**3GPP TSG-RAN WG3 #115-e R3-222972**

**21 Feb – 3 Mar 2022**

**Online**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.463** | **CR** | **0678** | **rev** | **4** | **Current version:** | **16.8.0** |  |
|  | | | | | | | | |
| *For* ***[HE](http://www.3gpp.org/3G_Specs/CRs.htm" \l "_blank)******[LP](http://www.3gpp.org/3G_Specs/CRs.htm" \l "_blank)*** *on using this form: comprehensive instructions can be found at  <http://www.3gpp.org/Change-Requests>.* | | | | | | | | |
|  | | | | | | | | |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network | **x** | Core Network |  |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | | | | |
| ***Title:*** | Support for User Plane Integrity Protection support for EPC connected architectures with EN-DC capable UE | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | ZTE,China Telecom, Ericsson, Vodafone, Qualcomm, Nokia, Nokia Shanghai Bell,Huawei, Intel Corporation | | | | | | | | | |
| ***Source to TSG:*** | R3 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | UPIP\_SEC\_LTE-RAN-Core | | | | |  | ***Date:*** | | | 2022-2-17 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | | Rel-17 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-15 (Release 15) Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | In order to provide additional user plane data security (i.e. in addition to user plane data ciphering), SA3 agreed in their WI on “User Plane Integrity Protection for LTE” to additionally support user plane integrity protection (UPIP) for data transferred over Uu interface for UE connected to EPC. It is necessary for RAN WGs to enhance signalling. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Introduce User Plane Integrity Protection policy IE in the following procedure:  Bearer Context Setup  Bearer Context Modification  The CR has no BC impact. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | No support for UPIP in LTE split architecture. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 2, 8.3.1.2, , 8.3.2.2, 9.3.1.23, 9.3.1.32, 9.1.3.52, 9.3.3.1, 9.3.3.3, 9.3.3.7, 9.3.3.8, 9.3.3.13, 9.3.3.15, 9.3.1.2, , ASN.1 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | | **X** |  | Other core specifications | | | | TS 36.413 CR1852,  TS 36.423 CR1663 | | |
| ***affected:*** | |  | **x** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **x** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | | Rev 1: adding co-source company, removing reference, update section 9.3.1.32 and 9.3.1.52  Rev 2: Resubmit  Rev 3: R3-222568  Correct IE in 8.3.1.2 and 8.3.2.2; add reference to 33.401.  Rev 4: R3-222972  Merge TP in R3-222769 | | | | | | | | |

|  |
| --- |
| Start of Change |

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 38.401: "NG-RAN; Architecture Description".

[3] 3GPP TS 38.460: "NG-RAN; E1 general aspects and principles".

[4] 3GPP TS 38.300: "NR; Overall description; Stage-2".

[5] 3GPP TR 25.921 (version.7.0.0): "Guidelines and principles for protocol description and error".

[6] 3GPP TS 38.413: "NG-RAN; NG Application Protocol (NGAP)".

[7] ITU-T Recommendation X.691 (2002-07): "Information technology - ASN.1 encoding rules - Specification of Packed Encoding Rules (PER)".

[8] ITU-T Recommendation X.680 (07/2002): "Information technology – Abstract Syntax Notation One (ASN.1): Specification of basic notation".

[9] ITU-T Recommendation X.681 (07/2002): "Information technology – Abstract Syntax Notation One (ASN.1): Information object specification".

[10] 3GPP TS 38.331: "NR; Radio Resource Control (RRC); Protocol Specificaiton”.

[11] 3GPP TS 23.401: “General Packet Radio Service (GPRS) Enhancements for Evolved Universal Terrestrial Radio Access Network (E-UTRAN) access”.

[12] 3GPP TS 23.203: “Policy and Charging Control Architecture”.

[13] 3GPP TS 33.501: “Security Architecture and Procedures for 5G System”.

[14] IETF RFC 5905: “Network Time Protocol Version 4: Protocol and Algorithms Specification”.

[15] 3GPP TS 29.281: “General Packet Radio System (GPRS) Tunnelling Protocol User Plane (GTPv1-U)”.

[16] 3GPP TS 38.414: “NG-RAN; NG Data Transport”.

[17] 3GPP TS 38.323: "NR; Packet Data Convergence Protocol (PDCP) specification".

[18] 3GPP TS 38.462: "NG-RAN; E1 Signalling Transport".

