**3GPP TSG-RAN WG2 #124 *R2-231xxxx***

**Chicago, USA, November 2023**

Agenda Item: 7.15.X

Source: OPPO

Title: Summary of [POST123bis][113][V2X/SL] QoS flows mapping to carriers (OPPO)

Document for: Discussion, Decision

# Introduction

This is for the following email discussion.

* [POST123bis][113][V2X/SL] QoS flows mapping to carriers (OPPO)

**Scope:** Discuss whether there is any problem (including inter-operability issue, ignoring NW configuration, etc.), if feasible or not, and pros and cons for each option. The discussion will focus idle/inactive/OOC.

**Intended outcome:** Discussion summary.

**Deadline:** Long

# Discussion

During 123bis, the following issue has been discussed

**QoS flows mapping to carriers**

[Vivo]: Three options have been discussed for idle/inactive/OOC:

* Option1: UE establish multiple SLRBs to avoid different carrier for QoS flow ids in a SLRB
* Option2: Intersection among QoS flow ids belonging to a SLRB is considered in LCP
* Option3: No further enhancement based on running CR

[Nokia]: For RRC connected, option1 seems already feasible because we just agreed to include flow-to-carrier mapping for each destination into SUI message. [Qualcomm]: have strong concern with option2, e.g. multiple carriers are not guaranteed, whenever the upper layer adds new service type it should update it to the lower layer. [OPPO]: Can we see companies’ view? [IDC]: Option2 and option3 are actually same. Option2 is just for better clarification. Option3 is inherited sentence from LTE V2X as it was. [LG]: Do not think option2 and option3 are same. Prefer either option1 or option3. [Apple]: Option1 means that UE does not follow network configuration, which is not acceptable.

=> We’ll decide one of three options. No more new option is considered.

=> Comeback Friday.

Option1: Huawei, LG, Vivo, Xiaomi, Nokia, Qualcomm (6)

Option2: IDC, Ericsson, Lenovo, Apple (4)

Option3: CATT, ZTE, ASUSTek, OPPO, NEC (5)

It seems beneficial to firstly further analyze the pros/cons for each option, before final conclusion.

## Option-1

During 123bis, there were some offline discussion on option-1, it would be good to further check the Pros/Cons of it.

**Q1-1a: What is the advantage(s) of option-1 in your view?**

**- Pros-1: ensure every flow being delivered via the expected carrier**

**- Others**

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| --- | --- | --- |
| Company | Pros | Comment |
| Xiaomi | Pros-1 and see comment | In our understanding, the key poin is to avoid to map the flows having no frequency intersection to the same RB, for example, (flow1, f1, f2) and (flow2, f3) should not be mapped to the same RB. This solution can solve the issue from the root.  In addition, if each flow having totally the same frequency can be mapped to the same RB, then pro-1 can be achieved, for example, (flow1, f1, f2), (flow2, f1, f2), (flow3, f1, f2, f3), then if flow 1 and flow 2 are mapped to a RB while flow 3 mapped to one RB, then each flow can be delivered via the expected carrier. With this, there is no need to consider the intersection as proposed by option 2  But if flows having at least intersection are allowed to be mapped to the same RB, e.g., flow 1, flow 2 and flow 3 to the same RB, then for flow 3, only grants from f1 and f2 can be utilized, which reduces the expected carrier for flow 3. With this, intersection of option 2 is still needed on top of option 1. |
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**Q1-1b: What is the disadvantage(s) of option-1 in your view?**

**- Cons-1: It leads to a UE behavior igoring the network (pre)configuration for SDAP (i.e., flow-to-bearer mapping)**

**- Cons-2: Inter-operability issue since in legacy, the UE would respect the SDAP configuration from network (pre)configuration**

**- Cons-3: currently there is no enough LCID space (16 for SL DRB) to carry QoS flow (64 at most, since flow-ID is of 6-bit) in an one-to-one manner**

**- Others**

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| Company | Pros | Comment |
| Xiaomi |  | Regarding 1, we think UE may not ignore the NW configuration since even more than 1 RB is established, the configuration still follows NW. UE just establish two RBs but both follows the SDAP/PDCP/RLC/MAC configuration from NW.  Regarding 2, is there any issue if R16 UE follows the legacy configuration and new UE establish more than one RB? For the case when a legacy UE communicates with a new UE, as long as for unicast, the TX can configure the RX through PC5-RRC with the SLRB, there is no inter-operability for unicast. For BC/GC, there may be some issue if TX UE and RX UE have different understanding on the QoS flow to RB mapping, e.g., RX UE may deliver the RB to a differnet PDCP if not aligned with TX UE.  Regarding 3, we are wondering if there is that many QoS flow for a DST and also if we allow flows having at least intersection are allowed to be mapped to the same RB, e.g., flow 1, flow 2 and flow 3 to the same RB, the LCID should be enough. |
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During 123bis, some draft TP is being circulated, to show the potential impact to R2 spec, which is attached in the Annex-1.

