**3GPP TSG-RAN3 Meeting #124R3-243820**

Fukuoka, Japan, 20 - 24 May, 2024

Agenda Item: 21.2

Source: Nokia (moderator)

Title: Summary of Offline Discussion for CB: # XR2\_NRDC

Document for: Discussion

# Introduction

**CB: # XR2\_NRDC**

**- Check the open issues above**

**- Provide TPs based on agreements**

(moderator - Nok)

Summary of offline disc [R3-243820](file:///C:\Users\ezlyamo\AppData\Local\Temp\fz3temp-2\Inbox\R3-243820.zip)

# For the Chair’s Notes

**Agree the following TPs:**

R3-243896 (TP to BL CR for TS 38.423) Support ECN Marking and Congestion Information Reporting in DC

R3-243897 (TP to BL CR for TS 37.340) Burst Arrival Time handling in NR-DC

R3-243899 (TP to BL CR for TS 37.340) End of Data Burst Indication handling in NR-DC

R3-243898 (TP to BL CR for TS 38.423) PSI-Based SDU Discarding

Agree LS to RAN2 in R3-243900 (draft) LS on UL PSI based discarding in NR-DC

For BAT reporting, FFS on whether SN can receive it from MN.

# Discussion

## PDU Set based handling

Notes from online session:

**For XR in NR-DC, non-homogenous deployment is possible similar like other features in DC.**

**Turn following WA to agreement:**

**WA: SN reports the PDU Set based Handling Indicator in S-NG-RAN node Addition Preparation procedure and M-NG-RAN node initiated S-NG-RAN node Modification Preparation procedure for the MN-terminated SCG bearer, SN-terminated MCG bearer and SN-terminated SCG bearer.**

**Other solutions can be checked as well.**

**Q1: Please share your view on how MN know whether SN support PDU set based handling in non-homogenous deployment, e.g. via the PDU Set based Handling Indicator (refer to the above WA), or other solution (please explain it)**

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| **Company** | **Comment** |
| Nokia | We prefer using the **PDU Set based Handling Indicator.** |
| CATT | We prefer using the **PDU Set based Handling Indicator.** |
| Qualcomm | We prefer only **PDU Set based Handling Indicator.**  This also aligns with other RAN interface enhancements done in R18 for PDU set handling indictor. |
| Ericsson | In our view, XR feature should be best use when both NG-RAN nodes in DC supports it, considering that all different bearer configuration should be supported.  Up to Rel-18, all the features using DC have been specified and implemented without any explicit Indicator. We do not see the need to do introduce it in Rel-19.  At the User Plane, the XR PDU set container has been introduced, there is no issue if for any reason the two nodes are non-homogenously deployed. **For MR-DC, all nodes supports PDU Set handling: CUs, DUs, PDCP entities, and RLC entities.** |
| Comments from offline discussion | No discussion due to lack of time. |
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**Summary**

**Potential proposals:**

## ECN Marking and Congestion Information Reporting

(For discussion, let’s use a short term “**ECN marking**” for “ECN marking and Congestion Information Reporting”.)

Notes from online session:

**For SN-terminated bearer, the MN provide the ECN Marking or Congestion Information Reporting Request per QoS flow to SN via the PDU Session Resource Setup Info – SN terminated IE, and PDU Session Resource Modification Info – SN terminated IE.**

**For SN-terminated bearer, the SN provides the ECN Marking or Congestion Information Reporting status per QoS flow or per DRB to the MN?**

**Add list of QoS flow related to SN-terminated SCG bearers, and for each QoS flow, reporting the ECN Marking or Congestion Information Reporting status.**

In addition, for SN terminated DRB using MCG resources, RAN3 need to discuss whether need to inform the SN about whether the MN-DU is active for ECN marking or congestion information reporting.

**Q2-1: For SN-terminated bearer (MCG, SCG, split), please share your view on whether the ECN marking reporting status is per DRB or per QoS flow to the MN.**

**Q2-2: For SN terminated DRB using MCG resources, please share your view on whether need to inform the SN about whether the MN-DU is active for ECN marking or congestion information reporting.**

