**3GPP TSG-WG3 Meeting #118 *R3-22xxxx***

**Toulouse, France, 14th – 18th November 2022**

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **36.413** | **CR** | **1895** | **rev** | **5** | **Current version:** | **17.2.0** |  |
|  | | | | | | | | |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network | **X** | Core Network | **X** |

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| ***Title:*** | Support for IoT NTN enhancements | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Nokia, Nokia Shanghai Bell, CATT, Thales, Ericsson, Huawei, ZTE | | | | | | | | | |
| ***Source to TSG:*** | RAN3 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | IoT\_NTN\_enh | | | | |  | ***Date:*** | | | 2022-10-26 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | | Rel-18 |
|  | *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-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Support for IOT NTN Enhancements | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Add a new cause value for indicating the UE context release due to discontinuous coverage. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Cannot support the discontinuous coverage, e.g. the receiver cannot know the reason for UE context release. | | | | | | | | |
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| ***Clauses affected:*** | | 9.2.1.3, 9.3.4 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***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 2: updated for submission to RAN3#118.  Rev 3: updated the cover page (CR revision history) during RAN3#118.  Rev 4: Updated the list of co-sign companies.  Rev 5: Updated including the agreed TP from RAN3#118. | | | | | | | | |

**<<<<<< START OF CHANGE >>>>>>**

#### 9.2.1.3 Cause

The purpose of the *Cause* IE is to indicate the reason for a particular event for the S1AP protocol.

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| --- | --- | --- | --- | --- |
| 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,  TX2RELOCOverall Expiry,  Successful Handover,  Release due to E-UTRAN Generated Reason,  Handover Cancelled, Partial Handover, Handover Failure In Target EPC/eNB Or Target System,  Handover Target not allowed,  TS1RELOCoverall Expiry,  TS1RELOCprep Expiry,  Cell not available,  Unknown Target ID,  No Radio Resources Available in Target Cell, Unknown or already allocated MME UE S1AP ID,  Unknown or already allocated eNB UE S1AP ID,  Unknown or inconsistent pair of UE S1AP ID, Handover desirable for radio reasons,  Time critical handover,  Resource optimisation handover,  Reduce load in serving cell, User inactivity,  Radio Connection With UE Lost, Load Balancing TAU Required, CS Fallback Triggered,  UE Not Available For PS Service, Radio resources not available,  Failure in the Radio Interface Procedure,  Invalid QoS combination, Inter-RAT redirection,  Interaction with other procedure, Unknown E-RAB ID, Multiple E-RAB ID instances, Encryption and/or integrity protection algorithms not supported, S1 intra system Handover triggered, S1 inter system Handover triggered, X2 Handover triggered  …,  Redirection towards 1xRTT,  Not supported QCI value,  invalid CSG Id,  Release due to Pre-Emption,  N26 interface not available, Insufficient UE Capabilities, Maximum bearer pre-emption rate exceeded, UP integrity protection not possible, Release due to discontinuous coverage) |  |
| *>Transport Layer* |  |  |  |  |
| >>Transport Layer Cause | M |  | ENUMERATED (Transport Resource Unavailable,  Unspecified, …) |  |
| *>NAS* |  |  |  |  |
| >>NAS Cause | M |  | ENUMERATED (Normal Release,  Authentication failure,  Detach,  Unspecified,  …,  CSG Subscription Expiry, UE not in PLMN serving area) |  |
| *>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, Unknown PLMN, …) |  |

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.

