3GPP TSG-RAN WG3 Meeting #127 R3-250790

Athens, Greece, 17 – 21 February, 2025

**Agenda item: 11.4**

**Source: Nokia (Moderator)**

**Title: SoD for CB: # AIRAN5\_SplitArch**

**Document for: Approval**

# 1 Introduction

 This SoD discusses the following CB:

**CB: # AIRAN5\_SplitArch**

**- Discuss the E1 impact as mentioned above**

**- Capture agreements and provide TP if needed**

(moderator - Nok)

Summary of offline disc [R3-250790](file:///C%3A%5CUsers%5Cpantelid%5CDocuments%5Cworkspace%5C3GPP%5CFTP%5Ctsg_ran3%5CTSGR3_127%5CInbox%5CDrafts%5CCB%20%23%20AIRAN5_SplitArch%5CInbox%5CR3-250790.zip)

#  For the Chairman’s Notes

The following is proposed for the Chair’s notes:

There is a timing alignment issue when UE Performance (delay) is sent independently from gNB-DU to gNB-CU-CP and from gNB-CU-UP to gNB-CU-CP.

Packet delay measured for UE Performance feedback is sent from CU-UP to CU-CP. Stage 3 details of the solution and which entity (CU-UP or CU-CP)\_does the aggregation of the overall packet delay are FFS.

#  Discussion (second offline)

There is a timing alignment issue when UE Performance (delay) is sent independently from gNB-DU to gNB-CU-CP and from gNB-CU-UP to gNB-CU-CP.

Packet delay measured for UE Performance feedback is sent from CU-UP to CU-CP. Stage 3 details of the solution and which entity (CU-UP or CU-CP)\_does the aggregation of the overall packet delay are FFS.

# 4 Discussion

The following sentence was captured during the online discussion:

**For E1 interface:**

**CU-UP provides the UE performance feedback (UL/DL throughput, delay, packet loss) over E1 to CU-CP?**

This SoD is structured based on the following questions:

**Q1: Can companies agree that UE Performance feedback (UL/DL throughput, delay, packet loss) is sent from CU-UP to CU-CP?**

**Company views:**

**CMCC: thinks only delay is needed over UP**

**HW: What will happen if we change the way we measure? E///: Everything we have defined so far in Rel-18 is based on some IEs. We haven’t said how to measure.**

**ZTE: Doesn’t want to mix Rel-18 with Rel-19 issue.**

**CMCC: Guarantee that UE performance is measured in the same way.**

**E///: There is no guidance in Rel-18 how to measure these measurements.**

**SS: It is necessary to care about UP measurements in CU-UP.**

**E///: Measuring at higher layers is more reliable because if we measure at PDCP is closer to what an application will see. Packet loss rate in lower layer is meaningless. Measuring at CU-UP is more reliable.**

Another aspect to be discussed is which procedures to use in E1 for sending of UE performance from gNB-CU-UP to gNB-CU-CP.

**Q2: Which procedures to use to send UE Performance from gNB-CU-UP to gNB-CU-CP?**

* **Data Collection Reporting Procedures?**
* **Resource Status Procedures?**

**Company views:**

In a split-architecture, some of the delay components are measured in gNB-DU while some others are measured in gNB-CU-UP. For example, for DL Packet Delay, D1 and D2 are measured at the gNB-DU while D3 and D4 are measured at gNB-CU-UP. In case of UL Packet Delay, D2.1 and D2.2 are measured in gNB-DU while D2.3, D2.4 are measured in gNB-CU-UP. It should also be noted that D1 is measured by the UE (further details relative to handling of UL D1 can be sorted out in future meetings as part of the solution).

Regardless, the overall delay can eventually be known by the gNB-CU-UP. The delay components measured by the gNB-DU are transferred to the gNB-CU-UP via assistance information (PDU type 2) as described in TS 38.425:

#### 5.5.2.3 ASSISTANCE INFORMATION DATA (PDU Type 2)

This frame format is defined to allow the node hosting the PDCP entity to receive assistance information.

The following shows the respective ASSISTANCE INFORMATION DATA frame.