But good to re-evaluate it based on the Pros/Cons analysis above.

**Q1-2: Do you agree that the main impact to R2 spec is as shown in Annex-1? If no, please clarify the missing part.**

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| Company | Yes/No | Comment |
| Xiaomi | Yes with comment | We are wondering if we need to have normative text change if option 1 is adopted, maybe we just have a note to up to UE implementation to establish more than one RB if QoS flows are mapped to different carriers. How to determine “different” can be up to UE, e.g., not totally the same or has at least one different frequency |
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And then finally, it boils down to two questions, whether option-1 is feasible (**not preferred or not, but just about feasibility**), and whether there is strong objection for this option.

**Q1-3a: Is option-1 is technically feasible?**

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| Company | Yes/No | Comment |
| Xiaomi | Yes |  |
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**Q1-3b: Is option-1 acceptable? (i.e., if No, meaning it is unacceptable)**

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| Company | Yes/No | Comment |
| Xiaomi | Yes |  |
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## Option-2

During 123bis, there were some offline discussion on option-2, it would be good to further check the Pros/Cons of it.

**Q2-1a: What is the advantage(s) of option-2 in your view?**

**- Pros-1: Secure higher layer flow-to-carrier mapping without changing legacy SDAP behavior**

**- Others**

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| Company | Pros | Comment |
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**Q2-1b: What is the disadvantage(s) of option-2 in your view?**

**- Cons-1: the intersection operation may lead to a reduced carrier set to deliver V2X traffic**

**- Cons-2: the no-intersection issue anyway cannot be solved**

**- Others**

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| Company | Pros | Comment |
| Xiaomi | 1 and 2 | We still think option 2 and option 1 are handling different issues. Even with option 1, option 2 may still be needed, e.g., in the example raised above in Q1-1a. The key point is if we want to solve the no intersection issue or not, if so, option 2 can not solve it. Option 2 only works when there is intersection. |
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During 123bis, some draft TP is being circulated, to show the potential impact to R2 spec, which is attached in the Annex-2 (including both normative text-based approach and NOTE-based approach)

But good to re-evaluate it based on the Pros/Cons analysis above.

**Q2-2: Do you agree that the main impact to R2 spec is as shown in Annex-2? If no, please clarify the missing part.**

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| Company | Yes/No | Comment |
| Xiaomi | Yes |  |
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And then finally, it boils down to two questions, whether option-2 is feasible (**not preferred or not, but just about feasibility**), and whether there is strong objection for this option.

**Q2-3a: Is option-2 is technically feasible?**

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| Company | Yes/No | Comment |
| Xiaomi | It depends | If the targeted scenario is QoS flows assocated to the same RB having some intersection, then it is feasible; while for the no intersection case, it is not feasible. |
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**Q2-3b: Is option-2 acceptable? (i.e., if No, meaning it is unacceptable)**

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| Company | Yes/No | Comment |
| Xiaomi | It depends | See reply above. |
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## Option-3

If R2 cannot converge on either option-1 or option-2, option-3 is result automatically, but then it would be good to align the understanding in case of option-3.

**Q3-1: In case of option-3, do you agree to conclude that**

**- Option-1: R2 not puruse further optimization to enforce flow-to-carrier mapping, for RRC\_IDLE/RRC\_INACTIVE/OOC scenarios, and the case where there are multiple QoS flows mapped to a same SLRB**

**- Others**

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| Company | Yes/No | Comment |
| Xiaomi | Yes | If we can not reach consensus, we are fine to not solve this and leave to UE implementation. |
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## Others

**Q4: Do you agree to notify SA2 on the R2 conclusion for this issue?**

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| Company | Yes/No | Comment |
| Xiaomi | See comments | We are wondering if the QoS flow to carrier mapping only applies to UC or BC/GC as well, according to the existing running CR, it is not clarified that UE only reports this mapping for UC, so we think this aspect should be further checked with SA2. |
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1. Xxx.

