**3GPP TSG-RAN WG2 Meeting #116bis-e *R2-22xxxxx***

**Electronic, 17 – 25 Jan, 2022**

Agenda Item: 8.15.2

Source: Ericsson

Title: Summary of [Post116-e][718][V2X/SL] SL DRX configuration (Ericsson)

Document for: Discussion, Decision

# Introduction

This is to discuss the [718] as follows.

* [POST116-e][718][V2X/SL] SL DRX configuration (Ericsson)

**Scope:** Address and solve the remaining aspects based on P25 to P30 in R2-2109907, P11 to P13 in R2-2110062, and P12 in R2-2109801.

**Intended outcome:** Discussion summary

**Deadline:** Long email discussion

For rapporteur to have enough time drafting summary report, we would like to have the following two phases:

* Phase 1: collect companies’ views by 2021-12-14 2400 UTC
* Phase 2: rapporteur will finalize summary report based on inputs of phase 1 by 2021-12-17 0800 UTC

# Discussion

In the scope of this email discussion, the following proposals in [1][2][3] need to be addressed.

Proposals to discuss in [1] are listed as the following

***Proposal 25***  *For unicast, when a TX UE is in RRC\_CONNECTED, the serving gNB of the TX UE determines the SL DRX configurations for the RX UE, regardless of whether Mode 1 scheduling or Mode 2 resource allocation is adopted.*

***Proposal 26*** *For unicast, the serving gNB of a RX UE can either accept or reject the SL DRX configurations of the RX UE but cannot modify it.*

***Proposal 27*** *Alignment between Uu DRX of the Tx UE and SL DRX of the Rx UE is up to the serving gNB of the TX UE¸ regardless of whether Mode 1 scheduling or Mode 2 resource allocation is adopted.*

***Proposal 28*** *For alignment between Uu DRX of the Rx UE and SL DRX of the Rx UE, the serving gNB of the RX UE may adjust Uu DRX of the RX UE.*

***Proposal 29*** *For groupcast or broadcast, the TX UE and the RX UE may report assistance information (e.g., SidelinkUEInformationNR) to their serving gNB regarding traffic type (e.g., associated L2 ID or PQI).*

***Proposal 30*** *For groupcast or broadcast, no additional mechanism is needed in order to achieve alignment of Uu DRX and SL DRX.*

Proposals to discuss in [2] are listed as the following

***Proposal 11*** *mode-2 TX UE in RRC\_CONNECTED need not report RX UE’s assistance information for SL-DRX to its serving gNB.*

***Proposal 12*** *mode-2 TX UE in RRC\_CONNECTED need not obtain SL-DRX configuration for the unicast communication to an RX UE from its serving gNB, but determine SL-DRX configuration by itself.*

***Proposal 13*** *Mode-2 TX UE in RRC\_CONNECTED may inform its serving gNB about its decided SL-DRX configuration by including it in Sidelink UE Assistance information.*

Proposals to discuss in [3] are listed as the following

***Proposal 12*** *If the RRC CONNECTED UE is configured with sidelink DRX for SL groupcast/broadcast, it shall reports the related SL DRX configuration to the serving cell, then the serving cell can decides whether to update Uu DRX.*

The proposals are concerning the following questions:

1. **Question 1**: For SL unicast and TX UE in RRC CONNECTED, who provides configuration for SL DRX of RX UE?
2. **Question 2**: For SL unicast and TX UE in RRC CONNECTED, who determines alignment between Uu DRX of TX UE and SL DRX of RX UE?
3. **Question 3**: For SL unicast and RX UE in RRC CONNECTED, who determines alignment of Uu DRX of RX UE and SL DRX of RX UE?
4. **Question 4**: For SL groupcast or broadcast, how to align SL DRX and Uu DRX of UE who is interested with the service?

All the above proposals can be grouped into the following different cases (as shown in the table) for which the proposals are applicable. In the table, UE in RRC IDLE, RRC INACTIVE or out of coverage is treated as the same case, i.e., referred to as non RRC CONNECTED.

Table 1: Alignment cases of SL DRX for SL unicast

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Cases** | **TX UE RRC state** | **TX UE resource allocation (RA) mode** | **RX UE RRC state** | **status** |
| **Case 1** | RRC CONNECTED | Mode 1 | Non RRC CONNECTED | Not done |
| **Case 2** | RRC CONNECTED | Mode 2 | Non RRC CONNECTED | Not done |
| **Case 3** | RRC CONNECTED | Mode 1 | RRC CONNECTED | Not done |
| **Case 4** | RRC CONNECTED | Mode 2 | RRC CONNECTED | Not done |
| **Case 5** | Non RRC CONNECTED | Mode 2 | Non RRC CONNECTED | invalid |
| **Case 6** | Non RRC CONNECTED | Mode 2 | RRC CONNECTED | Not done |
| **Case 7** | SL DRX for groupcast and broadcast | | | Not done |

In addition, SL DRX for SL groupcast or broadcast is counted as **Case 7**.

