3GPP TSG RAN WG1#102 R1-2006962

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

**Source: Moderator (Nokia)**

**Title: Summary#1 for AI 7.2.4.6 QoS management for sidelink**

**Agenda item: 7.2.4.6**

**Document for: Discussion and Decision**

# Introduction

In this contribution we summarize the remaining issues raised in contributions in NR V2X QoS Management for sidelink (agenda item 7.2.4.6).

# Candidate issues for email discussion

Email thread budget: Up to 1

### Candidates

The following issues were raised in the contributions reviewed in preparing this document:

#### Substantive Issues

Issue 1.3: Semi-persistent resource reservation disabled by congestion control

Issue 1.4: CBR reporting in cross-RAT scenarios

Issue 3.1: QoS-based Resource Pool Segregation/Prioritization

#### Editorial Issues

* RAN2 renamed “configured sidelink grant” to “selected sidelink grant” for mode 2 (TS 38.215) [vivo], [Ericsson]
* Editorial issues related to PSSCH power control in TS 38.213
	+ Replace maximumtransmitPower-SL by sl-MaxTxPower (TS 38.213) [OPPO]
	+ Replace p0-DL-PSCCHPSSCH by dl-P0-PSSCH-PSCCH and p0-SL-PSCCHPSSCH by sl-P0-PSSCH-PSCCH (TS 38.213) [Samsung]
	+ When maximumtransmitPower-SL/sl-MaxTxPower is not provided then $P\_{MAX,CBR}$ is not defined, but potentially referenced in the calculation of $P\_{PSSCH,D}(i)$ [Samsung]

### Preparatory email discussion [102-e-Prep-NR-5G\_V2X\_NRSL-QoS]

Feature lead recommendation:

None of the issues are essential; two of them are in the RAN2 scope and can be raised in RAN2 by their proponents.

Regarding the editorial issues, these can be raised with the spec editors during the CR phase.

Therefore I don’t see the need for any email discussion.

First round company input on the identification of email discussion topics:

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| **Company** | **Issues for email discussion** | **Comments**  |
| Nokia, NSB | None |  |
| Samsung | the assumption on $P\_{MAX,CBR}$when *sl-MaxTransPower* is not provided | This issue was selected and discussed in the email thread of [101-e-NR-5G\_V2X\_NRSL-QoS-02] in the last meeting. In the previous discussion, we have focused only for $P\_{PSSCH}(i)$ but the same problem remains for the determination of $P\_{PSSCH,D}(i)$. We think that this issue needs to be finalized using one email thread budget for this agenda item. |
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# Issues

Note: Issue numbering is the same as in the previous meeting, hence gaps in numbering appear for issues which have been settled.

## Topic 1: Sidelink Congestion Control

### Issue 1.3: Semi-persistent resource reservation disabled by congestion control

#### Views expressed in contributions

[InterDigital] propose that congestion control can disable semi-persistent resource reservation. This is opposed by [ZTE, Sanechips], [Huawei, HiSilicon].

#### Feature lead view

Not critical. No evaluation results demonstrating benefit.

### Issue 1.4: CBR reporting in cross-RAT scenarios

#### Views expressed in contributions

[ZTE, Sanechips], [InterDigital] proposed support for reporting LTE sidelink CBR to the gNB for RRC\_CONNECTED UEs.

#### Feature lead view

Measurement reporting is a RAN2 topic, this can be discussed by RAN2.

## Topic 3: QoS

### Issue 3.1: QoS-based Resource Pool Segregation/Prioritization

#### Background

R12 ProSe sidelink supported resource segregation based on QoS by associating a priority list with each transmit resource pool (priority-based resource pool selection). No such mechanism was defined for the LTE V2X sidelink, the LTE V2X sidelink was designed to support transmission of all QoS levels in the same resource pool and it defined mechanisms to take QoS into account for procedures such as resource selection and congestion control. For the LTE V2X sidelink there is no AS mechanism to map a QoS level to specific resource pools. However, there is a higher layer configuration mechanism which allows mapping a service to specific carrier frequencies (TS 24.385); so, if e.g. a service has stringent QoS requirements then that higher layer mechanism allows mapping that service to one or more specific carriers.

#### Views expressed in contributions

In the current meeting, this topic was addressed in one contribution:

* [InterDigital]: A resource pool can be configured with an allowed QoS for the data that can be transmitted using that resource pool

#### Feature lead view

Resource pool selection is a RAN2 topic, this can be discussed by RAN2.

