**3GPP TSG-RAN WG2 Meeting #113bis electronic R2-210xxxx**

**Online, April 12 – April 20, 2021**

Agenda Item: 8.15.2

Source: ZTE

Title: [AT113bis-e][708][V2X/SL] DRX configuration for SL groupcast and broadcast

Document for: Discussion, Decision

# Introduction

This is for the following email discussion

* [AT113bis-e][708][V2X/SL] DRX configuration for SL groupcast/broadcast (ZTE)

 **Scope:** Discuss DRX configuration issues for SL groupcast/broadcast based on the companies’ contributions including whether it is allowed to configure different sl-drx-StartOffset for different groupcast/broadcast and whether DRX cycle length is associated with PQI. Discussion on inactivity timers and HARQ timers is not scope of this email discussion.

 **Intended outcome:** Discussion summary in R2-2104474.

**Deadline:** 4/19, 10:00am (UTC), R2-2104474 should be available before next Monday session on SL enhancement

# Discussion

## DRX cycle length for groupcast/broadcast

In last RAN2#113-meeting, RAN2 agreed that TX/RX UE can obtain DRX configuration from pre-configration for OOC UE and SIB for IC UE, *further granularity to multiple sets of DRX configurations (beyond just cast type) is required i.e. more than two DRX Cycle configurations should be supported in specification* and *RAN2 will study/discuss how PQI and/or L2 destination ID is used to derive groupcast and broadcast DRX configuration*.

Considering corresponding pros and cons of per PQI or per L2 DST ID DRX cycle configuration has been discussed in previous RAN2 email discussion[1], before making the decision between per PQI or per L2 DST ID, we think it’s better to clarify the feasibility of these two solutions based on companies contribution.

To begin with, irrespective of which solution(i.e., PQI based or L2 DST ID based) is selected, the first issue we need to discuss is the general principle of DRX cycle configuration i,e. which factor should be taken into consideration of DRX cycle configuration for groupcast/broadcast. During the email discussion[2], many companies think the DRX configuration of groupcast/broadcast needs take QoS requirements into consideration. In consequence, it is suggested that RAN2 discuss whether DRX cycle is configured at least based on the QoS requirement.

**Question1-1: Irrespective of which solution(i.e., PQI based or L2 DST ID based) is selected, from high-level principle, do you agree that DRX cycle should take at least QoS requirement into consideration?**

**-Yes.**

**-No (Please clarify why QoS does not need to be taken into consideration and which factor shall be taken into consideration).**

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| --- | --- | --- |
| Company | Yes or No | Comment |
| Lenovo, MotM | Yes | DRX Cycle should achieve power savings but at the same time can’t sacrifice QoS. If the SL devices save power but can’t perform SL communication with required reliability – it would not be acceptable solution. |
| LG  | Yes | Agree with Lenovo. |
|  |  |  |

If companies agree that DRX cycle should take at least QoS requirement into consideration, then we think RAN2 need to check whether above two solutions(i.e., PQI based or L2 DST ID based) can ensure the QoS requirement. As we know that PQI represents the QoS of service data, it is straightforward for RAN2 to understand that QoS can be ensured by adopting per PQI DRX cycle. Therefore the question is whether per L2 DST ID DRX cycle can ensure the QoS requirement.

**Question1-2: If the answer of Question 1-1 is yes, do you think per L2 DST ID DRX cycle configuration can ensure the QoS requirement?**

**-Yes(Please clarify how to ensure the QoS)**

**-No(Please clarify why QoS can not be ensured)**

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| --- | --- | --- |
| Company | Yes or No | Comment |
| Lenovo, MotM | No | L2 destination Id is allocated in the V2X layer and this allocation has nothing to do with QoS i.e. there’s no mention of QoS being a factor in allocating a L2 SRC/ DST Id. RAN2 has decided that the DRX configuration is an Access Stratum functionality, it is not possible to associate a 24 bit number to any form of QoS from AS perspective. |
| LG | No | Same view with Lenovo. L2 destination Id is allocated in the V2X layer and this allocation has nothing to do with QoS. In addition, in the V2X layer, not only the source ID but also the GC/BC destination ID are changed periodically. DRX cycle configuration based on L2 ID causes frequent DRX cycle updates. |
|  |  |  |

For per PQI DRX cycle configuration, companies holding the opposite views think:

1. RX UE does not know the PQI of upcoming service data. It’s only configured by upper layers with one or more destination layer-2 ID(s) for reception.