[19] 3GPP TS 37.340: "NR; Multi-connectivity; Overall description; Stage-2".

[20] 3GPP TS 23.501: "System Architecture for the 5G System".

[21] 3GPP TS 36.331: "Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC) protocol specification".

[22] 3GPP TS 28.552: "Management and orchestration; 5G performance measurements".

[23] 3GPP TS 23.003: "Numbering, addressing and identification".

[24] 3GPP TS 32.422: "Trace control and configuration management".

[25] 3GPP TS 36.300: "Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Overall description; Stage 2".

[26] 3GPP TS 32.425: "Performance measurements; Evolved Universal Terrestrial Radio Access Network (E-UTRAN)".

[27] 3GPP TS 37.320: "Universal Terrestrial Radio Access (UTRA) and Evolved Universal Terrestrial Radio Access (E-UTRA); Radio measurement collection for Minimization of Drive Tests (MDT);Overall description; Stage 2".

[28] 3GPP TS 38.474: "NG-RAN; F1 data transport".

[29] 3GPP TS 29.244: "Interface between the Control Plane and the User Plane Nodes; Stage 3".

[x4] 3GPP TS 33.401: "Security architecture".

|  |
| --- |
| Next Change |

### 8.3.1 Bearer Context Setup

#### 8.3.1.1 General

The purpose of the Bearer Context Setup procedure is to allow the gNB-CU-CP to establish a bearer context in the gNB-CU-UP. The procedure uses UE-associated signalling.

#### 8.3.1.2 Successful Operation



Figure 8.3.1.2-1: Bearer Context Setup procedure: Successful Operation.

The gNB-CU-CP initiates the procedure by sending the BEARER CONTEXT SETUP REQUEST message to the gNB-CU-UP. If the gNB-CU-UP succeeds to establish the requested resources, it replies to the gNB-CU-CP with the BEARER CONTEXT SETUP RESPONSE message.

--unchanged part

For E-UTRAN:

* For each DRB for which the *Security Indication* IE is included in the *DRB To Setup List* IE of the BEARER CONTEXT SETUP REQUEST message, and the *Integrity Protection Indication* IE is set to "preferred", then the gNB-CU-UP should, if supported, perform user plane integrity protection for the concerned DRB and notify whether it performed the user plane integrity protection by including the *Integrity Protection Result* IE, in the *DRB Setup List* IE of the BEARER CONTEXT SETUP RESPONSE message.
* For each DRB for which the *Security Indication* IE is included in the *DRB To Setup List* IE of the BEARER CONTEXT SETUP REQUEST message, and the *Integrity Protection Indication* IE is set to "required", then the gNB-CU-UP shall, if supported, perform user plane integrity protection for the concerned DRB. If the gNB-CU-UP cannot perform the user plane integrity protection, it shall reject the setup of the DRB with an appropriate cause value.
* For each DRB for which the *Security Indication* IE is included in the *DRB To Setup List* IE of the BEARER CONTEXT SETUP REQUEST message, and the *Integrity Protection Indication* IE is set to "not needed", then the gNB-CU-UP shall not perform user plane integrity protection for the concerned DRB;

|  |
| --- |
| Next Change |

### 8.3.2 Bearer Context Modification (gNB-CU-CP initiated)

#### 8.3.2.1 General

The purpose of the Bearer Context Modification procedure is to allow the gNB-CU-CP to modify a bearer context in the gNB-CU-UP. The procedure uses UE-associated signalling.

#### 8.3.2.2 Successful Operation



Figure 8.3.2.2-1: Bearer Context Modification procedure: Successful Operation.

The gNB-CU-CP initiates the procedure by sending the BEARER CONTEXT MODIFICATION REQUEST message to the gNB-CU-UP. If the gNB-CU-UP succeeds to modify the bearer context, it replies to the gNB-CU-CP with the BEARER CONTEXT MODIFICATION RESPONSE message.

