**3GPP TSG-RAN WG3 Meeting #126 R3-247860**

Orlando, USA, 18th – 22th Oct 2024

**Title:** (TP to 38.473) Transfer Measured EC via F1 for split architecture

**Source:** CMCC, ZTE, CATT, Lenovo

**Agenda item:** 11.4

**Document Type:** Discussion and Decision

# Introduction

During the offline discussion for AI/ML split architecture use case, Summary for Chair Notes as below:

**In split architecture, the Energy Cost of gNB is the sum of the Energy Cost of its gNB-DUs.**

**Mapping rule is only provisioned on gNB-DU and shall be unified for all the gNB-DUs within a defined area.**

**Agree to send LS R3-24xxxx to SA5 to clarify the EC for split gNB in this meeting.**

**Reflect the above agreements in TP to 38.473 (R3-24xxxx).**

# 2. TP to TS 38.473

# 8 F1AP procedures

## 8.1 List of F1AP Elementary procedures

In the following tables, all EPs are divided into Class 1 and Class 2 EPs (see subclause 3.1 for explanation of the different classes):

<< *Start of the change>>*

Table 1: Class 1 procedures

| Elementary Procedure | Initiating Message | Successful Outcome | Unsuccessful Outcome |
| --- | --- | --- | --- |
| Response message | Response message |
| Reset | RESET | RESET ACKNOWLEDGE |  |
| F1 Setup | F1 SETUP REQUEST | F1 SETUP RESPONSE | F1 SETUP FAILURE |
| gNB-DU Configuration Update | GNB-DU CONFIGURATION UPDATE | GNB-DU CONFIGURATION UPDATE ACKNOWLEDGE | GNB-DU CONFIGURATION UPDATE FAILURE |
| gNB-CU Configuration Update | GNB-CU CONFIGURATION UPDATE | GNB-CU CONFIGURATION UPDATE ACKNOWLEDGE | GNB-CU CONFIGURATION UPDATE FAILURE |
| UE Context Setup | UE CONTEXT SETUP REQUEST | UE CONTEXT SETUP RESPONSE | UE CONTEXT SETUP FAILURE |
| UE Context Release (gNB-CU initiated) | UE CONTEXT RELEASE COMMAND | UE CONTEXT RELEASE COMPLETE |  |
| UE Context Modification (gNB-CU initiated) | UE CONTEXT MODIFICATION REQUEST | UE CONTEXT MODIFICATION RESPONSE | UE CONTEXT MODIFICATION FAILURE |
| UE Context Modification Required (gNB-DU initiated) | UE CONTEXT MODIFICATION REQUIRED | UE CONTEXT MODIFICATION CONFIRM | UE CONTEXT MODIFICATION REFUSE |
| Write-Replace Warning | WRITE-REPLACE WARNING REQUEST | WRITE-REPLACE WARNING RESPONSE |  |
| PWS Cancel | PWS CANCEL REQUEST | PWS CANCEL RESPONSE |  |
| gNB-DU Resource Coordination | GNB-DU RESOURCE COORDINATION REQUEST | GNB-DU RESOURCE COORDINATION RESPONSE |  |
| F1 Removal | F1 REMOVAL REQUEST | F1 REMOVAL RESPONSE | F1 REMOVAL FAILURE |
| BAP Mapping Configuration | BAP MAPPING CONFIGURATION | BAP MAPPING CONFIGURATION ACKNOWLEDGE | BAP MAPPING CONFIGURATION FAILURE |
| GNB-DU Resource Configuration | GNB-DU RESOURCE CONFIGURATION | GNB-DU RESOURCE CONFIGURATION ACKNOWLEDGE | GNB-DU RESOURCE CONFIGURATION FAILURE |
| IAB TNL Address Allocation | IAB TNL ADDRESS REQUEST | IAB TNL ADDRESS RESPONSE | IAB TNL ADDRESS FAILURE |
| IAB UP Configuration Update | IAB UP CONFIGURATION UPDATE REQUEST | IAB UP CONFIGURATION UPDATE RESPONSE | IAB UP CONFIGURATION UPDATE FAILURE |
