3GPP TSG-RAN WG1 Meeting #118bis R1-240yyyy

Hefei, China, October 14th – October 18th 2024

**Agenda Item: 5**

**Title: Moderator summary #1 for RAN1 reply to RAN2 LS on IUC Scheme-2 and Random Selection**

**Source: Moderator (OPPO)**

**Document for: Discussion, Decision**

# Introduction

In “R1-2407589 LS on IUC Scheme-2 and Random Selection” RAN 2 asks following to RAN1 [1]:

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| In TS 38.321, it is specified that   |  | | --- | | 5.22.1.2b Re-selection for using a received resource conflict indication  If the MAC entity has been configured with Sidelink resource allocation mode 2 to transmit using pool(s) of resources in a carrier as indicated in TS 38.331 [5] based on full sensing, or partial sensing or random selection or any combination(s), the MAC entity shall for each Sidelink process:  1> if *sl-interUECoordinationScheme2* enabling reception/transmission of a resource conflict indication is configured by RRC; and  <Text Removed> |   But it is not clear to RAN2 whether the configuration of both Inter-UE coordination scheme-2 and random-selection is supported or not.  **Q1**: Is configuration of both Inter-UE coordination scheme-2 and random-selection supported or not, for normal resource pool and for exceptional resource pool?  **2. Actions:**  **To RAN WG1**  **ACTION:** RAN2 respectfully asks RAN1 to provide answer to **Q1** above. |

Companies have provided their views in contributions [2] – [15] under agenda item 5:

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| [R1-2407825](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_118b/Docs/R1-2407825.zip) | **Answer**: RAN1 has not discussed whether the Inter-UE coordination scheme-2 and random-selection can be enabled together. From RAN1 perspective, it is possible to enable IUC scheme-2 for a UE performing random selection, which may be beneficial for a PUE, that has no sensing result, to avoid potential resource conflict. |
| [R1-2407999](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_118b/Docs/R1-2407999.zip) | **Answer:** There has been no special handling for supporting IUC scheme-2 with random selection in RAN1. From RAN1’s perspective, IUC scheme-2 is benefit for sensing-based resource selection as well as random selection, by excluding the conflict resource(s) from the candidate resource set or from the resource pool. Therefore, it is RAN1’s understanding that co-configuration of IUC scheme-2 and random selection can be supported for normal resource pool and exceptional resource pool. |
| [R1-2408125](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_118b/Docs/R1-2408125.zip)  [R1-2408126](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_118b/Docs/R1-2408126.zip) | **Observation 1: From the perspective of UE A, it is allowed by current specification that UE performing random selection can determine and provide resource conflict information.**  **Observation 2: From the perspective of UE B, physical layer will report conflict resources or slot to higher layer in the case of random selection.**  **Proposal 1: The configuration of IUC scheme 2 and random selection is supported in physical layer for both normal and exceptional resource pool.** |
| [R1-2408185](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_118b/Docs/R1-2408185.zip) | ***Proposal 1: Reply question to RAN2 as follows:***   * *Configuration of both inter-UE coordination scheme-2 and random resource selection is not supported.* |
| [R1-2408297](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_118b/Docs/R1-2408297.zip) | ***Observation 1: The following aspects should be taken into consideration when RAN1 decides whether to support the combination of IUC scheme-2 and Random-selection:***   * ***The feedback and reselection of resources suffering from the half-duplex problem by IUC scheme-2 can be technically beneficial for Random-selection regardless of the resource pool type (e.g., normal pool, exceptional pool).*** * ***No additional RAN1 specification work is required to support the combination of IUC scheme-2 and Random-selection.*** |
| [R1-2408439](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_118b/Docs/R1-2408439.zip) | **Reply to Question1:** The configuration of both Inter-UE coordination scheme 2 and random selection are supported, for normal resource pool and for exceptional resource pool. |
| [R1-2408521](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_118b/Docs/R1-2408521.zip) | **Answer:** If PSFCH is configured in a resource pool, from RAN1’s perspective, inter-UE coordination scheme-2 can be applied for a mode 2 UE based on random selection, no matter in a normal resource pool or an exceptional resource pool. Once the resource conflict indication is received, the UE can re-select a resource by random selection. Besides, to support this configuration combination, no RAN1 specification impact has been identified. Based on above judgment, whether to support the configuration of both Inter-UE coordination scheme-2 and random-selection can be determined by RAN2. |
| [R1-2408616](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_118b/Docs/R1-2408616.zip) | * It is up to RAN2 to decide whether to support configuration of both Inter-UE coordination scheme-2 and random-selection, for normal resource pool and for exceptional resource pool. * From RAN1 specification perspective, there is no limitation on configuration of both features. |
| [R1-2408771](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_118b/Docs/R1-2408771.zip) | **Observation 1:**   * **Inter-UE coordination scheme 2 works well in a resource pool (pre-)configured with random selection and full and/or partial sensing.** * **Inter-UE coordination scheme 2 works well in a resource pool (pre-)configured only with random selection, at least when *sl-OptionForCondition2-A-1* = '1'.**   **Proposal 1:**   * **Conclude that inter-UE coordination scheme 2 can be (pre-)configured with random selection for the same resource pool regardless of whether the pool is normal or exceptional.**   + **RAN1 sends a reply LS to inform RAN2 of this RAN1 conclusion.** |
| [R1-2408832](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_118b/Docs/R1-2408832.zip) | From RAN1’s perspective, configuration of both inter-UE coordination Scheme 2 and random selection in the same resource pool is supported. |
| [R1-2408912](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_118b/Docs/R1-2408912.zip)  [R1-2408914](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_118b/Docs/R1-2408914.zip) | 1. For a resource pool where IUC is configured:    1. Option A: the UE is not expected to use RRS when doing inter-UE coordination with another UE in the resource pool    2. Option B: the resource pool not configured with RRS in the allowed resource selection methods.   For Q1: configuration of both Inter-UE coordination scheme-2 and random-selection in the same resource pool, for both normal resource pool and for exceptional resource pool, is not supported. |
| [R1-2408947](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_118b/Docs/R1-2408947.zip) | RAN1 has not made an explicit agreement regarding the configuration of both Inter-UE coordination scheme-2 and random-selection. From RAN1’s point of view there is no reason not to support this configuration. No update to RAN1’s specification will be required. |