2. If DRX cycle is configured per PQI, UEs have to be awake in all PQI-based On-durations. It could significantly reduce the efficiency of power saving.

For the first issue, according to latest SA2’s output in 23.776[3] as shown in following:

|  |
| --- |
| 7.2 Conclusions for PC5 DRX operationsFor Key Issue #1 (Support of QoS aware NR PC5 power efficiency for pedestrian UEs), regarding NR PC5 DRX operations the following principles are taken as the conclusion:- The Access Stratum (AS) layer determines the PC5 DRX parameter values for V2X communication over PC5 reference point to enable pedestrian UE power saving.- The existing PC5 QoS parameters provided by the V2X layer can be used by the AS layer to determine the PC5 DRX parameter values.- For groupcast and broadcast, the AS layer of Rx UE needs PC5 QoS parameters to determine the PC5 DRX parameter values for V2X communication over PC5 reference point. Therefore, the V2X layer of Rx UE determines the interested V2X service types, and derives the corresponding PC5 QoS parameters based on either the mapping of V2X service types to PC5 QoS parameters, or the V2X Application Requirements for the V2X service type (e.g. priority requirement, reliability requirement, delay requirement, range requirement) provided by the application layer. The V2X layer of Rx UE passes the PC5 QoS parameters together with the corresponding destination layer-2 ID(s) for reception to the AS layer.- The AS layer provides the applied PC5 DRX information to the V2X layer. |

It can be observed that not only TX UE knows about the QoS (PQI) of a new service requesting radio services but also a RX UE anticipates data of certain PQI(s) of interest. This allows both the TX UE and RX UE to use PQI as a common basis to initiate sidelink communication using a corresponding DRX configuration.

**Question 1-2a: According to the latest SA2’s output in 23.776[3], do you agree that RAN2 does not need to send LS to SA2 to clarify whether the PC5 QoS parameters are available in the AS layer of Rx-UE for broadcast/groupcast.**

**-Yes**

**-No(Please clarify why RAN2 need to send the LS)**

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| --- | --- | --- |
| Company | Yes or No | Comment |
| LG |  Yes | There is no reason to send LS to SA2 because it has already been agreed in SA2 that RX UE can also know PC5 QoS parameters (e.g., PQI). |
|  |  |  |

For the second issue, considering that after MAC PDU multiplexing, data with different PQIs will be multiplexed into same TB, therefore some companies think UE does not need to be awaken in all PQI-based on-duration, only one value of sl-drx-cycle is derived by UE at a given time for each destination ID of SL groupcast/broadcast reception according to per PQI DRX cycle configuration.

**Question1-3: If DRX cycle is configured per PQI and there are more than one PQIs associated with a specific L2 DST ID, how many values of sl-drx-cycle can be derived:**

**Option1: Only one value of sl-drx-cycle can be derived for a groupcast or broadcast service with the same destination id at a given time.**

**Option2: Multiple values of sl-drx-cycle can be derived for a groupcast or broadcast service with the same destination id at a given time.**

**Option3: Others (Please clarify the solution)**

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| --- | --- | --- |
| Company | Option | Comment |
| Lenovo, MotM | 2 | It is possible that more than one service “can” use the same L2 destination Id; therefore there may be as many DRX configurations for the same L2 DST Id! |
| LG | 2 | UE can have multiple PQIs for the same destination, thus UE can have multiple values of SL DRX cycle based on multiple PQIs. |
|  |  |  |

For per L2 DST ID DRX cycle configuration, companies holding the opposite views think, there is literally huge number (2^24) of L2 destination IDs, which may cause huge signaling overhead especially in SIB.

