**3GPP TSG-RAN WG2 Meeting #117 electronic *Draft\_*R2-2202823**

**Online, 21 February – 03 March 2022**

**Source: vivo (Rapporteur)**

**Title:** **Summary of [POST116bis-e][706][V2X/SL] Open issues on power-saving resource allocation, Phase 2**

**Agenda Item:** **8.15.3**

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

# Introduction

Based on the outcome open issue list from Phase 1 [1] this document summarizes the Phase-2 discussion of the following email discussion:

* [POST116bis-e][706][V2X/SL] Open issues on power-saving resource allocation (vivo)

 **Scope:** 1st phase: Make an open issue lists with the proposed candidate options or rapporteur suggestion. Open issue lists can include pre-identified issues (e.g. FFS, not decided or skipped from previous offline/email discussion) and new issues raised in company contributions at RAN2#116bis. For new issues that have not discussed before, rapporteur can collect companies’ inputs (e.g. whether it is essential issue that need to be considered and closed in Rel-17) and based on that, determine whether to be included in the open issue list or not.

2nd phase: email discussion on the identified open issues with collecting companies’ inputs on the candidate options or rapporteur’s suggestion.

 **Intended outcome:** Open issue list with the proposed candidate options or rapporteur’s suggestion from 1st phase (in R2-2201806). Discussion summary for the identified open issues from 2nd phase.

**Deadline**: 1st phase (1/21 – 1/28 UTC), 2nd phase (2/9 – 2/14 UTC)

Specifically, this discussion focuses on the open issues with the suggested way of handling as “Company input into Pre117-e-offline”. Those issues categorized as “CR rapporteur handled issue” will be handled by the corresponding Spec rapporteurs for this WI in the running CR discussions.

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|  |  |  |
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# Discussions

**[Issue 1] Should the resource allocation scheme(s) applicable in UE’s AS depend on the type of NR SL transmission configured by the upper layers? If yes, how such configuration should be reflected in the AS Spec (e.g. P2X vs. non-P2X as in LTE)?**

* **Option 1: Yes. A UE can be configured to perform NR SL transmission using power-saving resource allocation or NR SL transmission using non-power-saving resource allocation.**
* **Option 2: Yes. A UE can be configured to perform P2X related NR SL transmission or non-P2X related NR SL transmission (as in LTE).**
* **Option 3: No. A UE decides which resource allocation scheme can be used in the AS completely based on UE capability.**

The selection of options and comments from companies towards **Issue 1** are collected in the below table.

|  |  |  |
| --- | --- | --- |
| **Company** | **Selected option(s)** | **Comments, if any** |
| **Xiaomi** | **3** |  |
| **OPPO** | **Option 3 with comments** | Firstly, **prefer AS layer decides**. For Option 3, besides UE capability, **resource pool configuration** should also be considered;Then for Option 1/2, we are a bit **reluctant for the upper layer configuration** since:1) **additional SA/CT work** cannot be avoided;2) according to our RAN1 colleagues, even **a VUE has power saving needs**, i.e., when the battery is low, which cannot be reflected by service type.Therefore, considering the **difference between LTE and NR**, in order to **accomplish the WI in time**, besides the resource pool configuration and UE capability agreed by RAN1, we prefer to leave it to UE implementation to decide the resource allocation schemes.In case there is majority preference on upper layer input, option-2 is anyway not feasible since we cannot limit to V2X/P2X case, and thus option-1 should be the way-out, yet the so-called “(non-)power-saving resource allocation” requires further coordination with SA2/CT1. |
| Huawei, HiSilicon | Option 3 |  |
| Intel | Option 3 | We assume that resource pool configuration as well as UE capability shall determine which resource allocation scheme is used.  |
| NEC | Option 3 |  |
| LG | Option 3 |  |
| InterDigital | Option 1 | We think we should not deviate from the premise of LTE that upper layers configured the UE to use power savings schemes or not. Then as for how this is defined by upper layers, we can use a more generic configuration for NR (rather than P2V used in LTE) to support more used cases. |
| Sharp | Option 3 |  |
| Ericsson | Option 3 |  |
| CATT | Option 3 | UE decided which resource allocation scheme is used based on UE capability and the resource pool configuration. |
| Samsung | Option 1 | We think LTE option is the baseline and either option1 or option2 is quite aligned with what is supported in LTE.  |
| ZTE | Option3 |  |
| Apple | Option 1 | Even if UE is capable of partial sensing, it may only need to do it based on upper layer requirement. Not sure how AS layer itself can determine which resource allocation scheme to use. We prefer to follow LTE V2X. |
| Qualcomm | Option 3 | The resource allocation scheme(s) (power saving or non-power saving) should be decided by UE’s capability. |
| Lenovo | Option 3 |  |
| vivo | Option 1 preferred;Option 3 acceptable | Option 1 is the optimal solution. But for the progress, we can follow majority’s view to rely only on AS capability. |

**[Rapp’s remark]** There is a clear majority of companies selecting Option 3 (13/16) and finding no problem to not relying on upper layer configurations anymore. Among the majority, OPPO, Intel and CATT raised another point that the resource allocation schemes allowed to be used in the UE AS also depend on the resource pool configurations, i.e. the pool-specific allowed resource allocation schemes indicated by *allowedResourceSelectionConfig*. Rapporteur thinks this is an obvious point, and can be included in the proposal along with UE capability.