| Resource Status Reporting Initiation | RESOURCE STATUS REQUEST | RESOURCE STATUS RESPONSE | RESOURCE STATUS FAILURE |
| Positioning Measurement | POSITIONING MEASUREMENT REQUEST | POSITIONING MEASUREMENT RESPONSE | POSITIONING MEASUREMENT FAILURE |
| Positioning Information Exchange | POSITIONING INFORMATION REQUEST | POSITIONING INFORMATION RESPONSE | POSITIONING INFORMATION FAILURE |
| TRP Information Exchange | TRP INFORMATION REQUEST | TRP INFORMATION RESPONSE | TRP INFORMATION FAILURE |
| Positioning Activation | POSITIONING ACTIVATION REQUEST | POSITIONING ACTIVATION RESPONSE | POSITIONING ACTIVATION FAILURE |
| E-CID Measurement Initiation | E-CID MEASUREMENT INITIATION REQUEST | E-CID MEASUREMENT INITIATION RESPONSE | E-CID MEASUREMENT INITIATION FAILURE |
| Broadcast Context Setup | BROADCAST CONTEXT SETUP REQUEST | BROADCAST CONTEXT SETUP RESPONSE | BROADCAST CONTEXT SETUP FAILURE |
| Broadcast Context Release | BROADCAST CONTEXT RELEASE COMMAND | BROADCAST CONTEXT RELEASE COMPLETE |  |
| Broadcast Context Modification | BROADCAST CONTEXT MODIFICATION REQUEST | BROADCAST CONTEXT MODIFICATION RESPONSE | BROADCAST CONTEXT MODIFICATION FAILURE |
| Multicast Context Setup | MULTICAST CONTEXT SETUP REQUEST | MULTICAST CONTEXT SETUP RESPONSE | MULTICAST CONTEXT SETUP FAILURE |
| Multicast Context Release | MULTICAST CONTEXT RELEASE COMMAND | MULTICAST CONTEXT RELEASE COMPLETE |  |
| Multicast Context Modification | MULTICAST CONTEXT MODIFICATION REQUEST | MULTICAST CONTEXT MODIFICATION RESPONSE | MULTICAST CONTEXT MODIFICATION FAILURE |
| Multicast Distribution Setup | MULTICAST DISTRIBUTION SETUP REQUEST | MULTICAST DISTRIBUTION SETUP RESPONSE | MULTICAST DISTRIBUTION SETUP FAILURE |
| Multicast Distribution Release | MULTICAST DISTRIBUTION RELEASE COMMAND | MULTICAST DISTRIBUTION RELEASE COMPLETE |  |
| PDC Measurement Initiation | PDC MEASUREMENT INITIATION REQUEST | PDC MEASUREMENT INITIATION RESPONSE | PDC MEASUREMENT INITIATION FAILURE |
| PRS Configuration Exchange | PRS CONFIGURATION REQUEST | PRS CONFIGURATION RESPONSE | PRS CONFIGURATION FAILURE |
| Measurement Preconfiguration | MEASUREMENT PRECONFIGURATION REQUIRED | MEASUREMENT PRECONFIGURATION CONFIRM | MEASUREMENT PRECONFIGURATION REFUSE |
| Timing Synchronisation Status | TIMING SYNCHRONISATION STATUS REQUEST | TIMING SYNCHRONISATION STATUS RESPONSE | TIMING SYNCHRONISATION STATUS FAILURE |
| Multicast Context Notification | MULTICAST CONTEXT NOTIFICATION INDICATION | MULTICAST CONTEXT NOTIFICATION CONFIRM | MULTICAST CONTEXT NOTIFICATION REFUSE |
| Multicast Common Configuration | MULTICAST COMMON CONFIGURATION REQUEST | MULTICAST COMMON CONFIGURATION RESPONSE | MULTICAST COMMON CONFIGURATION REFUSE |
| Data Collection Reporting Initiation | DATA COLLECTION REQUEST | DATA COLLECTION RESPONSE | DATA COLLECTION FAILURE |