Based on the inputs above, although majority companies observed that there is no explicit RAN1 agreement regarding configuration of both inter-UE coordination scheme-2 and random-selection, they still believe that both can be configured in an exceptional or normal resource pool with random selection as no RAN1 specification update is identified, furthermore, support of this concurrent configuration is beneficial. However, there are also technical concerns on support configuration of both, including lack of RSRP threshold needed for resource conflict determination, and the need of sensing capability of a UE.

Inter-UE coordination scheme-2 involves 2 UEs, i.e. UE-A and UE-B, the technical concerns raised by companies so far are all on UE-A only. The behavior of UE-A is specified in subclause 16.3.0 of 38.213 copied below, where UE-A determines resource conflict according to 1) due to half-duplex operation in the slot or 2）first and second resources overlap in time and frequency. 1) is not dependent on any RSRP measurement or RSRP threshold, which can be supported even by a UE without sensing capability, and it should be applicable in a resource pool with random selection. 2) is dependent on RSRP measurement of second/third UE and corresponding RSRP threshold, which may not be applicable for all configurations or all UE-A, even so seems there is no need to make any update for a resource pool with random selection as this condition is simply not triggered in the cases.

As per subclause 16.3.1 of 38.213 and majority companies’ observation, there is no need to update UE-B’s behavior for a resource pool with random selection.