**[Issue 2] Is there a case that an RRC\_CONNECTED UE needs to report the actual type of NR SL transmission it is configured to perform to the gNB?**

* **Option 1: Yes, it reports whether it is configured to perform NR SL communication using power-saving or NR SL communication using non-power-saving resource allocation.**
* **Option 2: Yes, it reports whether it is configured to perform P2X or non-P2X NR SL communication (as in LTE).**
* **Option 3: No, RAN decides what resource configuration and resource allocation scheme for a UE to use completely based on UE capability.**

The selection of options and comments from companies towards **Issue 2** are collected in the below table.

|  |  |  |
| --- | --- | --- |
| **Company** | **Selected option(s)** | **Comments, if any** |
| **Xiaomi** | **3** |  |
| **OPPO** | **Option 3** | As replied in Issue 1, AS layer can decide the resource allocation mode, so no need for this report. |
| Huawei, HiSilicon | Option 3 |  |
| Intel | Option 3 |  |
| NEC | Option 3 |  |
| LG | Option 3 |  |
| InterDigital | Option 1 | As replied in Q1, we should deviate the least possible from LTE. |
| Sharp | Option 3 |  |
| Ericsson | Option 3 |  |
| CATT | Option 3 |  |
| Samsung | Option 1 | We think LTE option is the baseline and either option1 or option2 is quite aligned with what is supported in LTE. |
| ZTE | Opiton3 |  |
| Apple | Option 1 | Prefer to reuse the legacy LTE V2X method |
| Qualcomm | Option 3 | Same to Q1 |
| Lenovo | Option 3 |  |
| vivo | Option 1 preferred;Option 3 acceptable | Same as to Q1 |

**[Rapp’s remark]** The answer to this Issue has dependency on that to Issue 1, so the same situation is seen.

Based on companies’ views to Issue 1 and 2, the following two proposals are given:

**Proposal 1: A UE decides which resource allocation scheme(s) can be used in the AS based on UE capability and the allowed resource schemes (i.e. *allowedResourceSelectionConfig*) in the resource pool configuration.**

**Proposal 2: A UE does not report the type of NR SL communication it is performing to the RAN (which decides what resource configuration and resource allocation scheme the UE can use based on UE capability).**

**[Issue 4a] Do companies agree that NO Spec impact is needed to support the resource pool selection based on resource allocation scheme?**

* **Yes.**
* **No. If selected, please specify what Spec impact is needed in detail.**

The selection of options and comments from companies towards **Issue 4a** are collected in the below table.

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments, if any** |
| **Xiaomi** | **Yes** |  |
| **OPPO** | **Yes** | Follow LTE principle. |
| Huawei, HiSilicon | Yes |  |
| Intel | Yes |  |
| NEC | Yes |  |
| LG | Yes |  |
| InterDigital | Yes with comments | Assuming this means that the UE can use a specific scheme if the pool is configured to use that scheme, which is the LTE baseline. |
| Sharp | Yes with comments | Same comment as InterDigital. |
| Ericsson | Yes |  |
| CATT | Yes |  |
| Samsung | No with comments | In our understanding, in LTE, resource pool is selected based on (if the UE is configured to transmit P2X related V2X SL communication) and (which resource allocation mechanism, i.e. partial sensing or random selection, is selected by the UE) (5.10.13.1a). We assume similar spec impact as LTE.  |
| ZTE | Yes |  |
| Apple | No with comment | In NR SL, resource pool selection is in MAC layer. But in LTE SL, this is done in RRC layer. So, I guess we cannot just follow LTE. There is some spec impact to add the new rules in MAC spec (e.g., check which resource pool supporting which resource allocation scheme) |
| Qualcomm | Yes | UE knows if the pool is configured for power saving or not. |
| Lenovo | Yes |  |
| vivo | Yes | In LTE, even if the resource pool selection is specified in RRC (5.10.13.2), nothing about allowed/supported resource allocation schemes is mentioned in that procedure, either in the normative texts or in the NOTE. It is completely up to UE implementation on how to consider the resource allocation schemes allowed in the configured resource pools and those the UE actually supports. As a result, no matter in which Spec pool selection is specified in NR, this principle of LTE can be followed (i.e. leaving consideration of resource allocation scheme during pool selection to UE implementation w/o need of embodying it explicitly in the Spec). |

**[Rapp’s remark]** There is a clear majority of companies selecting Yes (14/16) and proposing no need to have any Spec impact regarding how the UE selects resource pools based on the allowed/supported resource allocation scheme(s). Among the majority, Interdigital and Sharp raised another valid point that this is under the assumption that the UE can only use an allowed resource allocation configured in a resource pool, if it uses the pool for transmission. Rapporteur thinks that this is an obvious restriction that just follows the function of the “*allowedResourceSelectionConfig*”, and can be included in the proposal to be made.