--unchanged part

For E-UTRAN:

* For each DRB for which the *Security Indication* IE is included in the *DRB To Setup List* IE of the BEARER CONTEXT MODIFICATION REQUEST message, and the *Integrity Protection Indication* IE is set to "preferred", then the gNB-CU-UP should, if supported, perform user plane integrity protection for the concerned DRB and notify whether it performed the user plane integrity protection by including the *Integrity Protection Result* IE in the *DRB Setup List* IE of the BEARER CONTEXT MODIFICATION RESPONSE message.
* For each DRB for which the *Security Indication* IE is included in the *DRB To Setup List* IE of the BEARER CONTEXT MODIFICATION REQUEST message, and the *Integrity Protection Indication* IE is set to "required", then the gNB-CU-UP shall, if supported, perform user plane integrity protection for the concerned DRB. If the gNB-CU-UP cannot perform the user plane integrity protection, it shall reject the setup of the DRB with an appropriate cause value.
* For each DRB for which the *Security Indication* IE is included in the *DRB To Setup List* IE of the BEARER CONTEXT MODIFICATION REQUEST message and the *Integrity Protection Indication* IE is set to "not needed", then the gNB-CU-UP shall not perform user plane integrity protection for the concerned DRB.

|  |
| --- |
| Next Change |

#### 9.3.1.23 Security Indication

This IE contains the user plane integrity protection indication and confidentiality protection indication which indicates the requirements on UP integrity protection and ciphering for corresponding PDU Session Resources, respectively.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
| Integrity Protection Indication | M |  | ENUMERATED (required, preferred, not needed, …) | Indicates whether UP integrity protection shall apply, should apply or shall not apply for the concerned PDU Session Resource for the gNB/ng-eNB CP-UP separation, or for the concerned E-RAB for the eNB CP-UP separation. |
| Confidentiality Protection Indication | M |  | ENUMERATED (required, preferred, not needed, …) | Indicates whether UP ciphering shall apply, should apply or shall not apply for the concerned PDU Session Resource.  NOTE: This IE is not applicable to eNB CP-UP separation. |
| Maximum Integrity Protected Data Rate | C-ifIntegrityProtectionrequiredorpreferred |  | 9.3.1.57 | If present, this is the value received from the CN for the overall UE capability. This IE is ignored when enforcing the maximum IP data rate.  NOTE: This IE is not applicable to eNB CP-UP separation. |

|  |
| --- |
| Next Change |

#### 9.3.1.32 User Plane Security Keys

This IE contains the ciphering and/or integrity protection keys generated by the gNB-CU-CP.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
| Encryption Key | M |  | OCTET STRING | As defined in TS 33.501 [13] |
| Integrity Protection Key | O |  | OCTET STRING | As defined in TS 33.501 [13] for NG-RAN or TS 33.401 [x4] for eNB CP-UP separation. |

|  |
| --- |
| Next Change |

#### 9.3.1.52 Security Result

This IE indicates whether the security policy indicated as "preferred" in the *Security Indication* IE is performed or not.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
| Integrity Protection Result | M |  | ENUMERATED (performed, not performed, …) | Indicates whether UP integrity protection is performed or not for the concerned PDU Session Resource for the gNB/ng-eNB CP-UP separation, or for the eNB CP-UP separation. |
| Confidentiality Protection Result | M |  | ENUMERATED (performed, not performed, …) | Indicates whether UP ciphering is performed or not for the concerned PDU Session Resource.  NOTE: This IE is not applicable to eNB CP-UP separation. |

|  |
| --- |
| Next Change |

#### 9.3.3.1 DRB To Setup List E-UTRAN

This IE contains DRB related information used at Bearer Context Setup Request in E-UTRAN

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
| **DRB To Setup Item E-UTRAN** |  | *1..<maxnoofDRBs>* |  |  | - | - |
| >DRB ID | M |  | 9.3.1.16 |  | - | - |
| >PDCP Configuration | M |  | 9.3.1.38 |  | - | - |
| >E-UTRAN QoS | M |  | 9.3.1.17 |  | - | - |
| >S1 UL UP Transport Layer Information | M |  | UP Transport Layer Information  9.3.2.1 |  | - | - |
| >Data Forwarding Information Request | O |  | 9.3.2.5 | Requesting forwarding info from the target gNB-CU-UP. | - | - |
| >Cell Group Information | M |  | 9.3.1.11 |  | - | - |
| >DL UP Parameters | O |  | UP Parameters  9.3.1.13 |  | - | - |
| >DRB Inactivity Timer | O |  | Inactivity Timer  9.3.1.54 | Included if the Activity Notification Level is set to DRB. | - | - |
| >Existing Allocated S1 DL UP Transport Layer Information | O |  | UP Transport Layer Information  9.3.2.1 | This IE is not used in this version of the specification. | - | - |
| >Security Indication | O |  | 9.3.1.23 |  | YES | reject |

|  |  |
| --- | --- |
| Range bound | Explanation |
| maxnoofDRBs | Maximum no. of DRBs for a UE. Value is 32. |

|  |
| --- |
| Next Change |

#### 9.3.3.3 DRB Setup List E-UTRAN

This IE contains setup DRB related information at Bearer Context Setup Response in E-UTRAN