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| 16.3.0 UE procedure for transmitting PSFCH with control information **……**  A first UE determines a second UE for providing the conflict information to in a PSFCH as follows  - if the first UE is an intended receiver of the second UE for a reserved resource of a PSSCH transmission in a slot,  - does not expect to perform reception on the sidelink due to half-duplex operation in the slot, and  - determines to transmit to the second UE the PSFCH with the conflict information.  A first UE determines a UE for providing the conflict information to in a PSFCH as follows  - if, for a resource pool, *typeAUEScheme2* is disabled, the first UE has been indicated a first reserved resource and a second reserved resource as resources for PSSCH reception or, if for a resource pool *typeAUEScheme2* is enabled, has been indicated at least the first reserved resource or the second reserved resource for PSSCH reception,  - detects a first SCI format 1-A that includes a first priority value, , and the first reserved resource for PSSCH transmission from a second UE,  - detects a second SCI format 1-A that includes a second priority value, , and the second reserved resource for PSSCH transmission from a third UE, and  - determines that the first and second resources overlap in time and frequency  - the PSFCH occasions for resource conflict information of the second UE and the third UE are valid  - the indicationUEB flag in SCI Format 1-A from the second UE and the third UE is set to 1, if *indicationUEBScheme2* = 'enabled'  - determines the first SCI format 1-A and the second SCI format 1-A are not received later than *sl-MinTimeGapPSFCH* before the PSFCH occasion for conflict information  - determines to transmit to the second UE the PSFCH with the conflict information  - determines to transmit to either the second UE or the third UE the PSFCH with the conflict information, if  The first UE can be provided conditions by *optionForCondition2A1Scheme2* to determine conflict of reserved resources in a resource pool  - if *optionForCondition2A1Scheme2* = '0', the first UE can be provided by, *ThresPSSCH-RSRP-List* , a list of RSRP thresholds for each priority combination [6, TS 38.214]  - if the first UE is an intended receiver for PSSCH in a reserved resource of the second UE, the first UE determines a resource conflict if the RSRP [6, TS 38.214] of the third UE is above a threshold  - if the first UE is an intended receiver for PSSCH in a reserved resource of the third UE, the first UE determines a resource conflict if the RSRP of the second UE is above a threshold  - if *optionForCondition2A1Scheme2* = '1', the first UE can be provided a value by *deltaRSRPThresh*  - if the first UE is an intended receiver for PSSCH in a reserved resource of the second UE, the first UE determines a resource conflict if , where and are the RSRP measurements from the first UE for the second UE and the third UE, respectively  - if the first UE is an intended receiver for PSSCH in a reserved resource of the third UE, the first UE determines a resource conflict if |

# Discussion

### 2.1 First round

Companies are invited to provide their inputs to the questions below.

**Question 1: The current RAN1 specification does not preclude configuration of both Inter-UE coordination scheme-2 and random-selection for a single resource pool, is this understanding correct or not?**

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| **Company** | **Y/N** | **Comments** |
| Apple | Yes |  |
| Nokia | Yes |  |
| NEC | Yes |  |
| DCM | Yes |  |
| Sharp | Yes |  |
| Qualcomm | yes |  |
| Huawei, HiSilicon | yes |  |
| CATT/CICTCI | Yes |  |
| OPPO | Yes |  |

**Question 2: If the answer to Question 1 is Y, any comment on the draft reply to the LS below:**

***RAN1’s reply:***

***RAN1 has not made any explicit agreement regarding the configuration of both Inter-UE coordination scheme-2 and random-selection. However, no additional RAN1 specification work is required to support configuration of both Inter-UE coordination scheme-2 and random-selection. In another word, from RAN1 perspective configuration of both Inter-UE coordination scheme-2 and random-selection is supported, for normal resource pool and for exceptional resource pool.***