NOTE 1: All information elements defined in Figure 5.5.2.3-1 are also applicable to E-UTRA PDCP unless specified otherwise in section 5.5.3.

|  |  |
| --- | --- |
| Bits | Number of Octets |
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| PDU Type (=2) | PDCP Dupl. Ind.  | Assistance Info. Ind. | UL Delay Ind. | DL Delay Ind. | 1 |
| Spare | UL Congestion Information Ind.  | DL Congestion Information Ind.  | PDCP Duplication Activation Suggestion  | 1 |
| Number of Assistance Information Fields | 0 or 1 |
| Assistance Information Type | 0 or (2\*Number of Assistance Info Fields + sum of Number of octets for Radio Quality Assistance Information Fields) |
| Number of octets for Radio Quality Assistance Information Fields |
| Radio Quality Assistance Information |
| UL Delay DU Result | 0 or 4 |
| DL Delay DU Result | 0 or 4 |
| UL Congestion Information | 0 or 2 |
| DL Congestion Information | 0 or 2 |

Figure 5.5.2.3-1: ASSISTANCE INFORMATION DATA (PDU Type 2) Format (TS 38.425)

Also as can be seen in TS 38.415 [1], an NG-RAN node (gNB-CU-UP) as part of the QoS monitoring can send to UPF in the UL PDU SESSION INFORMATION (PDU Type 1) frame the *DL Delay Result* and *UL Delay Result* IEs:

|  |  |
| --- | --- |
| Bits | Number of Octets |
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| PDU Type (=1) | QMP | DL Delay Ind. | UL Delay Ind. | SNP | 1 |
| N3/N9 Delay Ind. | New IE Flag | QoS Flow Identifier  | 1 |
| DL Sending Time Stamp Repeated | 0 or 8 |
| DL Received Time Stamp | 0 or 8 |
| UL Sending Time Stamp | 0 or 8 |
| DL Delay Result | 0 or 4 |
| UL Delay Result | 0 or 4 |
| UL QFI Sequence Number | 0 or 3 |
| N3/N9 Delay Result | 0 or 4 |
| New IE flag 7(E) | New IE Flag 6 | New IE Flag 5 | New IE Flag 4 | New IE Flag 3 | New IE Flag 2 | New IE Flag 1 | New IE Flag 0 | 0 or 1New IEFlagsOctet |
| Spare | D1 UL PDCPDelay Result Ind | 0 or 1 |
| UL Congestion Information | 0 or 2 |
| DL Congestion Information | 0 or 2 |
| Padding  | 0-3 |

Figure 2‑1 UL PDU SESSION INFORMATION (PDU Type 1) Format (TS 38.415)

*DL Delay Result* IE indicates the downlink delay measurement result which is the sum of the delay incurred in NG-RAN (including the delay at gNB-CU-UP, on F1-U and in the gNB-DU) and the delay over Uu interface in milliseconds for the involved QoS flow. Similarly, the *UL Delay Result* IE indicates the uplink delay measurement result which is the sum of the delay incurred in NG-RAN (including the delay at gNB-CU-UP, on F1-U and on gNB-DU) and the delay over Uu interface and the delay in the UE in milliseconds for the involved QoS flow. Even though the purpose of sending the UL PDU SESSION INFORMATION is to send control information elements related to the PDU session from NG-RAN to UPF, this delay information is available to NG-RAN.

This is one example showing that delay measurement is available at gNB-CU-UP, based on QoS Monitoring framework**.**

**Observation: Delay components are available in gNB-CU-UP based on QoS monitoring framework.**

In the Chair’s minutes it is captured: how to provide the delay should be checked. We think that this could also be discussed as part of this CB discussion.