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
| **DRB Setup Item E-UTRAN** |  | *1..<maxnoofDRBs>* |  |  | - | - |
| >DRB ID | M |  | 9.3.1.16 |  |  |  |
| >S1 DL UP Transport Layer Information | M |  | UP Transport Layer Information  9.3.2.1 |  | - | - |
| >Data Forwarding Information Response | O |  | Data Forwarding Information  9.3.2.6 | Providing forwarding info from the target gNB-CU-UP. | - | - |
| >UL UP Parameters | M |  | UP Parameters  9.3.1.13 |  | - | - |
| >S1 DL UP Unchanged | O |  | ENUMERATED (True, …) | This IE is not used in this version of the specification. | - | - |
| >Security Result |  |  | 9.3.1.52 |  | YES | ignore |

|  |  |
| --- | --- |
| Range bound | Explanation |
| maxnoofDRBs | Maximum no. of DRBs for a UE. Value is 32. |

|  |
| --- |
| Next Change |

#### 9.3.3.7 DRB To Setup Modification List E-UTRAN

This IE contains DRB to setup related information used at Bearer Context Modification Request in E-UTRAN

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
| **DRB To Setup Modification Item E-UTRAN** |  | *1..<maxnoofDRBs>* |  |  | - | - |
| >DRB ID | M |  | 9.3.1.16 |  | - | - |
| >PDCP Configuration | M |  | 9.3.1.38 |  | - | - |
| >E-UTRAN QoS | M |  | 9.3.1.17 |  | - | - |
| >S1 UL UP Transport Layer Information | M |  | UP Transport Layer Information  9.3.2.1 |  | - | - |
| >Data Forwarding Information Request | O |  | 9.3.2.5 | Requesting forwarding info from the target gNB-CU-UP. | - | - |
| >Cell Group Information | M |  | 9.3.1.11 |  | - | - |
| >DL UP Parameters | O |  | UP Parameters  9.3.1.13 |  | - | - |
| >DRB Inactivity Timer | O |  | Inactivity Timer  9.3.1.54 | Included if the Activity Notification Level is set to DRB. | - | - |
| >Security Indication | O |  | 9.3.1.23 |  | YES | reject |

|  |  |
| --- | --- |
| Range bound | Explanation |
| maxnoofDRBs | Maximum no. of DRBs for a UE. Value is 32. |

|  |
| --- |
| Next Change |

#### 9.3.3.8 DRB To Modify List E-UTRAN

This IE contains DRB to modify related information used at Bearer Context Modification Request in E-UTRAN

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
| **DRB To Modify Item E-UTRAN** |  | *1..<maxnoofDRBs>* |  |  |
| >DRB ID | M |  | 9.3.1.16 |  |
| >PDCP Configuration | O |  | 9.3.1.38 |  |
| >E-UTRAN QoS | O |  | 9.3.1.17 |  |
| >S1 UL UP Transport Layer Information | O |  | UP Transport Layer Information  9.3.2.1 |  |
| >Data Forwarding Information | O |  | 9.3.2.6 | Providing forwarding info to the source gNB-CU-UP. |
| >PDCP SN Status Request | O |  | ENUMERATED (requested, …) | The gNB-CU-CP requests the gNB-CU-UP to provide the PDCP SN Status in the response message. |
| >PDCP SN Status Information | O |  | 9.3.1.58 | Providing SN Status information to the target gNB-CU-UP. |
| >DL UP Parameters | O |  | UP Parameters  9.3.1.13 |  |
| >Cell Group To Add | O |  | Cell Group Information 9.3.1.11 |  |
| >Cell Group To Modify | O |  | Cell Group Information 9.3.1.11 |  |
| >Cell Group To Remove | O |  | Cell Group Information 9.3.1.11 |  |
| >DRB Inactivity Timer | O |  | Inactivity Timer  9.3.1.54 | Included if the Activity Notification Level is set to DRB. |

|  |  |
| --- | --- |
| Range bound | Explanation |
| maxnoofDRBs | Maximum no. of DRBs for a UE. Value is 32. |

|  |
| --- |
| Next Change |

#### 9.3.3.13 DRB Setup Modification List E-UTRAN

This IE contains setup DRB related information at Bearer Context Modification Response in E-UTRAN

