ Take “A set of resources” into account to make S\_A in Mode 2 [9] [11] [15] [16] [18] [19] [20] [24]
	+ Take “A set of resources” into account to decide selected resources for PSCCH/PSSCH transmission [1] [3] [7] [8] [9] [11] [13] [14] [16] [20] [21] [23]
		- * Further consideration on mixture of blind retransmission and HARQ-ACK feedback-based retransmission [8] [25] [26]
			* Further consideration on Mode 2 RA enhancement considering sum of multiple interference and TX power level [9]
			* Further consideration on resource selection from the earliest available resources [13] [25] [26]
1. **Reference**
2. R1-2005255 Inter-UE coordination in sidelink resource allocation Huawei, HiSilicon
3. R1-2005276 Sidelink resource allocation for Reliability enhancement Lenovo, Motorola Mobility
4. R1-2005296 Views on resource allocation enhancements for sidelink communication FUTUREWEI
5. R1-2005404 Discussion on mode-2 enhancements vivo
6. R1-2005501 Discussion of sidelink resource allocation mode 2 enhancements Nokia, Nokia Shanghai Bell
7. R1-2005537 Resource Allocation Enhancements for Mode 2 Fraunhofer HHI, Fraunhofer IIS
8. R1-2005546 Considerations on inter-UE coordination for mode 2 enhancements Fujitsu
9. R1-2005588 High-level concepts for mode 2 enhancements Sony
10. R1-2005612 Considerations on Mode 2 Latency Enhancement ITRI
11. R1-2005645 Discussion on Mode 2 enhancements MediaTek Inc.
12. R1-2005692 Discussion on feasibility and benefits for mode 2 enhancements CATT
13. R1-2005749 Discussion on feasibility and benefits for mode 2 enhancements LG Electronics
14. R1-2005763 Views on feasibility and benefits for mode 2 enhancements NEC
15. R1-2005774 Feasibility and benefits for mode 2 enhancements TCL Communication Ltd.
16. R1-2005840 Sidelink resource allocation for Reliability enhancement Lenovo, Motorola Mobility
17. R1-2005897 On feasibility and benefits of sidelink enhancements targeting Mode 2 reliability and latency Intel Corporation
18. R1-2005903 Inter-UE coordination for enhanced resource allocation Mitsubishi Electric RCE
19. R1-2005961 Inter-UE coordination in mode-2 ZTE, Sanechips
20. R1-2006010 Discussion on feasibility and benefits of mode 2 enhancements OPPO
21. R1-2006171 On Feasibility and Benefits for Mode2 Enhancements Samsung
22. R1-2006184 NR SL Mode 2 enhancement for reliability improvement InterDigital, Inc.
23. R1-2006231 Discussion on reliability and latency enhancements for mode-2 resource  allocation CMCC
24. R1-2006268 Discussion on feasibility and benefit of mode 2 enhancements Spreadtrum Communications
25. R1-2006445 Feasibility and benefits of mode 2 enhancements for inter-UE coordination Ericsson
26. R1-2006508 Mode 2 Resoruce Allocation with Inter-UE Coordination Apple
27. R1-2006537 Mode 2 enhancements in sidelink Panasonic Corporation
28. R1-2006587 Discussion on V2X mode 2 enhancements ASUSTeK
29. R1-2006626 Discussion on Mode 2 enhancement for enhanced reliability and reduced latency Xiaomi
30. R1-2006748 Discussion on sidelink resource allocation for reliability and latency enhancements NTT DOCOMO, INC.
31. R1-2006829 Reliability and Latency Enhancements for Mode 2 Qualcomm Incorporated
32. R1-2006876 Sidelink Resource Allocation Enhancements ROBERT BOSCH GmbH
33. R1-2006922 On Resource Allocation Mode 2 Enhancement for NR Sidelink Convida Wireless