**Notes**

1. For the above cases, rapporteur considers **case 5** invalid since there is no alignment issue in this case. TX UE will determine SL DRX based on existing RAN2 agreements.
2. **Question 1 and Question 2** will be checked jointly in all relevant cases of SL unicast since Q1 will not depend on RRC state of RX UE
3. **Question 3** will be checked jointly in all relevant cases of SL unicast since how RX UE’s gNB behaves will depend on neither RRC state nor RA mode of TX UE**.**
4. **Question 4** will be checked only in Case 7**.**

In the rest sections, we discuss the alignment issue, i.e., alignment between SL DRX and Uu DRX for different cases respectively.

## Question 1 – For SL unicast and TX UE in RRC CONNECTED, who provides configuration for SL DRX of RX UE

According to proposals in [1] and [2], RAN2 needs to discuss whether this question depends on RA mode of TX UE. The rapporteur therefore formulates the following questions accordingly.

**Note**: the following questions in this clause are corresponding to P25-P28 in [1].

***Q1-1: For unicast and TX UE in RRC CONNECTED and Mode 1 RA, do companies agree that the serving gNB of TX UE determines the SL DRX configurations for RX UE?***

|  |  |  |
| --- | --- | --- |
| Company | Yes or No | Comments |
| OPPO | Yes |  |
| Xiaomi | Yes | Since the transmission resource is scheduled by gNB, gNB should determine the SL DRX. |
| vivo | Yes | From our understanding, when TX UE in RRC CONNECTED and Mode 1 RA, it is a natural way that the serving gNB of TX UE determines the SL DRX configurations for RX UE since it is up to gNB to align between resource allocation and DRX pattern. |
| InterDigital | Yes |  |
| Sharp | Yes |  |
| LG | Yes | We think that when TX UE is in RRC CONNECTED, the SL DRX configuration for RX UE is decided by the serving gNB of TX UE regardless of mode 1 or mode 2. |
| Intel | Yes | Same comment as Xiaomi |
| Huawei, HiSilicon | Yes |  |
| Apple | Yes |  |
| Lenovo | Yes |  |
| NEC | Yes |  |
| CATT | Yes |  |
| Nokia | Yes |  |

In case of Mode 2 resource allocation, regarding who determines SL DRX for RX UE, the following two different options are proposed in [1] and [2] respectively.

Option 1: same as for Mode 1 scheduling, TX UE’s gNB determines SL DRX for RX UE

Option 2: TX UE determines SL DRX for RX UE

For Option 1, it is beneficial to achieve a unified treatment regarding how to provide SL DRX for RX UE regardless of Mode 1 scheduling or Mode 2 resource allocation is adopted.

Meanwhile the proponent of Option 2 states in [2] that

* Additional latency and signalling overhead for using SL DRX configuration will be introduced if mode 2 TX UE is mandated to obtain SL-DRX configuration from its serving gNB.
* gNB-determined SL-DRX configuration may cause unnecessary mode-2 resource reselections.
* Mandating an RRC\_CONNECTED mode-2 TX UE obtaining SL-DRX configuration from NW increases UE complexity.

For the first argument, rapporteur thinks that TX UE may typically perform SL DRX configuration before PC5-RRC connection/SL RB is established. Reconfiguration of SL DRX may be seldom triggered after PC5-RRC connection/SL RB is established. The additional latency and signalling overhead are expected to be small.

For the second argument, TX UE is able to report traffic pattern to the gNB based on which the gNB can provide a suitable DRX configuration fitting to the traffic pattern. Therefore, mode 2 resource reselection can be avoided.

For the third argument, as described in the above for Option 1, with option 1, UE only needs to implement a common mechanism to obtain SL DRX regardless whether Mode 1 scheduling or Mode 2 resource allocation is applied, this can actually simplify UE complexity, since UE will just rely on NW signalling/configuration.

Therefore, companies are welcome to give views on the above two options.

Rapporteur therefore formulates the following questions accordingly.

**Note**: the following questions in this clause are corresponding to P25-P28 in [1] and P11-P13 in [2].

***Q1-2: For unicast and TX UE in RRC CONNECTED and Mode 2 RA, which option do companies agree to adopt regarding who determines SL DRX for RX UE?***