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
| **DRB Setup Modification Item E-UTRAN** |  | *1..<maxnoofDRBs>* |  |  | - | - |
| >DRB ID | M |  | 9.3.1.16 |  | - | - |
| >S1 DL UP Transport Layer Information | M |  | UP Transport Layer Information  9.3.2.1 |  | - | - |
| >Data Forwarding Information Response | O |  | 9.3.2.6 | Provides forwarding information from the target gNB-CU-UP. | - | - |
| >UL UP Parameters | M |  | UP Parameters  9.3.1.13 |  | - | - |
| >Security Result | O |  | 9.3.1.52 |  | YES | ignore |

|  |  |
| --- | --- |
| Range bound | Explanation |
| maxnoofDRBs | Maximum no. of DRBs for a UE. Value is 32. |

|  |
| --- |
| Next Change |

#### 9.3.3.15 DRB Modified List E-UTRAN

This IE contains modified DRB related information at Bearer Context Modification Response in E-UTRAN

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
| **DRB Modified Item E-UTRAN** |  | *1..<maxnoofDRBs>* |  |  |
| >DRB ID | M |  | 9.3.1.16 |  |
| >S1 DL UP Transport Layer Information | O |  | UP Transport Layer Information 9.3.2.1 |  |
| >PDCP SN Status Information | O |  | 9.3.1.58 | Provides the PDCP SN Status from the source gNB-CU-UP. |
| >UL UP Parameters | O |  | UP Parameters  9.3.1.13 | Carries the UL UP parameters. |

|  |  |
| --- | --- |
| Range bound | Explanation |
| maxnoofDRBs | Maximum no. of DRBs for a UE. Value is 32. |

|  |
| --- |
| Next Change |

#### 9.3.1.2 Cause

The purpose of the *Cause* IE is to indicate the reason for a particular event for the E1AP protocol.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
| CHOICE *Cause Group* | M |  |  |  |
| >*Radio Network Layer* |  |  |  |  |
| >>Radio Network Layer Cause | M |  | ENUMERATED (Unspecified,  Unknown or already allocated gNB-CU-CP UE E1AP ID,  Unknown or already allocated gNB-CU-UP UE E1AP ID,  Unknown or inconsistent pair of UE E1AP ID,  Interaction with other procedure,  PDCP Count Wrap Around,  Not supported QCI value,  Not supported 5QI value,  Encryption algorithms not supported,  Integrity protection algorithms not supported,  UP integrity protection not possible,  UP confidentiality protection not possible,  Multiple PDU Session ID Instances,  Unknown PDU Session ID,  Multiple QoS Flow ID Instances,  Unknown QoS Flow ID,  Multiple DRB ID Instances,  Unknown DRB ID,  Invalid QoS combination,  Procedure cancelled,  Normal release,  No radio resources available,  Action desirable for radio reasons,  Resources not available for the slice,  PDCP configuration not supported,  …,  UE DL maximum integrity protected data rate reason,  UP integrity protection failure, Release due to Pre-Emption, RSN not available for the UP, NPN not supported,  Report Characteristics Empty,  Existing Measurement ID,  Measurement Temporarily not Available  Measurement not Supported For The Object, UP integrity protection not possible) |  |
| >Transport Layer |  |  |  |  |
| >>Transport Layer Cause | M |  | ENUMERATED (Unspecified,  Transport Resource Unavailable, …,  Unknown TNL address for IAB) |  |
| >Protocol |  |  |  |  |
| >>Protocol Cause | M |  | ENUMERATED (Transfer Syntax Error, Abstract Syntax Error (Reject), Abstract Syntax Error (Ignore and Notify), Message not Compatible with Receiver State,  Semantic Error,  Abstract Syntax Error (Falsely Constructed Message), Unspecified, …) |  |
| >Misc |  |  |  |  |
| >>Miscellaneous Cause | M |  | ENUMERATED (Control Processing Overload, Not enough User Plane Processing Resources, Hardware Failure, O&M Intervention, Unspecified, …) |  |