**Q3: Provide solutions how to collect the delay components at gNB-CU-UP by extending QoS Monitoring framework.**

Company views:

# References

|  |  |  |
| --- | --- | --- |
| [R3-250455](file:///C%3A%5CUsers%5Cpantelid%5CDocuments%5Cworkspace%5C3GPP%5CFTP%5Ctsg_ran3%5CTSGR3_127%5CInbox%5CDrafts%5CCB%20%23%20AIRAN5_SplitArch%5CDocs%5CR3-250455.zip) | Split architecture support for Release 18 use cases (Ericsson, Nokia, Jio Platforms (JPL), Deutsche Telekom, FiberCop) | discussion |
| [R3-250376](file:///C%3A%5CUsers%5Cpantelid%5CDocuments%5Cworkspace%5C3GPP%5CFTP%5Ctsg_ran3%5CTSGR3_127%5CInbox%5CDrafts%5CCB%20%23%20AIRAN5_SplitArch%5CDocs%5CR3-250376.zip) | (TP for AI/ML BLCR to TS 38.473 and TP for AI/ML BLCR to TS 37.483) Split architecture support for Rel-18 “AI/ML for NG-RAN” use cases (Huawei) | other |
| [R3-250143](file:///C%3A%5CUsers%5Cpantelid%5CDocuments%5Cworkspace%5C3GPP%5CFTP%5Ctsg_ran3%5CTSGR3_127%5CInbox%5CDrafts%5CCB%20%23%20AIRAN5_SplitArch%5CDocs%5CR3-250143.zip) | (TP to 38.473, 37.483) Discussion on split architecture (ZTE Corporation) | other |
| [R3-250173](file:///C%3A%5CUsers%5Cpantelid%5CDocuments%5Cworkspace%5C3GPP%5CFTP%5Ctsg_ran3%5CTSGR3_127%5CInbox%5CDrafts%5CCB%20%23%20AIRAN5_SplitArch%5CDocs%5CR3-250173.zip) | (TP to BLCR TS38.473) Split architecture support (NEC) | other |
| [R3-250276](file:///C%3A%5CUsers%5Cpantelid%5CDocuments%5Cworkspace%5C3GPP%5CFTP%5Ctsg_ran3%5CTSGR3_127%5CInbox%5CDrafts%5CCB%20%23%20AIRAN5_SplitArch%5CDocs%5CR3-250276.zip) | (TP to BLCR 38.473 and 37.483) Discussion on split architecture related issues for Rel18 use cases (Lenovo) | other |
| [R3-250278](file:///C%3A%5CUsers%5Cpantelid%5CDocuments%5Cworkspace%5C3GPP%5CFTP%5Ctsg_ran3%5CTSGR3_127%5CInbox%5CDrafts%5CCB%20%23%20AIRAN5_SplitArch%5CDocs%5CR3-250278.zip) | (TP to BLCR 38.401) AIML for RAN in split architecture (Lenovo, CATT, ZTE Corporation) | other |
| [R3-250456](file:///C%3A%5CUsers%5Cpantelid%5CDocuments%5Cworkspace%5C3GPP%5CFTP%5Ctsg_ran3%5CTSGR3_127%5CInbox%5CDrafts%5CCB%20%23%20AIRAN5_SplitArch%5CDocs%5CR3-250456.zip) | (TP to 38.473) - Split architecture support for Release 18 use cases – addition of Data collection procedure (Ericsson, Nokia, Jio Platforms (JPL), Deutsche Telekom, FiberCop) | other |
| [R3-250457](file:///C%3A%5CUsers%5Cpantelid%5CDocuments%5Cworkspace%5C3GPP%5CFTP%5Ctsg_ran3%5CTSGR3_127%5CInbox%5CDrafts%5CCB%20%23%20AIRAN5_SplitArch%5CDocs%5CR3-250457.zip) | (TP to 38.473) - Split architecture support for Release 18 use cases – reuse of Resource Status Reporting (Ericsson, Nokia, Jio Platforms (JPL), Deutsche Telekom, FiberCop) | other |