**Question1-4: If DRX cycle is configured per L2 DST ID, how to control the signaling overhead of SIB?**

**Option1: L2 DST IDs can be further divided into several L2 DST ID groups, group\_1 use DRX\_Configuration\_1; group\_2 use DRX\_Configuration\_2 and so on**

**Option2: others (Please clarify the solution)**

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| --- | --- | --- |
| Company | Option | Comment |
| Lenovo, MotM | 1 | Since we are not a proponent, we assume any reasonable solution will go this way. |
| LG | See the comment | We don’t agree on the DRX cycle based on the L2 Destination ID. In the V2X layer, not only the source ID but also the GC/BC destination ID are changed periodically. DRX cycle configuration based on L2 ID causes frequent DRX cycle updates. |
|  |  |  |

Based on the discussion above, we think it is sufficient to make the final decision between per PQI and per L2 DST ID DRX cycle configuration. Except the issues listed above, companies can also discuss other issues in question1-5.

**Question1-5: What is your expectation on DRX cycle configuration :**

**Option1: Per PQI**

**Option2: Per L2 DST ID.**

**Option3: Others (Please clarify the solution)**

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| --- | --- | --- |
| Company | Option | Comment |
| Lenovo, MotM | 1 | Only per PQI can provide a reasonable common basis to start any sidelink communication that fulfils QoS and provides power saving. |
| LG | 1 | See the comment with Q1-3/Q1-4. |
|  |  |  |

## sl-drx-StartOffset for groupcast/broadcast

According to some companies’ contributions, the DRX configuration including sl-drx-StartOffset are configured per-PQI/QoS. However, based on some other contribution, for PQI/QoS based sidelink DRX configuration, multiple groups or services may share the same sidelink DRX on duration which may cause uneven traffic on sidelink. Moreover, if all the UE wake up at the same time, those mode2 TX UEs participating different broadcast/groupcast services will perform sidelink transmission simultaneously. It may cause congestion and increase the probability of resource collision. In order to avoid congestion and decrease the the probability of resource collision, it is better to configure different sl-drx-StartOffset for different groupcast/broadcast services, then they will not wake up at the same time. Therefore, in other companies’ contributions, sl-drx-StartOffset are configured per L2 destination ID. In this section, we will discuss the configuration for sl-drx-StartOffset.

**Question2-1: Do you agree that the sl-drx-StartOffset value may take into consideration the PQI/QoS?**

**-Yes**

**-No**

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| --- | --- | --- |
| Company | Yes or No | Comment |
| Lenovo, MotM | Yes | PQI/ QoS based DRX configuration can distribute the load on the physical resources evenly across time. Number of PQIs available (Table 5.4.4-1 of TS 23.287) balance nicely between too many possible DRX configuration (leading to implementation complexity) and too little DRX configuration (leading to high congestion and HD issue around the active time). |
| LG | Yes | See the comment with Q1-3/Q1-4. |
|  |  |  |

**Question2-2: How to configure sl-drx-StartOffset for different groupcast/broadcast?**

**Option 1: configure the same value of sl-drx-StartOffset for all groupcast/broadcast service**

**Option 2: configure different values of sl-drx-StartOffset per PQI/QoS**

**Option 3a: configure different values of sl-drx-StartOffset per L2 destination ID**

**Option 3b: configure different values of sl-drx-StartOffset per L2 destination ID group**

**Option 4: Others (Please clarify the solution)**

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| --- | --- | --- |
| Company | Option | Comment |
| Lenovo, MotM | 2 | For reasons mentioned above |
| LG | 2 |  |
|  |  |  |

**Question2-3：If option 2 is selected for Q2-2, considering that a groupcast or broadcast service may associate to multiple PQI values, we shall further discuss whether multiple different values of sl-drx-StartOffset can be configured for a groupcast or broadcast service with the same destination id.**

**Option1: Only one value of sl-drx-StartOffset can be applied for a groupcast or broadcast service with the same destination id.**

**Option2: Multiple values of sl-drx-StartOffset can be applied for a groupcast or broadcast service with the same destination id.**

**Option3: Others (Please clarify the solution)**

|  |  |  |
| --- | --- | --- |
| Company | Option | Comment |
| Lenovo, MotM | 2 |  |
| LG | 2 |  |
|  |  |  |

## ~~Other~~

If the option of configuring SL DRX cycle per PQI/QoS and/or sl-drx-StartOffset per PQI/QoS is adopted, AS layer of the Rx-UE shall obtain the QoS parameters for the reception of NR SL broadcast/groupcast.