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| **Company** | **Comment** |
| Nokia | For Q2-1: there is no issue for either way. We slightly prefer per DRB.  For Q2-2: no need to inform SN. |
| CATT | For Q2-1: For SN terminated SCG, it should be per QoS flow. Especially, we already agree to introduce a list of QoS flow (QFI). We can define a new IE including QFI and legacy active status.  For SN terminated MCG, we prefer aligning with SN terminated SCG and also align with the ECN marking request which is per QoS flow.  For Q2-2: Yes, via Xn-U address indication. It cannot be assumed that MN DU always has the same capability as MN CU. We have the F1 procedure that CU asks whether DU support ECN marking in R18.  Even we assume CU and DU is homogenous, if MN does not support ECN marking, it does not means that it will not send ECN marking request to SN because SN may decides perform SN terminated SCG and SN is able to perform ECN marking. It is not clear how it works without MN DU ECN status. |
| Qualcomm | For Q2-1, either way works functionally. Prefer to use same method for both SN terminated SCG bearers and SN terminated MN bearers reporting mechanism.  For Q2-2, Yes |
| Ericsson | For Q2-1:   * for SN terminated SCG bearers the reporting has to be per QoS Flow as we have already agreed to include in the response from the SN a list of QoS Flows for SN terminated SCG bearers, together with an ECN marking reporting status per QoS Flow. * For SN terminated MCG bearers the reporting should be per DRB. IT makes no sense to report per QoS Flow for the SN terminated MCG bearers because all the QoS Flows in the same SN terminated MCG DRB would have the same ECN marking reporting status. With reporting per QoS Flow we expose us to the risk of errors coming from different ECN marking reporting status for QoS Flows of the same SN terminated MCG bearer.  Note that for MN terminated SCG bearers, where the SN responds with a list of admitted DRBs just like it does for SN terminated MCG bearers, the ECN Marking Reporting Status is per DRB. Hence we should follow the agreements we have already taken and report per DRB.   For Q2-2:  There is no need to inform the SN. The gNB-DU of the MN will signal to the gNB-CU of the MN an ECN Marking Reporting Status. With that, the MN is able to correctly respond to the CN. In the worst case where the MN gNB-DU cannot activate ECN assistance information reporting, the SN CU will not receive the percentage of packets to be ECN marked, hence the SN gNB-CU-UP will not mark the packets |
| Comments from offline discussion | HW, NEC: for Q2-1, per QoS flow for all SN-terminated bearer. No for Q2-2  ZTE: for Q2-1, per QoS flow for SCG bearer, per DRB for others  Len: in R18, it is 1:1 mapping between QoS flow and DRB. Can DRB be used for 1 QoS flow with ECN marking, and another QoS flow without ECN marking?  For SN report to MN on the ECN reporting status:  Option 1: per QoS flow for all SN-terminated bearer   * HW, NEC, CATT   Option 2: per QoS flow for SN-terminated SCG bearer, per DRB for others   * E///, ZTE   **For Q2-1, Agree following**   * **For SN-terminated SCG bearer, add an IE includes a list of items. Each item includes a DRB ID, and a list of QoS flows for SN-terminated SCG bearer mapped to the DRB, and the status for the DRB.** * **For other SN-terminated bearer, add status per DRB.**   **Ericsson will prepare TS38.423 TP**  **For Q2-2: not needed**. |
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**Summary**

**Potential proposals:**

## Burst Arrival Time reporting

When the MN and SN are not timing synchronized, the SN may receive the BAT from MN. It is unclear whether need to support the UE send the BAT directly to SN. In case yes, the SN need to handle it.

**Q3: Please share your view on following**

1. In case the MN forward the BAT to SN, how can SN handle it?
2. Whether need to support the BAT is directly sent to SN? In case yes, how can SN handle it?
3. For above issues, whether only Stage-2 TP is enough. (please refer to the TP in R3-243407)

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| **Company** | **Comment** |
| Nokia | For a), the SN handle it similar to HO, e.g. by considering the SFN offset of the MN.  For b), in case it is confirmed by RAN2, the handling can be similar to a)  For c) only Stage-2 TP is needed. R3-243407 can be good reference. |
| CATT | For a), we do not support a case that MN forward BAT to SN. There is no UAIMCG in current inter-node message send from MN to SN i.e., only have UAIsourceSCG which is used for SN change. From other point view, UAI may help SN to configure (non-integer) DRX but whether SN would like to do such optimization is based on its own decision instead of MN. So we think if SN wants to receive UAI, it can trigger the UAI retrieval by itself, rather MN retrieval UAI and further send it to SN.  But we agree that after SN receives UAI, SN should take SFN offset into account because the UAI contained BAT related to PCell.  For b), as discussed above, yes.  For 3407, we propose to update it as below, there is no forwarding mechanism.  The UE may report uplink assistance information (jitter range, burst arrival time, data burst periodicity) per QoS flow by the UE via UE Assistance Information to the MN and/or the SN as configured. If SN receiving UE assistance, the SN may use it by considering the SFN offset between the MN and the SN. |
| Qualcomm | For a) either implicitly or explicitly MN can indicate to SN. If MN provides its SFN timing to SN, then SN node can adjust BAT timing offset accordingly. We should not assume SRB3 support in all deployments.  b) SN has to handle BAT offset by taking MN SFN timing into account. |
| Ericsson | For a) we support explicit support. The SN uses it for async DC, as this is supported case.  For b) agree with QC. As explained in our DP, the SN can configure the UE to send UAI (via SRB3), so that SN can retrieve the SFN/slot number of the UL BAT from the UE.  For c), this can be fine |
| Comments from offline discussion | HW: SN can receive it from MN or UE.  QC: just say: if SN receive it, then..  **Agree Stage-2 37.340 TP to clarify:**  The UE may report uplink assistance information (jitter range, burst arrival time, UL data burst periodicity) per QoS flow by the UE via UE Assistance Information to the MN or the SN as configured. If the SN receive the burst arrival time, the SN may use it by considering the SFN offset of the MN.  **FFS on whether SN can receive it from MN.**  **Huawei will prepare the TS37.340 TP.** |
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**Summary**