# References

1. [RP-200129](http://www.3gpp.org/ftp//TSG_RAN/TSG_RAN/TSGR_87e/Docs/RP-200129.zip), “Revised WID: 5G V2X with NR sidelink”
2. TR 37.885, Study on evaluation methodology of new Vehicle-to-Everything V2X use cases for LTE and NR
3. TR 38.885, Study on NR Vehicle-to-Everything (V2X)

Background

WI Objectives

At RAN#83, a new work item “5G V2X with NR sidelink” (5G\_V2X\_NRSL) was approved ‎[1]. Two of the objectives are relevant for the present agenda item:

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| 1. NR sidelink: Specify NR sidelink solutions necessary to support sidelink unicast, sidelink groupcast, and sidelink broadcast for V2X services, considering in-network coverage, out-of-network coverage, and partial network coverage.* …
* Congestion control [RAN1, RAN2]

4. Specify support for QoS management [RAN2, RAN3, RAN1] |

Earlier Agreements

The following relevant agreements have been reached in previous meetings:

QoS

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| Agreements:From RAN1 perspective, at least the following QoS-related parameters relevant to physical layer studies are considered: * Priority
* latency
* reliability
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| Agreements:RAN1 studies further how to use * priority,
* latency,
* reliability,
* minimum required communication range (as defined by higher layers) if agreed to use

in the physical layer aspects of at least * resource allocation and
* congestion control and
* resolution of in-device coexistence issues and
* power control
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In the Sidelink resource allocation mode 2 agenda item, the following working assumption was reached:

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| Working assumption:* An indication of a priority of a sidelink transmission is carried by SCI payload
	+ This indication is used for sensing and resource (re)selection procedures
	+ This priority is not necessarily the higher layer priority
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| Agreements:* For the priority indication in 1st stage SCI:
	+ Up to RAN2 on how to define the mapping between the priority indication and the corresponding QoS
	+ Size is 3 bits (as a working assumption)
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Sidelink Congestion Control

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| Agreements:* Introduce at least one congestion metric for NR sidelink
	+ FFS details – to be done in WI phase (if included)
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| Agreements:* Congestion control is supported at least for sidelink mode 2
	+ Note: details of congestion control can be covered in the work item phase, not in this SI.
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| **Conclusion**:* It is deemed beneficial to report Sidelink Congestion Metrics(s) to a gNB
	+ Consequently, it is recommended to specify the corresponding details in the WI phase
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| Agreements:Support at least NR CBR as congestion metric for NR sidelink congestion control. * LTE CBR is the baseline for defining NR CBR.
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| Agreements:* LTE V2X sidelink congestion control is the starting point for defining NR sidelink congestion control.
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| Agreements:* Higher-layer reporting of CBR to the gNB is supported for RRC\_CONNECTED UEs.
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| Agreements:* For PSCCH/PSSCH multiplexing option 3, one CBR measurement over a resource pool is defined.
	+ PSFCH resources, if (pre)configured, are excluded from this CBR measurement.
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| Agreements:Define NR sidelink Channel Occupancy Ratio (CR) measurement.* LTE CR is the baselines
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| Agreements:* Congestion control can restrict the values of at least the following PSSCH/PSCCH TX parameters per resource pool:
	+ Range of MCS for a given MCS table supported within the resource pool
	+ Range of number of sub-channels
	+ Upper bound of number of (re)transmissions – already agreed in mode 2 AI
	+ Upper bound of TX power (including zero TX power)
* Congestion control can set an upper bound on channel occupancy ratio (CR), CRlimit.
* Ranges/bounds of the transmission parameters and CRlimit are functions of QoS and CBR.
* In addition to congestion control (in use or not in use), the above parameters can be restricted by reusing the same mechanism as in LTE
	+ For speed, further discussion on absolute vs. relative speed
	+ FFS other parameter(s) that can be restricted
	+ FFS whether or not to tie the speed with a UE capability
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| Agreements:Lookup table links CBR range with values of the transmission parameters and CRlimit for each value of the indication of a priority of a sidelink transmission carried by SCI payload (as per WA from RAN1#98), Lookup table is (pre)configured. Details up to RAN2. * Up to 16 (as a working assumption) CBR ranges are supported
	+ The working assumption will be automatically confirmed in RAN1#99 if no further input
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| Agreements:* Sidelink RSSI (SL-RSSI) measurement is used for CBR estimation
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| Agreements:A sidelink resource is busy for the purpose of CBR measurement if Sidelink RSSI measured by the UE in that resource exceeds a (pre-)configured threshold. |