The meaning of the different cause values is described in the following table. In general, "not supported" cause values indicate that the related capability is missing. On the other hand, "not available" cause values indicate that the related capability is present, but insufficient resources were available to perform the requested action.

|  |  |
| --- | --- |
| **Radio Network Layer cause** | **Meaning** |
| Unspecified | Sent for radio network layer cause when none of the specified cause values applies. |
| Unknown or already allocated gNB-CU-CP UE E1AP ID | The action failed because the gNB-CU-CP UE E1AP ID is either unknown, or (for a first message received at the gNB-CU) is known and already allocated to an existing context. |
| Unknown or already allocated gNB-CU-UP UE E1AP ID | The action failed because the gNB-CU-UP UE E1AP ID is either unknown, or (for a first message received at the gNB-CU-UP) is known and already allocated to an existing context. |
| Unknown or inconsistent pair of UE E1AP ID | The action failed because both UE E1AP IDs are unknown, or are known but do not define a single UE context. |
| Interaction with other procedure | The action is due to an ongoing interaction with another procedure. |
| PDCP COUNT wrap around | PDCP COUNT approaches the maximum value. |
| Not supported QCI value | The action failed because the requested QCI is not supported. |
| Not supported 5QI value | The action failed because the requested 5QI is not supported. |
| Encryption algorithms not supported | The gNB-CU-UP is unable to support the selected encryption algorithm for the UE. |
| Integrity protection algorithms not supported | The gNB-CU-UP is unable to support the selected integrity protection algorithm for the UE. |
| UP integrity protection not possible | The PDU Session cannot be accepted according to the required user plane integrity protection policy. |
| UP confidentiality protection not possible | The PDU Session cannot be accepted according to the required user plane confidentiality protection policy |
| Multiple PDU Session ID Instances | The action failed because multiple instances of the same PDU Session had been provided. |
| Unknown PDU Session ID | The action failed because the PDU Session ID is unknown. |
| Multiple QoS Flow ID Instances | The action failed because multiple instances of the same QoS flow had been provided. |
| Unknown QoS Flow ID | The action failed because the QoS Flow ID is unknow. |
| Multiple DRB ID Instances | The action failed because multiple instances of the same DRB had been provided. |
| Unknown DRB ID | The action failed because the DRB ID is unknow. |
| Invalid QoS combination | The action was failed because of invalid QoS combination |
| Procedure cancelled | The sending node cancelled the procedure due to other urgent actions to be performed. |
| Normal release | The action is due to a normal release of the UE (e.g. because of mobility) and does not indicate an error. |
| No radio resources available | The requested node doesn’t have sufficient radio resources available. |
| Action desirable for radio reasons | The reason for requesting the action is radio related. |
| Resources not available for the slice | The requested resources are not available for the slice. |
| PDCP configuration not supported, | The gNB-CU-UP is unable to support the selected PDCP configuration for the UE. |
| UE DL maximum integrity protected data rate reason | The request is not accepted in order to comply with the maximum downlink data rate for integrity protection supported by the UE. |
| UP integrity protection failure | The gNB-CU-UP detects an integrity protection failure in the UL PDU. |
| Release due to Pre-Emption | Release is initiated due to pre-emption. |
| RSN not available for the UP | The redundant user plane resources indicated by RSN are not available. |
| NPN not supported | The action failed because the indicated SNPN is not supported in the node. |
| Report Characteristics Empty | The action failed because there is no measurement object in the report characteristics. |
| Existing Measurement ID | The action failed because the measurement ID is already used. |
| Measurement Temporarily not Available | The gNB-CU-UP can temporarily not provide the requested measurement object. |
| Measurement not Supported For The Object | At least one of the concerned object(s) does not support the requested measurement. |
| UP integrity protection not possible | The E-RAB cannot be accepted according to the required user plane integrity protection policy. |

|  |  |
| --- | --- |
| **Transport Layer cause** | **Meaning** |
| Unspecified | Sent when none of the above cause values applies but still the cause is Transport Network Layer related. |
| Transport Resource Unavailable | The required transport resources are not available. |
| Unknown TNL address for IAB | The action failed because the TNL address is unknown.  This cause value is applicable for IAB only. |