**Potential proposals:**

## End of Data Burst Indication to the peer gNB

Contribution (R3-243408) proposed following:

- the PDU with indication of End of Data Burst is transmitted to UE by MN. In this case, the MN still needs to send the indication of End of Data Burst without PDU or with the last forwarding PDU to SN so that SN can send the UE to DRX sleep mode regarding the DRX group with SCG. Clarifications on Stage 2 is needed for this case.

Proposal 4: When gNB receives the End of Data Burst Indication of a QoS flow from the UPF, the PDCP hosting node always provides the End of Data Burst Indication of the QoS flow to the corresponding node regardless of whether the PDU is forwarded along with the End of Data Burst Indication.

**Q4: Please share your view on above proposal**

**Comments from offline discussion: Lenovo will prepare TP, e.g. with following text:**

When gNB receives the End of Data Burst Indication of a QoS flow from the UPF, the PDCP hosting node always provides the End of Data Burst Indication of the QoS flow to the corresponding node.

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| **Company** | **Comment** |
| Nokia | The proposal is ok.  We think it may also need to cover the Indication of End PDU of the PDU Set. |
| CATT | Agree |
| Qualcomm | Agree |
| Ericsson | Some clarification is needed: EoDB is optional information, if not provided by UPF, how can the PDCP entity forward absent information to other node? We do not understand well this part of the proposal: “regardless of whether the PDU is forwarded along with the End of Data Burst Indication.” |
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**Summary**

**Potential proposals:**

## PSI based Discard coordination

**For UL PSI based discard**

**Issue a: whether inform peer gNB that PSI based discard timer is configured/released.** Contribution (R3-243240) proposes following:

**Proposal 1: to add PSI based SDU Discard UL IE with ENUMERATED (start, stop, …) in the PDU Session Resource Setup Response Info – SN terminated IE, PDU Session Resource Setup Info – MN terminated IE, PDU Session Resource Modification Response Info – SN terminated IE and PDU Session Resource Modification Info – MN terminated IE.**

**Issue b: whether provide the congestion status over Xn**, Contribution (R3-243173) proposes following:

Proposal 3: For split DRB case, when MN sends MAC CE to activate/deactivation PSI based PDU set discarding to UE, it also informs SN about MN congestion situation.

Proposal 4: For split DRB case, when SN sends MAC CE to activate/activate PSI based PDU set discarding to UE, it also informs MN about SN congestion situation.

Other Contributions, e.g. R3-243345, R3-243358, R3-243483, etc, questioned the benefit of the signaling approach and prefer a simple solution.

**For DL PSI based discard, it seems all companies agree no enhancement is needed.**

**Q5: Please share your view on following:**

1. **For UL PSI based discard, add PSI based SDU Discard UL IE with ENUMERATED (start, stop, …) in the *PDU Session Resource Setup Response Info – SN terminated* IE, *PDU Session Resource Setup Info – MN terminated* IE, *PDU Session Resource Modification Response Info – SN terminated* IE and *PDU Session Resource Modification Info – MN terminated* IE.**

**Comments from Offline discussion: agree. NEC will prepare TS38.423 TP.**

1. **For UL PSI based discard, whether need following enhancement**

* For split DRB case, when MN sends MAC CE to activate/deactivation PSI based PDU set discarding to UE, it also informs SN (then to SN-DU) about MN congestion situation.
* For split DRB case, when SN sends MAC CE to activate/activate PSI based PDU set discarding to UE, it also informs MN (then to MN-DU) about SN congestion situation.