According to TS 24.587[1], UE’s usage of V2X communication is controlled by V2X communication parameters. The V2X communication parameters consist of the configuration parameters for V2X communication over PC5 is listed as below:

|  |
| --- |
| 5.2.3 Configuration parameters for V2X communication over PC5The configuration parameters for V2X communication over PC5 consist of:i) configuration parameters for a V2X communication over PC5 in NR-PC5, consisting of:1) optionally, a list of V2X service identifier to V2X NR frequency mapping rules. Each mapping rule contains one or more V2X service identifiers and the V2X NR frequencies with associated geographical areas;2) a list of V2X service identifier to destination layer-2 ID for broadcast mapping rules. Each mapping rule contains one or more V2X service identifiers and the destination layer-2 ID for broadcast;3) optionally, a default destination layer-2 ID for broadcast;4) a list of V2X service identifier to destination layer-2 ID for groupcast mapping rules. Each mapping rule contains one or more V2X service identifiers and the destination layer-2 ID for groupcast;5) a list of V2X service identifier to default destination layer-2 ID for unicast initial signaling mapping rules. Each mapping rule contains one or more V2X service identifiers and the default destination layer-2 ID for initial signalling to establish unicast connection;6) a list of V2X service identifier to PC5 QoS parameters mapping rules. The PC5 QoS parameters are specified in clause 5.4.2 of 3GPP TS 23.287 [3];7) an AS configuration, including a list of SLRB mapping rules applicable when the UE is not served by E-UTRA and is not served by NR. Each SLRB mapping rule contains a PC5 QoS profile and an SLRB. The PC5 QoS profile contains the following parameters:i) the PC5 QoS profile contains a PQI;ii) if the PQI of the PC5 QoS profile identifies a GBR QoS, the PC5 QoS profile contains a PC5 flow bit rates consisting of a guaranteed flow bit rate (GFBR) and a maximum flow bit rate (MFBR);iii) if the PQI of the PC5 QoS profile identifies a non-GBR QoS, the PC5 QoS profile contains the PC5 link aggregated bit rate consisting of a per link aggregate maximum bit rate (PC5 LINK-AMBR);NOTE: PC5 link aggregated bit rate is only used for unicast mode communications over PC5.iv) the PC5 QoS profile contains a range, which is only used for groupcast mode communications over PC5; andv) the PC5 QoS profile can contain the priority level, the averaging window, and the maximum data burst volume. If one or more of the priority level, the averaging window or the maximum data burst volume are not contained in the PC5 QoS profile, their default values apply; |

**Observation 1: Based on the TS 24.587 [1], the possible PC5 QoS parameters can be derived according to the L2 destination ID for groupcast/broadcast in NAS layer.**

However,whether the AS layer of the Rx UE can obtain the possible PC5 QoS parameters for each L2 destination ID is unclear, so maybe we can ask SA2 to clarify whether QoS parameters are provided to the AS layer of the Rx-UE side for broadcast/groupcast. And if QoS parameters are not available in the AS layer of the Rx-UE side for broadcast/groupcast, whether the NAS lay can provide them to the AS layer.