**[Issue 4b] Do companies agree that as in LTE, it is up to UE implementation to select the resource allocation scheme finally used in the selected resource pool (if the selected pool allows multiple resource allocation schemes the UE is configured/capable to perform)?**

* **Yes.**
* **No. If selected, please specify the reason why UE implementation does not work and detail what Spec impact is needed.**

The selection of options and comments from companies towards **Issue 4b** are collected in the below table.

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments, if any** |
| **Xiaomi** | **Yes** |  |
| **OPPO** | **Yes** | Follow LTE principle. |
| Huawei, HiSilicon | Yes |  |
| Intel | Yes |  |
| NEC | Yes |  |
| LG | Yes |  |
| InterDigital | Yes |  |
| Sharp | Yes with comments | We agree with the view that selection of both pool and RA scheme should be left to UE implementation, but when comparing the formulation of 4a and 4b,* With 4a, resource pool selection is determined by the UE, chosen from pools that allow a selected resource allocation scheme, i.e. a RA scheme is already selected prior to pool selection.
* With 4b, resource allocation scheme is determined by the UE, chosen from schemes allowed in a selected resource pool, i.e. a pool is already selected prior to RA scheme selection.

It seems impossible to apply both bullets.[Rapp] Note that this question is asking how the UE selects the final RA scheme **in the “selected” resource pool**, meaning that the RA scheme is selected after the resource pool to be used for transmission has already been selected. This is completely following LTE principle in TS 36.331. No ambiguity as questioned above.Also, the above bullet 1 is talking about an RA scheme based resource pool selection which is just what above Issue 4a aims to preclude (as per majority’s view in Phase-1 discussion). |
| Ericsson | Y |  |
| CATT | Yes |  |
| Samsung | Yes |  |
| ZTE | Yes |  |
| Apple | Yes with comment | I assume that the scope of this question is only between “partial sensing” and “random selection” when both schemes are supported in the selected pool. The UE will not need to choose between “full sensing” and “partial sensing” again because that will be against the Q4a. |
| Qualcomm | Yes |  |
| Lenovo | Yes |  |
| vivo | Yes |  |

**[Rapp’s remark] All companies selected Yes, and are thus OK to leave selection of resource allocation scheme in the selected pool to UE implementation (LTE principle). With P1 above, the proposal will be made applying to all the possible resource allocation schemes. Also, it is clarified that the selection of resource allocation scheme is to be done in the resource pool *already selected* by the UE based on the conclusion to be drawn for Issue 4a.**

**During the review of draft summary on the reflector, for resource pool selection, there was one company proposing the need of having normative text like “UE shall also consider the restriction in *allowedResourceSelectionConfig* when selecting the pool”, followed by a NOTE saying “NOTE: It is up to UE implementation how *allowedResourceSelectionConfig* is jointly considered with other factors such as HARQ FB enable/disable and UE capability.”. Rapporteur understands from companies’ input in both Phase-1 and Phase 2 that the clear majority did not regard any normative texts for a specified UE behaviour as necessary, and perhaps the only point that may need to be further check during the meeting is whether to have a NOTE in the Spec to capture the above way of UE implementation. This is going to be reflected in the proposals as well.**

**Based on companies’ views to Issue 4a and 4b, the following two proposals are given:**

**Proposal 4a-1: There is a restriction that a UE can only use a resource allocation scheme to transmit in a pool allowing this scheme with “*allowedResourceSelectionConfig*”. RAN2 to further confirm whether/what Spec impact is needed to capture this restriction (e.g. in field description).**

**Proposal 4a-2: It is up to UE implementation how to consider the per-pool *allowedResourceSelectionConfig* and UE capability during resource pool selection. RAN2 to further confirm whether to capture it as a NOTE in the Spec.**

**Proposal 4b: It is up to UE implementation to select an allowed resource allocation scheme finally used in the selected resource pool (if the selected pool allows multiple resource allocation schemes the UE is capable to perform).**

# Summary

Thanks to all the companies for the input. The proposals from this email discussions are summarized as follows:

**Proposal 1: A UE decides which resource allocation scheme(s) can be used in the AS based on UE capability and the allowed resource schemes (i.e. *allowedResourceSelectionConfig*) in the resource pool configuration.**

**Proposal 2: A UE does not report the type of NR SL communication it is performing to the RAN (which decides what resource configuration and resource allocation scheme the UE can use based on UE capability).**

**Proposal 4a-1: There is a restriction that a UE can only use a resource allocation scheme to transmit in a pool allowing this scheme with “*allowedResourceSelectionConfig*”. RAN2 to further confirm whether/what Spec impact is needed to capture this restriction (e.g. in field description).**

**Proposal 4a-2: It is up to UE implementation how to consider the per-pool *allowedResourceSelectionConfig* and UE capability during resource pool selection. RAN2 to further confirm whether to capture it as a NOTE in the Spec.**

**Proposal 4b: It is up to UE implementation to select an allowed resource allocation scheme finally used in the selected resource pool (if the selected pool allows multiple resource allocation schemes the UE is capable to perform).**

# References

1. R2-2201806 Summary of [POST116bis-e][706][V2X/SL] Open issues on power-saving resource allocation, Phase 1 vivo (Rapporteur)