Comments from offline discussion:

QC: impact to UE, and ask RAN2

ZTE, CATT: UE implementation issue

QC: need to define UE behavior; other node need to give priority to the affected UE.

E///: concern on the proposal. Optimization with drawback

Len: coordination between MN and SN can avoid the uncertainty of UE.

Samsung: agree with QC

Len: with MN-SN coordination, no UE impact

E///: still have questions. No LS now.

CATT;

Whether need to priority the UE in the other DU

QC will prepare a draft LS for discussion. The draft LS can be

* For split bearer, RAN3 ask RAN2 to clarify the UE behavior for handling uplink PSI based discarding when MN and/or SN send the MAC CE based congestion activation/deactivation.

1. **For DL PSI based discard, no enhancement is needed**

Comments from offline discussion: agree

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| **Company** | **Comment** |
| Nokia | For a), agree. We missed this issue in previous meeting.  For b), we prefer no information to be transferred to the peer gNB.  For c), agree |
| CATT | For a), agree  For b), No. Do not see the benefit.  For c), agree |
| Qualcomm | 1. Agree 2. We think it is beneficial for each node to inform other node about their congestion for split bearer case. Otherwise, other node does not know how to prioritize any UL BSR/data received from UE. This is beneficial to priority scheduling for split bearers. Also we propose to send an LS to RAN2 to clarify UE behavior for split bearer UL PSI based discarding and they can make corrections. 3. agree |
| Ericsson | For a), agree  For b), No. Do not see the benefit. It also impacts RAN2, which is against WID  For c), agree not needed |
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**Summary**

**Potential proposals:**

## Any other issues

**Please add any other issues that you want to discuss.**

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| **Company** | **Comment** |
| Qualcomm | We should also clarify CU-UP behavior as discussed in R3-243173  Proposal 6. For DL congestion management of NR-DC split bearer, when both MN and SN DUs report congestion to common CU-UP hosting PDCP entity, CU-UP based on implementation decides what % of DL congestion value to be reported to UPF. When DL PDU sets are received from UPF, based on MN and SN DU congestion reports, CU-UP decides how to split DL traffic towards MN and SN DUs.  Proposal 7. For DL congestion management of split bearer, if only either of MN or SN DUs report congestion to common CU-UP hosting PDCP entity, CU-UP does not need to report DL congestion to UPF. |
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**Summary**

**Potential proposals:**

# 2nd Round (TBD)

***Please add your comments in the draft TP.***

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| **Company** | **Comment** |
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# References

1. R3-243358, (TP to BL CR for TS 38.423) Discussion on the support of XR in NR-NR DC (Nokia, Nokia Shanghai Bell)
2. R3-243407, (TP to BLCR for 37.340) Burst Arrival Time handling in NR-DC (Lenovo, Samsung, ZTE, Qualcomm Incorporated, Xiaomi, Huawei, CATT)
3. R3-243345, (TP for NR\_XR\_Ph3 BL CR) Enhancement for NR-DC support of XR (Huawei)
4. R3-243173, R19 XR DC Signaling Enhancements (Qualcomm Incorporated)
5. R3-243239, (TP to TS 38.423 on Support of XR in DC) ECN Marking/Congestion Information Reporting on SN Terminated bearer (NEC)
6. R3-243240, (TP to TS 38.423 on Support of XR in DC) PSI-Based SDU Discarding (NEC)
7. R3-243408, Remaining issues on PSI discard, ECN marking and End of Data Burst (Lenovo)
8. R3-243483, (TP to BLCR for 38.423) Remaining issues for support of XR in DC (Ericsson)
9. R3-243485, Support for L4S in DC (Ericsson, Deutsche Telekom, Charter, BT)
10. R3-243486, Support for L4S in NR-NR DC (Ericsson, Deutsche Telekom, Charter, BT)
11. R3-243487, (TP to TS38.423) Support for L4S in DC (Ericsson, Deutsche Telekom, Charter, BT)
12. R3-243598, Discussion on support XR in DC (ZTE)
13. R3-243599, (TP to TS 37.340 and 38.423) Support XR in DC (ZTE)
14. R3-243640, Discussion on XR in DC (CATT)
15. R3-243652, Discussion on support XR in DC (Samsung)
16. R3-243653, (TP to TS 38.423) Support XR in DC (Samsung)
17. R3-243728, (TP to TS 38.423 and 37.340) Support of XR in DC (CMCC)
18. R3-243729, Discussion on support XR in DC (CMCC)