**~~Question3-1: If SL DRX cycle and/or sl-drx-StartOffset is configured per PQI/QoS, do you agree to send a LS to SA2 to clarify whether the possible PC5 QoS parameters are available in the AS layer of Rx-UE for broadcast/groupcast in current specification?~~**

**~~-Yes~~**

**~~-No~~**

|  |  |  |
| --- | --- | --- |
| Company | Yes or No | Comment |
| Lenovo, MotM | No (not required anymore) | As mentioned in [14], SA2 meeting#143 had already agreed a CR [in S2-2101436] that specifies QoS Provisioning for a Prose ***receiver*** device. Based on their approved CR, not only a transmitter SL UE knows about the QoS (PQI) of a new service requesting radio services but also a receiver SL UE anticipates data of certain PQI(s) of interest. This allows both the transmitter and receiver SL devices to use PQI as a common basis to initiate sidelink communication using a corresponding DRX configuration. |
| LG | No (not required anymore) | In the February SA meeting, it has already been agreed that RX UE can also know PC5 QoS parameters (e.g., PQI). For your information, the contribution agreed at the SA2 meeting in February is S2-2101436. The proposed text was reflected in TR 23.776. |
| X | X | X |

**~~Question3-2: If SL DRX cycle and/or sl-drx-StartOffset is configured per PQI/QoS, and if the possible PC5 QoS parameters are not available in the AS layer of the Rx-UE side for broadcast/groupcast, do you agree to send the LS to SA2 to request NAS layer providing QoS parameters to the AS layer of Rx-UE ?~~**

**~~-Yes~~**

**~~-No~~**

|  |  |  |
| --- | --- | --- |
| Company | Yes or No | Comment |
| Lenovo, MotM | No (not required anymore) | As previously indicated. |
| LG | No (not required anymore) | See the comment with Q3-1. |
| X | X | X |

# Conclusion

These are the following proposals out of this email discussion:

# Reference

1. R2-2102184 Summary of [AT113-e][708]
2. R2-2101727 Summary of email discussion [702][SLe] High-level principles for SL DRX (LG)
3. 23.776 Study on architecture enhancements for 3GPP support of advanced Vehicle-to-Everything (V2X) services
4. R2-2102981 Discussion on SL DRX configuration for groupcast/broadcast ZTE
5. R2-2102689 Further Study on DRX for Sidelink Groupcast/Broadcast CATT discussion Rel-17 NR\_SL\_enh-Core
6. R2-2102817 SL DRX for Groupcast and Broadcast vivo discussion
7. R2-2102886 Discussion on DRX configuration OPPO discussion Rel-17 NR\_SL\_enh-Core
8. R2-2102888 Left issues on DRX mechanisms and granularity OPPO discussion Rel-17 NR\_SL\_enh-Core
9. R2-2103003 General aspects of SL DRX Ericsson,Qualcomm Incorporated discussion Rel-17 NR\_SL\_enh-Core
10. R2-2103068 On general SL DRX design Intel Corporation discussion Rel-17 NR\_SL\_enh-Core
11. R2-2103174 Consideration on sidelink DRX for broadcast and groupcast Huawei, HiSilicon discussion
12. R2-2103288 Alignment of sidelink DRX active time Fujitsu discussion Rel-17 NR\_SL\_enh-Core
13. R2-2103462 Discussion on SL DRX active time for groupcast and broadcast ASUSTeK discussion Rel-17 NR\_SL\_enh-Core
14. R2-2103615 Discussion on Sidelink DRX Sony Europe B.V. discussion Rel-17 NR\_SL\_enh-Core
15. R2-2103741 DRX Configuration for Broadcast and Groupcast SL communication Lenovo, Motorola Mobility discussion Rel-17 NR\_SL\_enh-Core
16. R2-2103779 Discussion on SL DRX configuration for Groupcast & Broadcast Qualcomm Finland RFFE Oy discussion Rel-17
17. R2-2104285 Discussion on SL DRX configuration for Groupcast & Broadcast Qualcomm Finland RFFE Oy, Ericsson discussion Rel-17
18. R2-2103852 Discussion on remaining issues on SL DRX Apple discussion Rel-17 NR\_SL\_enh-Core
19. R2-2103891 SL DRX operation for groupcast/broadcast Samsung discussion
20. R2-2103952 SL DRX Granularity Considerations Convida Wireless discussion Rel-17
21. R2-2104256 Consideration on sidelink DRX determination LG Electronics Inc. discussion Rel-17 NR\_SL\_enh-Core