|  |  |
| --- | --- |
| **Protocol cause** | **Meaning** |
| Transfer Syntax Error | The received message included a transfer syntax error. |
| Abstract Syntax Error (Reject) | The received message included an abstract syntax error and the concerning criticality indicated "reject". |
| Abstract Syntax Error (Ignore And Notify) | The received message included an abstract syntax error and the concerning criticality indicated "ignore and notify". |
| Message Not Compatible With Receiver State | The received message was not compatible with the receiver state. |
| Semantic Error | The received message included a semantic error. |
| Abstract Syntax Error (Falsely Constructed Message) | The received message contained IEs or IE groups in wrong order or with too many occurrences. |
| Unspecified | Sent when none of the above cause values applies but still the cause is Protocol related. |

| **Miscellaneous cause** | **Meaning** |
| --- | --- |
| Control Processing Overload | Control processing overload. |
| Not EnoughUser Plane Processing Resources Available | No enough resources are available related to user plane processing. |
| Hardware Failure | Action related to hardware failure. |
| O&M Intervention | The action is due to O&M intervention. |
| Unspecified Failure | Sent when none of the above cause values applies and the cause is not related to any of the categories Radio Network Layer, Transport Network Layer, NAS or Protocol. |

|  |
| --- |
| Next Change |

### 9.4.5 Information Element Definitions

-- ASN1START

-- \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

--

-- Information Element Definitions

--

-- \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

--unchanged part

id-ignoreMappingRuleIndication,

id-EarlyDataForwardingIndicator,

id-QoSFlowsDRBRemapping,

id-SecurityIndication,

id-SecurityResult,

maxnoofQoSParaSets,

maxnoofErrors,

--unchanged part

CauseRadioNetwork ::= ENUMERATED {

unspecified,

unknown-or-already-allocated-gnb-cu-cp-ue-e1ap-id,

unknown-or-already-allocated-gnb-cu-up-ue-e1ap-id,

unknown-or-inconsistent-pair-of-ue-e1ap-id,

interaction-with-other-procedure,

pPDCP-Count-wrap-around,

not-supported-QCI-value,

not-supported-5QI-value,

encryption-algorithms-not-supported,

integrity-protection-algorithms-not-supported,

uP-integrity-protection-not-possible,

uP-confidentiality-protection-not-possible,

multiple-PDU-Session-ID-Instances,

unknown-PDU-Session-ID,

multiple-QoS-Flow-ID-Instances,

unknown-QoS-Flow-ID,

multiple-DRB-ID-Instances,

unknown-DRB-ID,

invalid-QoS-combination,

procedure-cancelled,

normal-release,

no-radio-resources-available,

action-desirable-for-radio-reasons,

resources-not-available-for-the-slice,

pDCP-configuration-not-supported,

...,

ue-dl-max-IP-data-rate-reason,

uP-integrity-protection-failure,

release-due-to-pre-emption,

rsn-not-available-for-the-up,

nPN-not-supported,

report-characteristic-empty,

existing-measurement-ID,

measurement-temporarily-not-available,

measurement-not-supported-for-the-object,

UP-integrity-protection-not-possible

}

--unchanged part

DRB-Setup-List-EUTRAN ::= SEQUENCE (SIZE(1.. maxnoofDRBs)) OF DRB-Setup-Item-EUTRAN

DRB-Setup-Item-EUTRAN ::= SEQUENCE {

dRB-ID DRB-ID,

s1-DL-UP-TNL-Information UP-TNL-Information,

data-Forwarding-Information-Response Data-Forwarding-Information OPTIONAL,

uL-UP-Transport-Parameters UP-Parameters,

s1-DL-UP-Unchanged ENUMERATED {true, ...} OPTIONAL,

iE-Extensions ProtocolExtensionContainer { { DRB-Setup-Item-EUTRAN-ExtIEs } } OPTIONAL,

...

}

DRB-Setup-Item-EUTRAN-ExtIEs E1AP-PROTOCOL-EXTENSION ::= {

{ID id-SecurityResult CRITICALITY ignore EXTENSION SecurityResult PRESENCE optional},

...