Table 2: Class 2 procedures

| Elementary Procedure | Message |
| --- | --- |
| Error Indication | ERROR INDICATION |
| UE Context Release Request (gNB-DU initiated) | UE CONTEXT RELEASE REQUEST |
| Initial UL RRC Message Transfer | INITIAL UL RRC MESSAGE TRANSFER |
| DL RRC Message Transfer | DL RRC MESSAGE TRANSFER |
| UL RRC Message Transfer | UL RRC MESSAGE TRANSFER |
| UE Inactivity Notification | UE INACTIVITY NOTIFICATION |
| System Information Delivery | SYSTEM INFORMATION DELIVERY COMMAND |
| Paging | PAGING |
| Notify | NOTIFY |
| PWS Restart Indication | PWS RESTART INDICATION |
| PWS Failure Indication | PWS FAILURE INDICATION |
| gNB-DU Status Indication | GNB-DU STATUS INDICATION |
| RRC Delivery Report | RRC DELIVERY REPORT |
| Network Access Rate Reduction | NETWORK ACCESS RATE REDUCTION |
| Trace Start | TRACE START |
| Deactivate Trace | DEACTIVATE TRACE |
| DU-CU Radio Information Transfer | DU-CU RADIO INFORMATION TRANSFER |
| CU-DU Radio Information Transfer | CU-DU RADIO INFORMATION TRANSFER |
| Resource Status Reporting | RESOURCE STATUS UPDATE |
| Access And Mobility Indication | ACCESS AND MOBILITY INDICATION |
| Reference Time Information Reporting Control | REFERENCE TIME INFORMATION REPORTING CONTROL |
| Reference Time Information Report | REFERENCE TIME INFORMATION REPORT |
| Access Success | ACCESS SUCCESS |
| Cell Traffic Trace | CELL TRAFFIC TRACE |
| Positioning Assistance Information Control | POSITIONING ASSISTANCE INFORMATION CONTROL |
| Positioning Assistance Information Feedback | POSITIONING ASSISTANCE INFORMATION FEEDBACK |
| Positioning Measurement Report | POSITIONING MEASUREMENT REPORT |
| Positioning Measurement Abort | POSITIONING MEASUREMENT ABORT |
| Positioning Measurement Failure Indication | POSITIONING MEASUREMENT FAILURE INDICATION |
| Positioning Measurement Update | POSITIONING MEASUREMENT UPDATE |
| Positioning Deactivation | POSITIONING DEACTIVATION |
| E-CID Measurement Failure Indication | E-CID MEASUREMENT FAILURE INDICATION |
| E-CID Measurement Report | E-CID MEASUREMENT REPORT |
| E-CID Measurement Termination | E-CID MEASUREMENT TERMINATION COMMAND |
| Positioning Information Update | POSITIONING INFORMATION UPDATE |
| Multicast Group Paging | MULTICAST GROUP PAGING |
| Broadcast Context Release Request | BROADCAST CONTEXT RELEASE REQUEST |
| Multicast Context Release Request | MULTICAST CONTEXT RELEASE REQUEST |
| PDC Measurement Report | PDC MEASUREMENT REPORT |
| PDC Measurement Failure Indication | PDC MEASUREMENT FAILURE INDICATION |
| PDC Measurement Termination | PDC MEASUREMENT TERMINATION COMMAND |
| Measurement Activation | MEASUREMENT ACTIVATION |
| QoE Information Transfer | QOE INFORMATION TRANSFER |
| Positioning System Information Delivery | POSITIONING SYSTEM INFORMATION DELIVERY COMMAND |
| DU-CU Cell Switch Notification | DU-CU CELL SWITCH NOTIFICATION |
| CU-DU Cell Switch Notification | CU-DU CELL SWITCH NOTIFICATION |
| DU-CU TA Information Transfer | DU-CU TA INFORMATION TRANSFER |
| CU-DU TA Information Transfer | CU-DU TA INFORMATION TRANSFER |
| QoE Information Transfer Control | QOE INFORMATION TRANSFER CONTROL |
| RACH Indication | RACH INDICATION |
| Timing Synchronisation Status Report | TIMING SYNCHRONISATION STATUS REPORT |
| Mobile IAB F1 Setup Triggering | MIAB F1 SETUP TRIGGERING |
| Mobile IAB F1 Setup Outcome Notification | MIAB F1 SETUP OUTCOME NOTIFICATION |
| Broadcast Transport Resource Request | BROADCAST TRANSPORT RESOURCE REQUEST |
| SRS Information Reservation Notification | SRS INFORMATION RESERVATION NOTIFICATION |
| DU-CU Access And Mobility Indication | DU-CU ACCESS AND MOBILITY INDICATION |
| Data Collection Reporting | DATA COLLECTION UPDATE |

<<next change>>

### 8.2.xx Data Collection Reporting Initiation

#### 8.2.xx.1 General

This procedure is used by a gNB-CU to request from a gNB-DU the reporting of information to support, e.g., AI/ML in NG-RAN.