**Option 1: same as for Mode 1 scheduling, TX UE’s gNB determines SL DRX for RX UE**

**Option 2: TX UE determines SL DRX for RX UE**

**Option 3: Other**

|  |  |  |
| --- | --- | --- |
| Company | Option | Comments |
| OPPO | Option 1 | Firstly, we agree with rapporteur option 1 is beneficial to achieve a unified treatment.  Besides the formulations from rapporteur above, another point is the Tx resource pool is configured in a UE-specific manner for RRC\_CONNECTED UE. Which means Option 1 can achieve a joint decision by network for Tx-pool and DRX configuration. |
| Xiaomi | Option 1 | Apart from unified solution, we think option 1 is more future proof, considering mixed resource allocation may be introduced in future. |
| vivo | Option 1 | Agree with the rapporteur’s view.  Firstly, a unified solution between mode 1 and mode 2 can reduce UE’s complexity and simplify the spec without obvious performance degradation.  Furthermore, if the nodes that finally determine the SL DRX configurations for RX UE in Mode 1 and Mode 2 are different, when the RA mode is reconfigured by the gNB, DRX pattern should be also reconfigured and some unexpected or asynchronization scenarios may occur in the transition period, which may need further consideration and specification efforts. |
| InterDigital | Option 1 | A unified approach is preferred, especially since we do not see any problems with option 1 (we agree with rapporteur). |
| Sharp | Option 1 | A unified approach is preferred. |
| LG | Option 1 | It’s preferred that TX UE’s gNB determines SL DRX for RX UE regardless of mode 1 or mode 2 when TX UE is in RRC\_CONNECTED. It will be helpful to align Uu DRX of TX UE and SL DRX for power saving. |
| Intel | Option 1 with comment | While we agree that having a unified approach is preferrable, we wonder if the added signaling associated with the traffic pattern reporting to the gNB from the TX UE in order to ‘update’ the SL DRX configuration also contributes to increased overhead. However, if majority wants to go with option 1, we are fine to support it |
| Huawei, HiSilicon | Option 1 | We prefer unified solution. |
| Apple | Option 2 | We do not see a need for gNB involvement here for the following reasons:.   1. **UE complexity**: First, a SL UE may not support mode 1 capability “*sl-TransmisisonMode1-r16*”, so there is no need to force a procedure which only makes sense in mode 1 to be applied to a mode 2 UE for “unified approach”. This actually adds mode 2 UE complexity, because mode 2 TX UE now has to support different process for SL-DRX when in different RRC states. 2. **Signaling latency and overhead**. The additional exchan ge in Uu interface will add latency and signaling overhead for the decision process of SL-DRX configuration. 3. **Quality of SL-DRX configuration.** If TX UE makes its own decision, it can take care of its mode 2 RA when considering the DRX configuration to ensure it has good resource selection window to select a TX resource. But gNB does not know the sensing information in mode 2 UE, so gNB’s decision about DRX configuration will not be as good as the TX UE’s own decision. If TX UE has to share thet sensing results to th gNB, then the signaling overhead is too huge. 4. **Regarding OPPO’s idea on gNB reconfiguring Tx-pool when determine SL-DRX**. This does not work. Because RAN2 has already agreed one-to-one pool mapping for SL-DRX case, so RX UE generates its SL-DRX assistance information based on an assumption of receiving in a known RX pool. If the gNB of TX UE has revoked this TX pool, then the new TX pool has to be shred with RX UE first to let RX UE to determine its assistance information again. Then the whole procedure has to be repeated. We do not see this TX pool/SL-DRX joint optimization is actually advantageous in terms of latency and signaling overhead. |
| Lenovo | Option 1 | Prefer unified solution |
| NEC | Option 1 | Since TX-UE is RRC\_connected, alignment between Uu DRX of TX UE and SL DRX of RX UE regardless RA mode, a unified approach is preferred. |
| CATT | Option.1 | A unified solution is preferable. |
| Nokia | Option 2, with comments | We do see the advantages of a unified solution, as well as the possibility to easily align Uu and SL DRX. However, we also agree to Apples/Intel concerns and think that this may be needed to discuss further to agree to option 1. |

**Rapporteur summary**:

Rapporteur would like to try to reach at least a consensus about the above highlighted points and thus would like to suggest:

1. xxxxx

## Question 2 – For SL unicast and TX UE in RRC CONNECTED, who determines alignment between Uu DRX of TX UE and SL DRX of RX UE

This question is only valid in case TX UE applies Mode 1 RA.

However, RAN2 needs to further clarify whether TX UE’s gNB and/or RX UE’s gNB to take care of alignment of Uu DRX of TX UE and SL DRX of RX UE. Therefore, it is sufficient to only raise the following question.

***Q2-1: For unicast and TX UE in RRC CONNECTD, which option do companies agree to adopt regarding who determines* alignment between Uu DRX of TX UE and SL DRX of RX UE*?***