| [R3-250458](file:///C%3A%5CUsers%5Cpantelid%5CDocuments%5Cworkspace%5C3GPP%5CFTP%5Ctsg_ran3%5CTSGR3_127%5CInbox%5CDrafts%5CCB%20%23%20AIRAN5_SplitArch%5CDocs%5CR3-250458.zip) | (TP to 37.483) - Split architecture support for Release 18 use cases (Ericsson, Nokia, Jio Platforms (JPL), Deutsche Telekom, FiberCop) | other |
| [R3-250538](file:///C%3A%5CUsers%5Cpantelid%5CDocuments%5Cworkspace%5C3GPP%5CFTP%5Ctsg_ran3%5CTSGR3_127%5CInbox%5CDrafts%5CCB%20%23%20AIRAN5_SplitArch%5CDocs%5CR3-250538.zip) | Discussion on AIML energy saving for split architecture (NTT DOCOMO INC..) | discussion |
| [R3-250571](file:///C%3A%5CUsers%5Cpantelid%5CDocuments%5Cworkspace%5C3GPP%5CFTP%5Ctsg_ran3%5CTSGR3_127%5CInbox%5CDrafts%5CCB%20%23%20AIRAN5_SplitArch%5CDocs%5CR3-250571.zip) | Energy Cost Measurement in Split Architecture (Nokia, Deutsche Telekom, Jio Platforms (JPL), FiberCop) | discussion |
| [R3-250572](file:///C%3A%5CUsers%5Cpantelid%5CDocuments%5Cworkspace%5C3GPP%5CFTP%5Ctsg_ran3%5CTSGR3_127%5CInbox%5CDrafts%5CCB%20%23%20AIRAN5_SplitArch%5CDocs%5CR3-250572.zip) | [Draft] LS on New Energy Consumption Measurement for gNB-DU (Nokia, Deutsche Telekom, Jio Platforms (JPL), FiberCop) | LS out To: SA5 CC:  |
| [R3-250575](file:///C%3A%5CUsers%5Cpantelid%5CDocuments%5Cworkspace%5C3GPP%5CFTP%5Ctsg_ran3%5CTSGR3_127%5CInbox%5CDrafts%5CCB%20%23%20AIRAN5_SplitArch%5CDocs%5CR3-250575.zip) | Discussion on Rel-18 UE Performance measurements (Nokia) | other |
| [R3-250619](file:///C%3A%5CUsers%5Cpantelid%5CDocuments%5Cworkspace%5C3GPP%5CFTP%5Ctsg_ran3%5CTSGR3_127%5CInbox%5CDrafts%5CCB%20%23%20AIRAN5_SplitArch%5CDocs%5CR3-250619.zip) | AI/ML for NG-RAN in split architecture (Samsung) | discussion |
| [R3-250620](file:///C%3A%5CUsers%5Cpantelid%5CDocuments%5Cworkspace%5C3GPP%5CFTP%5Ctsg_ran3%5CTSGR3_127%5CInbox%5CDrafts%5CCB%20%23%20AIRAN5_SplitArch%5CDocs%5CR3-250620.zip) | (CR to 37.483) AI/ML for NG-RAN on split architecture (Samsung) | CR0158r, TS 37.483 v18.3.0, Rel-19, Cat. B |
| [R3-250676](file:///C%3A%5CUsers%5Cpantelid%5CDocuments%5Cworkspace%5C3GPP%5CFTP%5Ctsg_ran3%5CTSGR3_127%5CInbox%5CDrafts%5CCB%20%23%20AIRAN5_SplitArch%5CDocs%5CR3-250676.zip) | (TP to 38.473) Transfer Measured EC via F1 for split architecture (CMCC, ZTE, CATT, Lenovo, Samsung) | other |
| [R3-250682](file:///C%3A%5CUsers%5Cpantelid%5CDocuments%5Cworkspace%5C3GPP%5CFTP%5Ctsg_ran3%5CTSGR3_127%5CInbox%5CDrafts%5CCB%20%23%20AIRAN5_SplitArch%5CDocs%5CR3-250682.zip) | Discussion on UE performance metric for split architecture use cases (CMCC) | discussion |
| [R3-250597](file:///C%3A%5CUsers%5Cpantelid%5CDocuments%5Cworkspace%5C3GPP%5CFTP%5Ctsg_ran3%5CTSGR3_127%5CInbox%5CDrafts%5CCB%20%23%20AIRAN5_SplitArch%5CDocs%5CR3-250597.zip) | (TP on 38.470/37.480) AI/ML in split gNBs (CATT) | other |