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| --- | --- | --- |
| Radio Network Layer cause | | Meaning |
| Unspecified | | Sent for radio network layer cause when none of the specified cause values applies. |
| TX2RELOCOverall Expiry | | The timer guarding the handover that takes place over X2 has abnormally expired. |
| Successful Handover | | Successful handover. |
| Release due to E-UTRAN generated reason | | Release is initiated due to E-UTRAN generated reason. |
| Handover Cancelled | | The reason for the action is cancellation of Handover. |
| Partial Handover | | Provides a reason for the handover cancellation. The HANDOVER COMMAND message from MME contained *E-RABs to Release List* IE and the source eNB estimated service continuity for the UE would be better by not proceeding with handover towards this particular target eNB. |
| Handover Failure In Target EPC/eNB Or Target System | | The handover failed due to a failure in target EPC/eNB or target system. |
| Handover Target not allowed | | Handover to the indicated target cell is not allowed for the UE in question. |
| TS1RELOCoverall Expiry | | The reason for the action is expiry of timer TS1RELOCoverall. |
| TS1RELOCprep Expiry | | Handover Preparation procedure is cancelled when timer TS1RELOCprep expires. |
| Cell not available | | The concerned cell is not available. |
| Unknown Target ID | | Handover rejected because the target ID is not known to the EPC. |
| No radio resources available in target cell | | Load on target cell is too high. |
| Unknown or already allocated MME UE S1AP ID | | The action failed because the MME UE S1AP ID is either unknown, or (for a first message received at the eNB) is known and already allocated to an existing context. |
| Unknown or already allocated eNB UE S1AP ID | | The action failed because the eNB UE S1AP ID is either unknown, or (for a first message received at the MME) is known and already allocated to an existing context. |
| Unknown or inconsistent pair of UE S1AP ID | | The action failed because both UE S1AP IDs are unknown, or are known but do not define a single UE context. |
| Handover Desirable for Radio Reasons | | The reason for requesting handover is radio related. |
| Time Critical Handover | | Handover is requested for time critical reason i.e., this cause value is reserved to represent all critical cases where the connection is likely to be dropped if handover is not performed. |
| Resource Optimisation Handover | | The reason for requesting handover is to improve the load distribution with the neighbour cells. |
| Reduce Load in Serving Cell | | Load on serving cell needs to be reduced. When applied to handover preparation, it indicates the handover is triggered due to load balancing. |
| User Inactivity | | The action is requested due to user inactivity on all E-RABs, e.g., S1 is requested to be released in order to optimise the radio resources. |
| Radio Connection With UE Lost | | The action is requested due to losing the radio connection to the UE. |
| Load Balancing TAU Required | | The action is requested for all load balancing and offload cases in the MME. |
| CS Fallback triggered | | The action is due to a CS fallback that has been triggered. When it is included in UE CONTEXT RELEASE REQUEST message, it indicates the PS service suspension is not required in the EPC. |
| UE Not Available for PS Service | | The action is requested due to a CS fallback to GERAN that has been triggered.  When it is included in the UE CONTEXT RELEASE REQUEST message, it indicates that the PS service suspension is required in the EPC due to the target GERAN cell or the UE has no DTM capability. |
| Radio resources not available | | No requested radio resources are available. |
| Invalid QoS combination | | The action was failed because of invalid QoS combination. |
| Inter-RAT Redirection | | The release is requested due to inter-RAT redirection or intra-LTE redirection. When it is included in UE CONTEXT RELEASE REQUEST message, the behaviour of the EPC is specified in TS 23.401 [11]. |
| Failure in the Radio Interface Procedure | | Radio interface procedure has failed. |
| Interaction with other procedure | | The action is due to an ongoing interaction with another procedure. |
| Unknown E-RAB ID | | The action failed because the E-RAB ID is unknown in the eNB. |
| Multiple E-RAB ID Instances | | The action failed because multiple instance of the same E-RAB had been provided to the eNB. |
| Encryption and/or integrity protection algorithms not supported | | The eNB is unable to support any of the encryption and/or integrity protection algorithms supported by the UE. |
| S1 Intra system Handover triggered | The action is due to a S1 intra system handover that has been triggered. | |
| S1 Inter system Handover triggered | The action is due to a S1 inter system handover that has been triggered. | |
| X2 Handover triggered | The action is due to an X2 handover that has been triggered. | |
| Redirection towards 1xRTT | The release of the UE-associated logical S1 connection is requested due to redirection towards a 1xRTT system e.g., CS fallback to 1xRTT, or SRVCC to 1xRTT, when the PS service suspension is required in the EPC. During this procedure, the radio interface message might but need not include redirection information. | |
| Not supported QCI Value | The E-RAB setup failed because the requested QCI is not supported. | |
| Invalid CSG Id | The CSG ID provided to the target eNB was found invalid. | |
| Release due to Pre-Emption | Release is initiated due to pre-emption. | |
| N26 interface not available | The action failed due to a temporary failure of the N26 interface. | |
| Insufficient UE Capabilities | The procedure can’t proceed due to insufficient UE capabilities. | |
| Maximum bearer pre-emption rate exceeded | The procedure can’t proceed because the number of requests exceed the maximum bearer pre-emption rate. | |
| UP integrity protection not possible | The E-RAB cannot be accepted according to the required user plane integrity protection policy. | |
| Release due to discontinuous coverage | The release is due to discontinuous coverage (only applicable to IoT NTN). | |