**Option 1: TX UE’s gNB**

**Option 2: RX UE’s gNB if RX UE is in RRC CONNECTED**

**Option 3: Other**

|  |  |  |
| --- | --- | --- |
| Company | Option | Comments |
| OPPO | Option 1 with no spec impact | For the “alignment between Uu DRX of TX UE and SL DRX of RX UE”, considering Uu-DRX of Tx-UE is in control of network, we do not see another alternative other than letting Tx-UE’s gNB to do the alignment, i.e.,a joint configuration of SL grant and SL DRX of Rx UE. No spec impact is needed. |
| Xiaomi | Both option 1 and option 2 | TX UE would report RX UE’s assistance information to its gNB. So, TX UE’s gNB determines RX UE’s SL DRX taking assistance information into account. RX UE would report received SL DRX to its gNB. So, RX UE’s gNB determines RX UE’s Uu DRX taking SL DRX into account. Apparently, both side could achieve alignment by adjusting SL DRX or Uu DRX. |
| vivo | Option 1 | According to the above Q1-1 and Q1-2, it is the serving gNB of TX UE to determine the SL DRX of RX UE. Hence, it is a natural way for the serving gNB to align between Uu DRX of TX UE and SL DRX of RX UE. |
| InterDigital | Option 1 | Uu DRX of the TX UE and SL DRX of the RX UE are both determined by the gNB of the TX UE, so naturally this node should perform the alignment. |
| Sharp | Option 1 | Uu DRX of TX UE is controlled by gNB, and as per our response to the Q2.1, SL DRX of RX UE is determined by gNB of TX UE, so Option 1 is preferred. |
| LG | Option 1 | According to the RAN2 agreement, TX UE in RRC\_CONNECTED may obtain DRX configuration from dedicated RRC to generate signaling-2(TX->RX). This means gNB of TX UE in RRC\_CONNECTED configures SL DRX of RX UE. So, the alignment of Uu DRX of TX UE and SL DRX of RX UE should be performed by the gNB of TX UE. |
| Intel | Option 1 | Same comment as OPPO, i.e. it is the same node (gNB) that is responsible for determining both the Uu DRX for the TX UE and SL DRX of the RX UE. The RX UE’s gNB may be responsible for aligning the RX UE’s Uu DRX and SL DRX, but that is not relevant to this question directly. |
| Huawei, HiSilicon | Option 1 | As we have already agreed to adopt TX centric mechanism as a baseline, therefore it is not possible to rely on the RX UE’s connected gNB to achieve the alignment between the TX UE’s Uu DRX and RX UE’s SL DRX. In addition, both Uu DRX of TX UE and SL DRX of RX UE are determined by gNB if the answer to Q1 is Option 1-1/1-2. In this case, TX UE’s gNB should be responsible for the alignment, by implementation. |
| Apple | Optino 1 | There is no need for RX UE worrying about it Uu DRX, because it does not need to get SL grant from gNB. Uu DRX alignment only applies to mode 1 TX UE. So, we think RX UE’s gNB does not need to be involved. |
| Lenovo | Option 1 | since gNB determines the SL DRX, gNB is responsible to align Uu and SL DRX by implementation |
| NEC | Option 1 | Share the same view of OPPO. |
| CATT | Option.1 | Based on the comment to Q1-1 and Q1-2, for SL unicast, the TX UE’s gNB in connected mode will determined the SL DRX configuration for Rx UE, so it is a natural way to let Tx UE’s gNB determine the alignment between Uu DRX of TX UE and SL DRX of RX UE. |
| Nokia | Option 1 | With no spec impact |

**Rapporteur summary**:

Rapporteur would like to try to reach at least a consensus about the above highlighted points and thus would like to suggest:

1. xxxxxxx

## Question 3 - For SL unicast and RX UE in RRC CONNECTED, who determines alignment of Uu DRX of RX UE and SL DRX of RX UE

According to the following RAN2 agreement,

In SL unicast, for DRX configuration of each direction where one UE as Tx-UE and the other as Rx-UE, when Rx-UE is in-coverage and in RRC\_CONNECTED state, Rx-UE report the DRX configuration received in signalling-2 (Tx->Rx) to the serving network.

A relevant question would be how RX UE reports a received SL DRX configuration to the gNB, i.e., using which signaling message.

***Q3-1: For unicast and RX UE in RRC CONNECTED, what signaling message does RX UE use to report a received SL DRX configuration to the gNB?***

***Option 1: existing Uu RRC signaling (e.g., SidelinkUEInformationNR)***

***Option 2: new Uu RRC signaling***

***Option 3: Other***

|  |  |  |
| --- | --- | --- |
| Company | Option | Comments |
| OPPO | Option 1 |  |
| Xiaomi | Option 1 |  |
| vivo | Option 1 | SL DRX configuration is also a kind of SL UE information. Hence, SidelinkUEInformationNR can also be reused to carry this. |
| InterDigital | Option 1 | No strong view here – but we are willing to go with majority view. |
| Sharp | Option 1 |  |
| LG | Option 1 |  |
| Intel | Option 1 | We think it is natural to use SUI to carry this to the gNB |
| Huawei, HiSilicon | Option 1 with comments | Existing Uu RRC signaling is preferred. However, whether it is SUI or UAI is still FFS and pending on the conclusion in 715. |
| Apple | Option 1 |  |
| Lenovo | Option 1 |  |
| NEC | Option 1 |  |
| CATT | Option 1 |  |
| Nokia | Option 1 |  |

When RX UE signals a received SL DRX to its serving gNB, how to align Uu DRX of RX UE with SL DRX of RX UE will be up to RX UE’s gNB implementation. However, in order to be aligned with the existing RAN2 agreement made in RAN2#114

* *For unicast, a two-step process (i.e., RX UE accepts or rejects TX UE’s suggestion) is adopted as a baseline, i.e., FFS on the following TX/RX UE behaviours when reject happens.*

*- Step 1: TX UE sends RRCReconfigurationSidelink containing a SL DRX configuration to be applied by RX UE to RX UE*

*- Step 2: RX UE replies with a PC5-RRC signalling indicating acceptance or rejection for the SL DRX configuration. FFS on whether the new rejection cause for SL DRX needs to be defined. FFS on whether RRCReconfigurationFailureSidelink or RRCReconfigurationCompleteSidelink is used in Step 2.*

The gNB of RX UE shall be able to indicate acceptance or rejection to the received SL DRX configuration.