The procedure uses non UE-associated signalling.

#### 8.2.xx.2 Successful Operation



Figure 8.2.xx.2-1: Data Collection Reporting Initiation, successful operation

gNB-CU initiates the procedure by sending the DATA COLLECTION REQUEST message to gNB-DU to start information reporting or to stop information reporting. Upon receipt, gNB-DU:

- shall initiate the requested information reporting according to the parameters given in the request in case the *Registration Request for Data Collection* IE is set to "start"; or

- shall stop all measurements and predictions and terminate the reporting in case the *Registration Request for Data Collection* IE is set to "stop".

If gNB-DUis capable of providing all of the requested information, it shall initiate the information reporting as requested by gNB-CU and respond with the DATA COLLECTION RESPONSE message.

If the *Reporting Periodicity for Data Collection* IE in the DATA COLLECTION REQUEST message is present, this indicates the periodicity for the reporting of configured measurement objects. The gNB-DU shall report only once, unless otherwise requested within the *Reporting Periodicity for Data Collection* IE.

**Interaction with the Data Collection Reporting procedure**

When starting a measurement, the *Report Characteristics* *for Data Collection* IE in the DATA COLLECTION REQUEST message indicates the type of objects gNB-DU performs on. gNB-DU shall include in the DATA COLLECTION UPDATE message:

- the *Energy Cost* IE, if the first bit, "Energy Cost" of the *Report Characteristics* *for Data Collection* IE included in the DATA COLLECTION REQUEST message is set to "1" and if the measurement object is admitted by GNB-DU.

#### 8.2.xx.3 Unsuccessful Operation



Figure 8.2.xx.3-1: Data Collection Reporting Initiation, unsuccessful operation

If none of the requested information can be initiated, gNB-DU shall send the DATA COLLECTION FAILURE message with an appropriate cause value.

#### 8.2.xx.4 Abnormal Conditions

For the same Measurement ID, if the initiating gNB-CU does not receive either the DATA COLLECTION RESPONSE message or the DATA COLLECTION FAILURE message, the gNB-CU may reinitiate the Data Collection Reporting Initiation procedure towards the same gNB-DU, provided that the content of the new DATA COLLECTION REQUEST message is identical to the content of the previously unacknowledged DATA COLLECTION REQUEST message.

If the gNB-DU receives a DATA COLLECTION REQUEST message which includes the *Registration Request for Data Collection* IE set to "stop" and if the gNB-CU Measurement ID value received in the DATA COLLECTION REQUEST message is not used, thegNB-DU shall initiate DATA COLLECTION FAILURE message with an appropriate cause value.

If in the *Report Characteristics for Data Collection* IE bitmap all bits are set to "0" in the DATA COLLECTION REQUEST message, then gNB-DU shall initiate a DATA COLLECTION FAILURE message with an appropriate cause value.

If the gNB-DU receives a DATA COLLECTION REQUEST message which includes the *Registration Request for Data Collection* IE set to "start" and the *gNB-CU Measurement ID* IE corresponding to an existing on-going Data Collection reporting, then gNB-DU shall initiate a DATA COLLECTION FAILURE message with an appropriate cause value.

### 8.2.yy Data Collection Reporting

#### 8.2.yy.1 General

This procedure is initiated by a gNB-DU to report information accepted by the gNB-DU following a successful Data Collection Reporting Initiation procedure for the purpose of, e.g., AI/ML in NG-RAN.

The procedure uses non UE-associated signalling.

#### 8.2.yy.2 Successful Operation



Figure 8.2.yy.2-1: Data Collection Reporting, successful operation

gNB-DU shall report the accepted information in DATA COLLECTION UPDATE message. The accepted information is the information that was successfully initiated during the preceding Data Collection Reporting Initiation procedure.

#### 8.2.yy.3 Unsuccessful Operation

Not applicable.

#### 8.2.yy.4 Abnormal Conditions

Void.