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| Transport Layer cause | Meaning |
| Transport Resource Unavailable | The required transport resources are not available. |
| Unspecified | Sent when none of the specified cause values applies but still the cause is Transport Network Layer related. |

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| NAS cause | Meaning |
| Normal Release | The release is normal. |
| Authentication Failure | The action is due to authentication failure. |
| Detach | The action is due to detach. |
| Unspecified | Sent when none of the specified cause values applies but still the cause is NAS related. |
| CSG Subscription Expiry | The action is due to the UE becoming a non-member of the currently used CSG. |
| UE not in PLMN serving area | The release is due to the UE not being within the serving area of its current PLMN (for IoT NTN). |

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| 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 specified cause values applies but still the cause is Protocol related. |

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| 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 specified cause values applies and the cause is not related to any of the categories Radio Network Layer, Transport Network Layer, NAS or Protocol. |
| Unknown PLMN | The MME does not identify any PLMN provided by the eNB. |

**<<<<<< Next CHANGE >>>>>>**

### 9.3.4 Information Element Definitions

-- ASN1START

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

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-- Information Element Definitions

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

S1AP-IEs {

itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)

eps-Access (21) modules (3) s1ap (1) version1 (1) s1ap-IEs (2) }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

**<<<<<< UNAFFECTED PART SKIPPED >>>>>>**

Cause ::= CHOICE {

radioNetwork CauseRadioNetwork,

transport CauseTransport,

nas CauseNas,

protocol CauseProtocol,

misc CauseMisc,

...

}

CauseMisc ::= ENUMERATED {

control-processing-overload,

not-enough-user-plane-processing-resources,

hardware-failure,

om-intervention,

unspecified,

unknown-PLMN,

...

}

CauseProtocol ::= 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,

...

}

CauseRadioNetwork ::= ENUMERATED {

unspecified,

tx2relocoverall-expiry,

successful-handover,

release-due-to-eutran-generated-reason,

handover-cancelled,

partial-handover,

ho-failure-in-target-EPC-eNB-or-target-system,

ho-target-not-allowed,

tS1relocoverall-expiry,

tS1relocprep-expiry,

cell-not-available,

unknown-targetID,

no-radio-resources-available-in-target-cell,

unknown-mme-ue-s1ap-id,

unknown-enb-ue-s1ap-id,

unknown-pair-ue-s1ap-id,

handover-desirable-for-radio-reason,

time-critical-handover,

resource-optimisation-handover,

reduce-load-in-serving-cell,

user-inactivity,

radio-connection-with-ue-lost,

load-balancing-tau-required,

cs-fallback-triggered,

ue-not-available-for-ps-service,

radio-resources-not-available,

failure-in-radio-interface-procedure,

invalid-qos-combination,

interrat-redirection,

interaction-with-other-procedure,

unknown-E-RAB-ID,

multiple-E-RAB-ID-instances**,**

encryption-and-or-integrity-protection-algorithms-not-supported,

s1-intra-system-handover-triggered,

s1-inter-system-handover-triggered,

x2-handover-triggered,

...,

redirection-towards-1xRTT,

not-supported-QCI-value,

invalid-CSG-Id,

release-due-to-pre-emption,

n26-interface-not-available,

insufficient-ue-capabilities,

maximum-bearer-pre-emption-rate-exceeded,

up-integrity-protection-not-possible,

release-due-to-discontinuous-coverage

}

CauseTransport ::= ENUMERATED {

transport-resource-unavailable,

unspecified,

...

}

**<<<<<< END OF CHANGE >>>>>>**