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| Agreements:The CBR measurement time window size is 100 ms and 100 slots by (pre-)configuration.CR window size is { 1000 ms, 1000 slots } by (pre)-configuration |

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| Agreement:* The future segment of the CR evaluation window reuses the same behaviour as in the LTE V2X sidelink.
	+ FFS whether additional constraints on UE’s choice of values for a and b are needed
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| Agreement: For the constraints on past/future window in CR evaluation:1. n+b shall not exceed the last transmission opportunity of the grant for the current transmission
2. b >= 0
3. b < (a+b+1)/2

 Notes:* in the first bullet point above, LTE’s “should” has been replaced by “shall”
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| Agreement:* UE evaluates CR and applies CR\_limit for every (re)transmission.
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| Agreement: * The CBR processing time is given by UE capability according to the following table

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| **µ**  | Congestion process time 1 (slots) | Congestion processing time 2 (slots) |
| 0 | 2 | 2 |
| 1 | 2 | 4 |
| 2 | 4 | 8 |
| 3 | 8 | 16 |

* A UE shall only apply a single CBR/CR processing time capability in SL.
* CR processing time is the same as CBR processing time.
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| Agreement:* The slot index in the definition of CBR is the physical slot index.

Agreement:* The slot index in the definition of CR is the physical slot index.
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| **Conclusion:*** Future granted resources which have been released due to HARQ feedback are not counted in the evaluation of CR
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| Agreements:* Endorse the TP to clarify the meaning of “granted” in TS 38.215
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| Agreements:* Take as a **conclusion** that no further discussion in RAN1 regarding whether TS 38.213 should state explicitly that CBR-based power control does not apply to a PSSCH transmission using resources allocated using mode 1
* The latest TP to 38.213 (Section 16.2.1) is endorsed.
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TX Parameter Restrictions

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| Agreements:* Only TX parameter restriction based on absolute speed can be (pre)configured in Rel-16.
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| Agreement:* In addition to congestion control (in use or not in use), the following PSSCH/PSCCH TX parameters per resource pool can be restricted by reusing the same mechanism as in LTE:
	+ Range of MCS for a given MCS table supported within the resource pool
	+ Range of number of sub-channels
	+ Upper bound of number of (re)transmissions

Note: This reverts the agreement made in RAN1#98b, which included “Upper bound of TX power” in the set of TX parameters that can be restricted using this mechanism. |

Appendix: Contributions used as basis for the summary

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| [R1-2005321](http://www.3gpp.org/ftp//TSG_RAN/WG1_RL1/TSGR1_102-e/Docs/R1-2005321.zip) | Remaining issues on QoS | ZTE, Sanechips |
| [R1-2005345](http://www.3gpp.org/ftp//TSG_RAN/WG1_RL1/TSGR1_102-e/Docs/R1-2005345.zip) | Remaining issues on QoS management for sidelink | vivo |
| [R1-2005802](http://www.3gpp.org/ftp//TSG_RAN/WG1_RL1/TSGR1_102-e/Docs/R1-2005802.zip) | Remaining details of QoS management for NR sidelink | Huawei, HiSilicon |
| [R1-2006006](http://www.3gpp.org/ftp//TSG_RAN/WG1_RL1/TSGR1_102-e/Docs/R1-2006006.zip) | Remaining open issues in QoS management | OPPO |
| [R1-2006105](http://www.3gpp.org/ftp//TSG_RAN/WG1_RL1/TSGR1_102-e/Docs/R1-2006105.zip) | On QoS Management for NR Sidelink | Samsung |
| [R1-2006180](http://www.3gpp.org/ftp//TSG_RAN/WG1_RL1/TSGR1_102-e/Docs/R1-2006180.zip) | Remaining Issues on Congestion Control and QoS Management for NR-V2X | InterDigital, Inc. |
| [R1-2006440](http://www.3gpp.org/ftp//TSG_RAN/WG1_RL1/TSGR1_102-e/Docs/R1-2006440.zip) | Correction for SL QoS management | Ericsson |