***Q3-2: For unicast and RX UE in RRC CONNECTED, do companies agree that the serving gNB of RX UE shall be able to indicate either acceptance or rejection to the received SL DRX configurations of RX UE?***

|  |  |  |
| --- | --- | --- |
| Company | Yes or No | Comments |
| OPPO | No | It should be Rx UE itself to decide whether the SL DRX configuration is accepted or not since   1. The gNB does not have full information of Rx-UE in terms of power consumption and DRX preference (active time of other links, half-duplex issue, desired DRX configuration, RF implementation…), which is the key input for Rx UE to derive the acceptance/rejection result 2. Unnecessary latency will be caused if rely on the serving gNB of RX UE to decide, it will take a long time to determine the SL DRX configuration. |
| Xiaomi | Yes | Received SL DRX may be conflict with gNB’s configuiration from resource scheduling point of view. For example, on duration time may be overlapped with configured grant. Note different unicast pair may configure different SL DRX cycle and offset. If gNB is not allowed to reject SL DRX, gNB may have to change the configured grant frequently or configured grant can’t be configured at all. |
| vivo | No, /see comments | We are not sure whether a SidelinkUEInformation message can be responded by acceptance or rejection, which is a little strange from the perspective of assistance information.  Furthermore, what is the RX UE’s behaviors after received rejection from its serving cell? It requires an additional specification effort on it. In our understanding, it can be left to RX UE’s implementation to respond TX UE a rejection via PC5 procedure, e.g. according to the Uu configuration from the serving cell of RX UE without explicit SL DRX rejection from its serving cell. |
| InterDigital | No | The gNB of the RX UE can always align the Uu DRX configuration to the SL DRX configuration determined at the TX UE. |
| Sharp | No |  |
| LG | No | We wonder what is the specific reason the serving gNB of RX UE rejects SL DRX transmitted from TX UE. And also, if the serving gNB of RX UE rejects the SL DRX configuration transmitted from TX UE(or the serving gNB of TX UE), should the TX UE (or the serving gNB of TX UE) configure another SL DRX to RX UE? There could be a ping-pong problem and there is some issue about when the SL DRX transmitting/rejecting between TX UE and RX UE will be stopped. So, it’s better not to be supported SL DRX acceptance/rejection from the gNB of RX UE in this release (rel-17). And also we think we need to specify the reason RX UE sends a rejection message. |
| Intel | No | We have similar view as OPPO that it seems like additional effort to have RX UE’s serving gNB involved in what is already a convoluted process to get to a mutually acceptable SL DRX configuration. Not to mention, the additional latency and overhead for this acceptance/rejection and any subsequent signaling needed. So, we think it should just be upto the RX UE to accept/reject the SL DRX configuration and based on that, the RX UE’s serving gNB can always reconfigure the Uu DRX configuration if needed. |
| Huawei, HiSilicon | No | RX UE has all necessary information (desired DRX configuration, power consumption requirement etc.) which is needed to determine whether the received SL DRX configuration is acceptable or not. The necessity/benefit to allow gNB to indicate acceptance or rejection is not clear and as mentioned by the other companies, will introduce additional signaling overhead and spec impact. In addition, this mechanism is only applicable for RX UEs in RRC CONNECTED mode which is not a unified solution for RX UEs in IDLE/INACTIVE/OoC. |
| Apple | No | As indicated in answer of Q2-1 |
| Lenovo | No | We think Rx UE report SL DRX configuration to gNB is rather a kind of assistance information but not a kind of configuration. So Rx UE’s gNB cannot “accept or reject” it. Instead, gNB may use such information to configure Uu DRX, to reach alignment between Rx UE Uu DRX and SL DRX. |
| NEC | No | If the rejection cause is due to confliction between Uu DRX and the SL DRX configuration determined at the TX UE, it might be beneficial to have the RX UE serving gNB to be able to indicate either acceptance or rejection. However, it is hard to think of such a situation, so it should be Rx UE itself to decide whether the SL DRX configuration is accepted or rejected. |
| CATT | No | The desired DRX configuration could be used by Rx UE to obtain SL DRX configuration from TX UE, this desired DRX configuration may have considered the impact from the Rx UE Uu DRX Configuration. Extra Rx UE’s gNB rejection/acceptance to Rx UE SL DRX configuration is not necessary, it will make the signaling procedure complex. |
| Nokia | No | Specifying this may require significant extra effort with many corner cases without much benefit, it is best to let the Rx UE decide by itself |

A relevant question would be how the gNB signals “acceptance” or “rejection” to RX UE.

***Q3-3: If the answer of Q3-2 is Yes, for unicast and RX UE in RRC CONNECTED, what signaling message does the gNB use to signal “acceptance” or “rejection”*** ***to RX UE for the received SL DRX configuration?***

***Option 1: existing Uu RRC signaling please specify which message if choose Option 1***

***Option 2: new Uu RRC signaling***

***Option 3: Other***

|  |  |  |
| --- | --- | --- |
| Company | Option | Comments |
| Xiaomi | Option 1 | Reconfiguration message could be reused. |
|  |  |  |

How to align Uu DRX of RX UE with SL DRX of RX UE will be up to RX UE’s gNB implementation, i.e., whether to update Uu DRX or SL DRX of RX UE is up to gNB’s implementation.

Therefore, no additional spec change is foreseen. It is necessary to check companies’ views on this.