<<next change>>

#### 9.2.x DATA COLLECTION messages

#### 9.2.x.aa DATA COLLECTION REQUEST

This message is sent by gNB-CU to gNB-DU to initiate the requested information reporting according to the parameters given in the message.

Direction: gNB-CU → gNB-DU.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
| --- | --- | --- | --- | --- | --- | --- |
| Message Type | M |  | 9.3.1.1 |  | YES | reject |
| Transaction ID | M |  | 9.3.1.23 |  | YES | reject |
| gNB-CU Measurement ID | M |  | INTEGER (1..4095,...) | Allocated by gNB-CU | YES | reject |
| gNB-DU Measurement ID | C-ifRegistrationRequestForDataCollectionStop |  | INTEGER (1..4095,...) | Allocated by gNB-DU | YES | ignore |
| Registration Request for Data Collection | M |  | ENUMERATED(start, stop, …) | Type of request for which the information is required. | YES | reject |
| Report Characteristics for Data Collection | C-ifRegistrationRequestForDataCollectionStart |  | BITSTRING  (SIZE(32)) | Each position in the bitmap indicates the object the gNB-DU is requested to report.  First Bit = Energy Cost | YES | reject |
| Reporting Periodicity for Data Collection | O |  | ENUMERATED(500ms, 1000ms, 2000ms, 5000ms, 10000ms, …) | Periodicity that can be used for reporting of requested objects. Also used as the averaging window length for all objects if supported. | YES | ignore |

| Condition | Explanation |
| --- | --- |
| ifRegistrationRequestForDataCollectionStop | This IE shall be present if the *Registration Request for Data Collection* IE is set to the value “stop”. |
| ifRegistrationRequestForDataCollectionStart | This IE shall be present if the *Registration Request* *for Data Collection* IE is set to the value “start”. |

#### 9.2.x.bb DATA COLLECTION RESPONSE

This message is sent by gNB-DU to gNB-CU to indicate that the requested information, for all or part of the measurement objects included in the reporting, is successfully initiated.

Direction: gNB-DU → gNB-CU.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
| --- | --- | --- | --- | --- | --- | --- |
| Message Type | M |  | 9.3.1.1 |  | YES | reject |
| Transaction ID | M |  | 9.3.1.23 |  | YES | reject |
| gNB-CU Measurement ID | M |  | INTEGER (1..4095,...) | Allocated by gNB-CU | YES | reject |
| gNB-DU Measurement ID | M |  | INTEGER (1..4095,...) | Allocated by gNB-DU | YES | reject |
| Criticality Diagnostics | O |  | 9.3.1.3 |  | YES | ignore |

#### 9.2.x.cc DATA COLLECTION FAILURE

This message is sent by the gNB-DU to gNB-CU to indicate that for all of the requested objects the reporting cannot be initiated.

Direction: gNB-DU → gNB-CU.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
| --- | --- | --- | --- | --- | --- | --- |
| Message Type | M |  | 9.3.1.1 |  | YES | reject |
| Transaction ID | M |  | 9.3.1.23 |  | YES | reject |
| gNB-CU Measurement ID | M |  | INTEGER (1..4095,...) | Allocated by gNB-CU | YES | reject |
| gNB-DU Measurement ID | M |  | INTEGER (1..4095,...) | Allocated by gNB-DU | YES | reject |
| Cause | M |  | 9.3.1.2 |  | YES | ignore |
| Criticality Diagnostics | O |  | 9.3.1.3 |  | YES | ignore |

#### 9.2.x.dd DATA COLLECTION UPDATE

This message is sent by gNB-DU to gNB-CU to report the requested information.

Direction: gNB-DU → gNB-CU.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
| --- | --- | --- | --- | --- | --- | --- |
| Message Type | M |  | 9.3.1.1 |  | YES | ignore |
| Transaction ID | M |  | 9.3.1.23 |  | YES | reject |
| gNB-CU Measurement ID | M |  | INTEGER (1..4095,...) | Allocated by gNB-CU | YES | reject |
| gNB-DU Measurement ID | M |  | INTEGER (1..4095,...) | Allocated by gNB-DU | YES | reject |
| Energy Cost | O |  | INTEGER(1..10000,...) | gNB-DU level measured Energy Consumption index.  Value 0 indicates the minimum measured Energy Consumption and 10000 indicates the maximum measured Energy Consumption. | YES | ignore |

<<end of the change>>