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| **Company** | **Comments** |
| Apple | Agree |
| Nokia | OK in principle, but prefer to remove the last sentence since it might give the impression that this configuration is explicitly supported. |
| NEC | OK, also suggest following clarification to better avoid RAN2 redundant discussion  ***RAN1 has not made any explicit agreement regarding the configuration of both Inter-UE coordination scheme-2 and random-selection. However, no additional RAN1 specification work is required to support configuration of both Inter-UE coordination scheme-2 and random-selection, i.e., RAN1 spec supports UE-A to determine IUC scheme 2 information with random-selection. In another word, from RAN1 perspective configuration of both Inter-UE coordination scheme-2 and random-selection is supported, for normal resource pool and for exceptional resource pool.*** |
| DCM | Agree |
| Sharp | Agree |
| Qualcomm | Agree. I think NEC suggestion is repeating the last sentence twice, so I am not sure it is needed.  Some minor corrections below:  ***In other words, from RAN1 perspective, configuration of both Inter-UE coordination scheme-2 and random-selection is supported for normal resource pool and for exceptional resource pool.*** |
| Huawei, HiSilicon | We suggest to leave the decision to RAN2. See red changes below.  ==  ***RAN1’s reply:***  ***RAN1 has not made any explicit agreement regarding the configuration of both Inter-UE coordination scheme-2 and random-selection. ~~However, n~~No additional RAN1 specification work is required to support configuration of both Inter-UE coordination scheme-2 and random-selection. ~~In another word, from RAN1 perspective~~ It is up to RAN2 whether to support configuration of both Inter-UE coordination scheme-2 and random-selection ~~is supported~~, for normal resource pool and for exceptional resource pool.*** |
| CATT/CICTCI | Agree with the draft LS reply.  We think at least we can provide RAN1 understanding/preference regarding the co-configuration of IUC scheme-2 and random selection, instead of saying the decision is totally up to RAN2. |
| OPPO | Agree |

### 2.2 2nd round

# References

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| [1] | [R1-2407589](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_118b/Docs/R1-2407589.zip) | LS on IUC Scheme-2 and Random Selection | RAN2, OPPO |
| [2] | [R1-2407825](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_118b/Docs/R1-2407825.zip) | Draft LS reply on IUC Scheme-2 and Random Selection | vivo |
| [3] | [R1-2407999](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_118b/Docs/R1-2407999.zip) | Draft Reply LS on IUC Scheme-2 and Random Selection | CATT, CICTCI |
| [4] | [R1-2408125](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_118b/Docs/R1-2408125.zip) | Discussion on IUC scheme 2 and random selection in NR SL | OPPO |
| [5] | [R1-2408126](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_118b/Docs/R1-2408126.zip) | Draft reply LS on IUC scheme 2 and random selection in NR SL | OPPO |
| [6] | [R1-2408185](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_118b/Docs/R1-2408185.zip) | Discussion on RAN2 LS on IUC Scheme-2 and Random Selection | Huawei, HiSilicon |
| [7] | [R1-2408297](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_118b/Docs/R1-2408297.zip) | Discussion on LS on IUC Scheme-2 and Random Selection | LG Electronics |
| [8] | [R1-2408439](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_118b/Docs/R1-2408439.zip) | Draft Reply LS to RAN2 on IUC Scheme-2 and Random Selection | Apple |
| [9] | [R1-2408521](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_118b/Docs/R1-2408521.zip) | Draft reply LS on IUC Scheme-2 and Random Selection | ZTE Corporation, Sanechips |
| [10] | [R1-2408616](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_118b/Docs/R1-2408616.zip) | Discussion on RAN2 LS about IUC Scheme-2 and Random Selection | Samsung |
| [11] | [R1-2408771](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_118b/Docs/R1-2408771.zip) | Discussion on RAN2 LS of SL IUC scheme 2 and random selection | NTT DOCOMO, INC. |
| [12] | [R1-2408832](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_118b/Docs/R1-2408832.zip) | Draft reply LS on IUC Scheme-2 and Random Selection | Qualcomm Incorporated |
| [13] | [R1-2408912](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_118b/Docs/R1-2408912.zip) | Discussion on LS on IUC Scheme-2 and Random Selection | Ericsson |
| [14] | [R1-2408914](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_118b/Docs/R1-2408914.zip) | Draft reply LS on IUC Scheme-2 and Random Selection | Ericsson |
| [15] | [R1-2408947](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_118b/Docs/R1-2408947.zip) | [Draft ]Reply LS on IUC Scheme-2 and Random Selection | Nokia |