}

DRB-Setup-Mod-List-EUTRAN ::= SEQUENCE (SIZE(1.. maxnoofDRBs)) OF DRB-Setup-Mod-Item-EUTRAN

DRB-Setup-Mod-Item-EUTRAN ::= SEQUENCE {

dRB-ID DRB-ID,

s1-DL-UP-TNL-Information UP-TNL-Information,

data-Forwarding-Information-Response Data-Forwarding-Information OPTIONAL,

uL-UP-Transport-Parameters UP-Parameters,

iE-Extensions ProtocolExtensionContainer { { DRB-Setup-Mod-Item-EUTRAN-ExtIEs } } OPTIONAL,

...

}

DRB-Setup-Mod-Item-EUTRAN-ExtIEs E1AP-PROTOCOL-EXTENSION ::= {

{ID id-SecurityResult CRITICALITY ignore EXTENSION SecurityResult PRESENCE optional},

...

}

--unchanged part

DRB-Setup-Mod-List-EUTRAN ::= SEQUENCE (SIZE(1.. maxnoofDRBs)) OF DRB-Setup-Mod-Item-EUTRAN

DRB-Setup-Mod-Item-EUTRAN ::= SEQUENCE {

dRB-ID DRB-ID,

s1-DL-UP-TNL-Information UP-TNL-Information,

data-Forwarding-Information-Response Data-Forwarding-Information OPTIONAL,

uL-UP-Transport-Parameters UP-Parameters,

iE-Extensions ProtocolExtensionContainer { { DRB-Setup-Mod-Item-EUTRAN-ExtIEs } } OPTIONAL,

...

}

DRB-Setup-Mod-Item-EUTRAN-ExtIEs E1AP-PROTOCOL-EXTENSION ::= {

{ID id-SecurityResult CRITICALITY ignore EXTENSION SecurityResult PRESENCE optional},

...

}

--unchanged part

DRB-To-Setup-List-EUTRAN ::= SEQUENCE (SIZE(1.. maxnoofDRBs)) OF DRB-To-Setup-Item-EUTRAN

DRB-To-Setup-Item-EUTRAN ::= SEQUENCE {

dRB-ID DRB-ID,

pDCP-Configuration PDCP-Configuration,

eUTRAN-QoS EUTRAN-QoS,

s1-UL-UP-TNL-Information UP-TNL-Information,

data-Forwarding-Information-Request Data-Forwarding-Information-Request OPTIONAL,

cell-Group-Information Cell-Group-Information,

dL-UP-Parameters UP-Parameters OPTIONAL,

dRB-Inactivity-Timer Inactivity-Timer OPTIONAL,

existing-Allocated-S1-DL-UP-TNL-Info UP-TNL-Information OPTIONAL,

iE-Extensions ProtocolExtensionContainer { { DRB-To-Setup-Item-EUTRAN-ExtIEs } } OPTIONAL,

...

}

DRB-To-Setup-Item-EUTRAN-ExtIEs E1AP-PROTOCOL-EXTENSION ::= {

{ID id-SecurityIndication CRITICALITY reject EXTENSION SecurityIndication PRESENCE optional},

...

}

DRB-To-Setup-Mod-List-EUTRAN ::= SEQUENCE (SIZE(1.. maxnoofDRBs)) OF DRB-To-Setup-Mod-Item-EUTRAN

DRB-To-Setup-Mod-Item-EUTRAN ::= SEQUENCE {

dRB-ID DRB-ID,

pDCP-Configuration PDCP-Configuration,

eUTRAN-QoS EUTRAN-QoS,

s1-UL-UP-TNL-Information UP-TNL-Information,

data-Forwarding-Information-Request Data-Forwarding-Information-Request OPTIONAL,

cell-Group-Information Cell-Group-Information,

dL-UP-Parameters UP-Parameters OPTIONAL,

dRB-Inactivity-Timer Inactivity-Timer OPTIONAL,

iE-Extensions ProtocolExtensionContainer { { DRB-To-Setup-Mod-Item-EUTRAN-ExtIEs } } OPTIONAL,

...

}

DRB-To-Setup-Mod-Item-EUTRAN-ExtIEs E1AP-PROTOCOL-EXTENSION ::= {

{ID id-SecurityIndication CRITICALITY reject EXTENSION SecurityIndication PRESENCE optional},

...

}

|  |
| --- |
| Next Change |

### 9.4.7 Constant Definitions

--unchanged part

id-SecurityIndication ProtocolIE-ID ::= 14x

id-SecurityResult ProtocolIE-ID ::= 14y

|  |
| --- |
| End of Change |