***Q3-4: For unicast and RX UE in RRC CONNECTED, how to align Uu DRX of RX UE with SL DRX of RX UE will be up to RX UE’s gNB implementation, i.e., no spec change is foreseen?***

|  |  |  |
| --- | --- | --- |
| Company | Yes or No | Comments |
| OPPO | Yes |  |
| Xiaomi | Yes |  |
| vivo | Yes |  |
| InterDigital | Yes |  |
| Sharp | Yes |  |
| LG | Yes |  |
| Intel | Yes | See comment on Q3-2 |
| Huawei, HiSilicon | See comments | Generally we agree it is up to gNB’s implementation. However based on our understanding, which gNB being responsible for the alignment depends on whether the RX UE having Uu DRX before SL DRX or having Uu DRX after SL DRX .  If the RX UE is configured with Uu DRX before it is configured with SL DRX, then it is more reasonable that the RX UE informs the TX UE of the configured Uu DRX and the TX UE forwards this assistance information to its gNB, then TX UE’s gNB performs the alignment when determining the SL DRX configuration for the RX UE.  If the RX UE is configured with SL DRX before it is configured with Uu DRX, then it is more reasonable that the RX UE informs its gNB of the SL DRX configuration, then RX UE’s gNB performs the alignment when determining the Uu DRX configuration for the RX UE.  If we have the restriction that only RX UE’s gNB being responsible for the alignment, then based on TX-centric mechanism, we are restricting that only Uu DRX can be adjusted to be aligned with SL DRX while SL DRX is not allowed to be adjusted to align with Uu DRX, which is not flexible and will introduce signaling overhead (e.g., RX UE is configured with Uu DRX before SL DRX and the Uu DRX needs to be updated to align with the received SL DRX). |
| Apple | Yes | This has already been agreed in RAN2#114,  *For at least SL RX-UEs in RRC CONNECTED, the alignment of Uu DRX and SL DRX is up to gNB.*  Logically, it is up to gNB. For example, if RX UE use different RX chains for SL and Uu, then there is no need of alignment at all. |
| Lenovo | Yes |  |
| NEC | Yes |  |
| CATT | Yes |  |
| Nokia | Yes | No spec impact needed |

**Rapporteur summary**:

Rapporteur would like to try to reach at least a consensus about the above highlighted points and thus would like to suggest:

1. xxxxx

## Question 4 - for SL groupcast or broadcast, how to align SL DRX and Uu DRX

For groupcast and broadcast, the SL DRX configuration can be configured by the gNB via SIB or preconfigured to the UE. In this case, the TX UE and the RX UE can report assistance information to its respective serving gNB on traffic type (e.g., associated L2 ID or PQI), the gNB therefore provides a proper Uu DRX configuration to the TX UE and the RX UE respectively according to the received assistance information. All these means are already existing. Therefore, no additional mechanism is needed for alignment of Uu DRX and SL DRX. It is necessary to check companies’ views on this. Therefore, rapporteur formulates the following questions correspondingly.

***Proposal 29*** *For groupcast or broadcast, the TX UE and the RX UE may report assistance information (e.g., SidelinkUEInformationNR) to their serving gNB regarding traffic type (e.g., associated L2 ID or PQI).*

***Proposal 30*** *For groupcast or broadcast, no additional mechanism is needed in order to achieve alignment of Uu DRX and SL DRX.*

***Proposal 12*** *If the RRC CONNECTED UE is configured with sidelink DRX for SL groupcast/broadcast, it shall reports the related SL DRX configuration to the serving cell, then the serving cell can decides whether to update Uu DRX.*

**Note**: the following questions in this clause are corresponding to P29-P30 in [1] and P12 in [3].

For GC or BC, we need to achieve alignment for the following two cases

TX UE: Uu DRX of TX UE is aligned with SL DRX of RX UE

RX UE: Uu DRX of RX UE is aligned with SL DRX of RX UE

For TX UE, in order to achieve alignment between Uu DRX of TX UE and SL DRX of RX UE in case of Mode 1 scheduling,

From rapporteur’s perspective, the existing content including L2 ID and PQI of the associated traffic/service shall be sufficient for TX UE to report. Since SL DRX for GC or BC shall be common for all UEs interested with the same service. The concerned SL DRX configuration can be either configured by network or preconfigured. gNB is able to obtain the concerned SL DRX configuration by itself based on the received L2 ID or PQI.

Rapporteur thinks it is necessary to check companies’ views.

***Q4-1: For groupcast or broadcast, do companies agree that the existing information content in the existing RRC signaling (e.g., SidelinkUEInformationNR) can be reused by TX UE if in RRC CONNECTED to report assistance information to the gNB in order to achieve alignment of Uu DRX of TX UE and SL DRX of RX UE?***