# Conclusion

We have the following proposals:

[Proposal 1 Xxx.](#_Toc148446647)

# Annex-1: TP for Option-1

alternative CR0

5.8.9.1a.2.1 Sidelink DRB addition/modification conditions

For NR sidelink communication, a sidelink DRB addition is initiated only in the following cases:

1> if any sidelink QoS flow is (re)configured by *sl-ConfigDedicatedNR*, *SIB12*, *SidelinkPreconfigNR* and is to be mapped to one sidelink DRB*,* which is not established, or is established but associated with different allowed frequenc(ies); or

1> if any sidelink QoS flow is (re)configured by *RRCReconfigurationSidelink* and isto be mapped to a sidelink DRB, which is not established;

For NR sidelink communication, a sidelink DRB modification is initiated only in the following cases:

1> if any of the sidelink DRB related parameters is changed by *sl-ConfigDedicatedNR*, *SIB12*, *SidelinkPreconfigNR* or *RRCReconfigurationSidelink* for one sidelink DRB*,* which is established;

alternative CR1

5.8.9.1a.2.1 Sidelink DRB addition/modification conditions

For NR sidelink communication, a sidelink DRB addition is initiated only in the following cases:

1> if any sidelink QoS flow is (re)configured by *sl-ConfigDedicatedNR*, *SIB12*, *SidelinkPreconfigNR* and is to be mapped to one sidelink DRB*,* which is not established; or

1. if any sidelink QoS flow is (re)configured by *RRCReconfigurationSidelink* and isto be mapped to a sidelink DRB, which is not established; or
2. if any sidelink QoS flow is (re)configured by sl-ConfigDedicatedNR, SIB12, SidelinkPreconfigNR and is to be mapped to a sidelink DRB, which is established and the carrier frequenci(es) associated with the sidelink QoS flow are different from the carrier frequenc(ies) associated with the sidelink DRB; or
3. if any sidelink QoS flow is (re)configured by RRCReconfigurationSidelink and is to be mapped to a sidelink DRB, which is is established and the carrier frequenc(ies) associated with the sidelink QoS flow are different from the carrier frequenc(ies) associated with the sidelink DRB;
4. NOTE: The carrier frequenc(ies) associated with the sidelink DRB are the carrier frequenc(ies) of QoS flow mapped to the sidelink DRB.

For NR sidelink communication, a sidelink DRB modification is initiated only in the following cases:

1> if any of the sidelink DRB related parameters is changed by *sl-ConfigDedicatedNR*, *SIB12*, *SidelinkPreconfigNR* or *RRCReconfigurationSidelink* for one sidelink DRB*,* which is established;

alternative CR2

5.8.9.1a.2.1 Sidelink DRB addition/modification conditions

UE shall establish different sidelink DRB for different QoS flow associated with different carrier frequenc(ies) among multiple QoS flows, if the multiple sidelink QoS flows are configured to one sidelink DRB configuration.

For NR sidelink communication, a sidelink DRB addition is initiated only in the following cases:

1> if any sidelink QoS flow is (re)configured by *sl-ConfigDedicatedNR*, *SIB12*, *SidelinkPreconfigNR* and is to be mapped to one sidelink DRB*,* which is not established; or

1. if any sidelink QoS flow is (re)configured by *RRCReconfigurationSidelink* and isto be mapped to a sidelink DRB, which is not established;

For NR sidelink communication, a sidelink DRB modification is initiated only in the following cases:

1> if any of the sidelink DRB related parameters is changed by *sl-ConfigDedicatedNR*, *SIB12*, *SidelinkPreconfigNR* or *RRCReconfigurationSidelink* for one sidelink DRB*,* which is established;

# Annex-2: TP for Option-2

alternative CR0

5.22.1.4.1.2 Selection of logical channels

<Text Removed>

- allowed on the carrier where the SCI is transmitted for NR sidelink, if the carrier is configured by upper layers according to TS 38.331 [5] and TS 23.287 [19];

- a LCH is allowed in a carrier based on whether this selected carrier is within a subset of frequencies associated with all the PC5 QoS flows allowed to be mapped to this LCH based on RRC configuration.

- having a priority whose associated [*sl-threshCBR-FreqReselection*] is no lower than the CBR of the carrier when the carrier is (re-)selected in accordance with 5.22.1.11.

alternative CR1

5.22.1.4.1.2 Selection of logical channels

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- allowed on the carrier where the SCI is transmitted for NR sidelink, if the carrier is configured by upper layers according to TS 38.331 [5] and TS 23.287 [19];

NOTE: A LCH is allowed in a carrier based on whether this selected carrier is within a subset of frequencies associated with all the PC5 QoS flows allowed to be mapped to this LCH based on RRC configuration.

- having a priority whose associated [*sl-threshCBR-FreqReselection*] is no lower than the CBR of the carrier when the carrier is (re-)selected in accordance with 5.22.1.11.