|  |  |  |
| --- | --- | --- |
| Company | Yes or No | Comments |
| OPPO | ~~No~~ update in comment | The existing information content (PQI and L2 ID) is used to report information on Tx traffic only, i.e., not applicable to Rx in R16.  Rapp: thanks for OPPO comment. For GC or BC, we need to achieve alignment for the following two cases  TX UE: Uu DRX of TX UE is aligned with SL DRX of RX UE  RX UE: Uu DRX of RX UE is aligned with SL DRX of RX UE  So, the existing information content is sufficient for TX UE, but not for RX UE as OPPO commented, I am going to add new question for TX UE.  [OPPO]: Thanks for considering our comments! For Tx UE, we think it is ok to allow implementation based on existing signalling. |
| Xiaomi | Yes |  |
| vivo | Yes with comments | For groupcast and broadcast, SL DRX configuration is determined by the PQI. If PQI is reported to the serving gNB, the gNB can deduce the SL DRX configuration correctly. Hence, it is feasible to reuse the existing reporting, i.e., *SidelinkUEInformationNR.*  However, our concern is whether the purposes of PQI reporting from TX UE and RX UE should be differentiated explicitly since TX UE takes in charge for resource allocation while RX UE for DRX alignment. |
| InterDigital | Yes. | SL DRX for an RX UE in groupcast/broadcast is determined from network configuration based on L2 ID and PQI. Both are reported by a TX UE in *SidelinkUEInformationNR.* |
| Sharp | Yes |  |
| LG | Yes | The current rel-16 mechanism can be reused, so, there will be no spec change expected. The BC/GC DRX configuration is decided basis on the traffic characteristic of TX UE and the current rel-16 SUI contents provides the requiring information to the gNB. |
| Intel | Yes | SidelinkUEInfo can be utilized by TX UE to report the traffic info needed by the gNB to align Uu DRX of the TX UE with SL DRX of the RX UE |
| Huawei, Hisilicon | No | In our understanding, further enhancement based on the existing RRC signaling should be considered. To be detailed, we had agreed that “TX profile” indicating whether SL DRX is supported or not for broadcast/groupcast, therefore, only reporting PQI/L2 ID is not enough as **the PQI/L2 ID information can only be used to derive the corresponding SL DRX configuration for a specific destination L2 ID, however the gNB should also know whether this specific destination L2 ID enables SL DRX or not when performing the alignment.** An extreme case is that TX profiles for all the reported L2 IDs are SL DRX-disabled, then no alignment between Uu DRX and SL DRX is needed at all.  Therefore, we think the TX UE should report the TX profile info associated with destination L2 ID through SUI to assist the gNB to achieve alignment of Uu DRX of TX UE and SL DRX of RX UE, otherwise, the NW has no information on which L2 ID being enabled on SL DRX and may achieve some kind of non-ideal alignment based on the assumption that all the reported L2 IDs are SL DRX-enabled. |
| Apple | Yes and no spec impact. | We do not see any new signaling or procedure is needed. There is no spec impact, either |
| Lenovo | Yes |  |
| NEC | Yes |  |
| CATT | No | Based on current agreement, if the Tx UE is in RRC\_CONNECTED state, the Tx UE should determine the SL DRX configuration for GC/BC by itself based on the SIB configuration. It also can be seen that SL DRX configuration is totally determined by Tx UE itself and the final SL DRX configuration will be used may be different from the SIB configuration due to down-selection. Hence, it is hard for the gNB to achieve alignment of Uu DRX of TX UE and SL DRX of RX UE. In order to solve this issue, the Rel-17 Tx UE in RRC\_CONNECTED state should report its SL DRX configuration of SL GC/BC to network. Also，for Rel-17 Tx UE using SL GC/BC, it can notify which L2 destination ID will use SL DRX and the detailed sidelink DRX configuration to gNB via existing RRC signaling (e.g., SidelinkUEInformationNR). |
| Nokia | No, with comments | Generally, we do not see any spec impact needed related to new signalling procedures, but we can agree to Huaweis comment that the Tx profile may be beneficial |

For RX UE, it is sufficient for RX UE if in RRC CONNECTED to report SL DRX configurations associated with its interested services to the gNB. This is motivated by that RAN2 has already agreed to let RX UE to report received SL DRX configuration to gNB in case of unicast. In this case, we can use the same RRC signaling for RX UE to report SL DRX to gNB in case of both unicast and GC or BC.

***Q4-2: For groupcast or broadcast, do companies agree that RX UE if in RRC CONNECTED can report SL DRX configurations associated with its interested services to the gNB in order to achieve alignment of Uu DRX of RX UE and SL DRX of RX UE?***

|  |  |  |
| --- | --- | --- |
| Company | Yes or No | Comments |
| Xiaomi | Yes | We discussed this issue in R2-2110223.  For groupcast and broadcast sidelink DRX, the DRX parameters are determined by QoS profile of destinations which UE is interested in reception. In R16, UE would report the destination id for transmission and its QoS profile to gNB. For some destination, UE may be only interested in reception, but has no data for transmission. For example, in P2V, vehicle would only receive transmission from pedestrian but not transmit to pedestrian. Therefore, gNB can’t acknowledge the DRX configuration used for these reception only destination. Alignment between Uu DRX and SL DRX for groupcast and broadcast can’t be reached.  On the other hand, UE may not receive from the destination(s), which was reported to gNB via *SL-TxResourceReq-r16* in SUI. For example, pedestrian would only perform transmission to vehicle but not receive from vehicle.  With above observations, gNB may not be aware of the DRX configuration used by UE for groupcast and broadcast, by *SL-TxResourceReq-r16* in SUI.  To enable the alignment, UE shall report the sidelink DRX configuration for groupcast and broadcast destination. |
| OPPO | No | With the SL-DRX configuration being fixed for G/B-cast, we do not see much feasibility / benefit from changing Uu-DRX dynamically based on reported SL DRX, i.e., a more feasible solution is to take the static G/B-cast SL DRX configuration as input for Uu-DRX tuning from the very beginning.  For the P-UE based optimization, we understand the network can be aware of that from UE capability info (R1 is already defining capability reflecting different UE types). |
| vivo | See comments | Need further clarification whether reporting from TX UE and RX UE need be differentiated explicitly. |
| InterDigital | No | The gNB should already be aware of the RX UE’s GC/BC DRX configuration (received by the RX UE from SIB or dedicated signaling) so there is no need for the RX UE to report it. |
| Sharp | No |  |
| LG | No | Same view as OPPO |
| Intel | No | We share the view with other companies that for GC/BC, since the SL DRX configuration is dynamically configured, there seems limited need to report this information to the RX UE’s serving gNB. |
| Huawei, Hisilicon | Yes | We share the same understanding with Xiaomi. Based on Rel-16 signaling structure, the RX UE’s gNB only knows about the QoS profile of the L2 IDs that the RX UE is interested for **transmission** while the Rel-17 SL DRX configuration for G/B-cast are determined by QoS profile of L2 IDs which UE is interested in **reception**.  In this case, even as mentioned by other companies to take the static G/B-cast SL DRX configuration as input for Uu-DRX tuning from the very beginning, “which” static G/B-cast SL DRX configuration should be considered is not known as the RX UE’s gNB has no information on the QoS profile of the RX UE for reception. An extreme case is that the associated SL DRX configuration for each QoS profile included in SIB/pre-configuration is taken into account when performing the alignment which may be non-ideal at all. |
| Apple | Yes | We think so far RX UE of GC/BC does not report anything to the NW if it does not intend to TX at the same time, so gNB has no way to understand the RX UE’s DRX configuration w/o knowing the RX UE’s reception interests. So, if gNB is to align Uu DRX to the SL-DRX. It first needs RX UE to report the SL-DRX information, |
| Lenovo | Yes | Share the view from Xiaomi and Huawei, that since currently UE does not report interest Rx destination for BC/GC, gNB cannot know which SL DRX configuration will be used by UE and thus cannot align Uu DRX with SL DRX configuration. |
| NEC | No | Share the same view with OPPO. |
| CATT | Yes | For groupcast or broadcast, the RX UE if in RRC CONNECTED can report SL DRX configurations associated with its interested services to indicate whether Rx UE is able to apply the SL DRX, which could also help gNB to achieve alignment of Uu DRX of RX UE and SL DRX of RX UE. |
| Nokia | No |  |

|  |  |  |
| --- | --- | --- |
| Company | Yes or No | Comments |
| OPPO | No | Same as comments to Q4-1  Rapp: this question is not valid anymore. |
|  |  |  |

After receiving assistance information from UE, the gNB may update Uu DRX for the UE. This can be achieved via existing signaling. Therefore, no spec change is expected.

***Q4-3: For groupcast or broadcast, do companies agree the gNB can provide proper Uu DRX configuration to TX UE or RX UE according to the received assistance information?***

|  |  |  |
| --- | --- | --- |
| Company | Yes or No | Comments |
| OPPO | ~~No~~ update in comment | Same as comments to Q4-1  Rapp: question has been updated according to OPPO comment.  [OPPO]:We are fine with the intention of this question in case there is no spec impact finally. |
| Xiaoi | Yes | gNB could reconfigure Uu DRX, which is legacy procedure. |
| vivo | Yes | For groupcast and broadcast, SL DRX pattern can not be changed. The serving gNB can only align the Uu DRX configuration to the SL DRX pattern, which is left to smart gNB’s implementation. |
| InterDigital | Yes |  |
| Sharp | Yes |  |
| LG | comment | In the question, what is the received assistance information on the RX UE side? We think the question is not clear, however, we think gNB can provide proper Uu DRX configuration to TX UE or RX UE by its implementation using the agreed rel-17/rel-16 assistance information. |
| Intel | Yes |  |
| Huawei, Hisilicon | Yes |  |
| Apple | No spec impact | We do not see the need of an agreement on this issue because gNB determines Uu DRX and UE just follow. UE does not have a say on whether Uu DRX configuration is proper or not. |
| Lenovo | Yes | gNB can reuse legacy procedure to reconfigure Uu DRX |
| NEC | Yes |  |
| CATT | Yes | See our comment to Q4-1, in our view, the received assistance information needs to be extended to help gNB provide proper Uu DRX configuration. |
| Nokia | Comment (yes) | We think that the question is not completely clear, but in general, we are not sure if any other information is needed |

**Rapporteur summary**:

Rapporteur would like to try to reach at least a consensus about the above highlighted points and thus would like to suggest*.*

1. xxxx

# Conclusion

We have the following proposal:

[Proposal 1 xxxxx](#_Toc88655069)

[Proposal 2 xxxxxxx](#_Toc88655070)

[Proposal 3 xxxxx](#_Toc88655071)

[Proposal 4 xxxx](#_Toc88655072)

3.1 For chair notes (proposal in priority order)

**Easy Proposals for Block Approval**

**Proposals for Online discussion**

# Reference

[1] R2-2109907 Remaining aspects of SL DRX Ericsson

[2] R2-2110062 Discussion on Remaining issues of SL DRX Apple

[3] R2-2109801 Further consideration on SL DRX configuration ZTE Corporation, Sanechips

# Appendix