**3GPP TSG-RAN WG2 Meeting #112-e  *draft\_R2-20010810***

**Online, 2nd - 13th November 2020**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *CR-Form-v12.0* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **36.300** | **CR** | **1298** | **rev** | **2** | **Current version:** | **15.11.0** |  |
|  | | | | | | | | |
| *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)*.* | | | | | | | | |
|  | | | | | | | | |

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

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | | | | |
| ***Title:*** | Clarification to UP-EDT | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Huawei, HiSilicon | | | | | | | | | |
| ***Source to TSG:*** | R2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NB\_IOTenh2-Core, LTE\_eMTC4-Core | | | | |  | ***Date:*** | | | 2020-11-xx |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **F** |  | | | | | ***Release:*** | | | Rel-15 |
|  | *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-9l (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) Rel-12 (Release 12)* *Rel-13 (Release 13) Rel-14 (Release 14) Rel-15 (Release 15) Rel-16 (Release 16)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | RAN2 has agreed that the EDT procedure terminates with the transmission of a HARQ ACK of MSG4 acknowledging the successful downlink transmission. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Capture in section 7.3b.3 that the procedure ends with the reception of the layer 1 ACK acknowledging the successful DL transmission.  **Impact analysis**  Impacted functionality:  UP-EDT  Inter-operability:  If the UE is implemented according to the CR and the NW is not, then the UE may not send a RLC STATUS and the NW concludes that the DL data were not successfully delivered.  If the NW is implemented according to the CR and the UE is not, there is no interoperability issue. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | The specification is incomplete. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 7.3b.3 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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:*** | |  | | | | | | | | |

### 7.3b.3 EDT for User Plane CIoT EPS optimizations

EDT for User Plane CIoT EPS optimizations, as defined in TS 24.301 [20], is characterized as below:

- The UE has been provided with a *NextHopChainingCount* in the *RRCConnectionRelease* message with suspend indication;

- Uplink user data are transmitted on DTCH multiplexed with UL *RRCConnectionResumeRequest* message on CCCH;

- Downlink user data are optionally transmitted on DTCH multiplexed with DL *RRCConnectionRelease* message on DCCH;

- The short resume MAC-I is reused as the authentication token for *RRCConnectionResumeRequest* message and is calculated using the integrity key from the previous connection;

- The user data in uplink and downlink are ciphered. The keys are derived using the *NextHopChainingCount* provided in the *RRCConnectionRelease* message of the previous RRC connection;

- The *RRCConnectionRelease* message is integrity protected and ciphered using the newly derived keys;

- There is no transition to RRC CONNECTED.

The EDT procedure for User Plane CIoT EPS optimizations is illustrated in Figure 7.3b-2.



Figure 7.3b-2: EDT for User Plane CIoT EPS Optimizations

0. Upon connection resumption request for Mobile Originated data from the upper layers, the UE initiates the early data transmission procedure and selects a random access preamble configured for EDT.

1. The UE sends an *RRCConnectionResumeRequest* to the eNB, including its Resume ID, the establishment cause, and an authentication token. The UE resumes all SRBs and DRBs, derives new security keys using the *NextHopChainingCount* provided in the *RRCConnectionRelease* message of the previous connection and re-establishes the AS security. The user data are ciphered and transmitted on DTCH multiplexed with the *RRCConnectionResumeRequest* message on CCCH.

2. The eNB initiates the S1-AP Context Resume procedure to resume the S1 connection and re-activate the S1-U bearers.

3. The MME requests the S-GW to re-activate the S1-U bearers for the UE.

4. The MME confirms the UE context resumption to the eNB.

5. The uplink data are delivered to the S-GW.

6. If downlink data are available, the S-GW sends the downlink data to the eNB.

7. If no further data are expected from the S-GW, the eNB can initiate the suspension of the S1 connection and the deactivation of the S1-U bearers.

8. The eNB sends the *RRCConnectionRelease* message to keep the UE in RRC\_IDLE. The message includes the *releaseCause* set to *rrc-Suspend*, the *resumeID,* the *NextHopChainingCount* and *drb-ContinueROHC* which are stored by the UE. If downlink data were received in step 6, they are sent ciphered on DTCH multiplexed with the *RRCConnectionRelease* message on DCCH. The procedure ends with the reception of the layer 1 ACK acknowledging the successful DL transmission.

NOTE 1: If the MME or eNB decides the UE to move in RRC\_CONNECTED mode, *RRCConnectionResume* message is sent in step 7 to fall back to the RRC Connection resume procedure. In that case, the *RRCConnectionResume* message is integrity protected and ciphered with the keys derived in step 1 and the UE ignores the *NextHopChainingCount* included in the *RRCConnectionResume* message. Downlink data can be transmitted on DTCH multiplexed with the *RRCConnectionResume* message. In addition, an *RRCConnectionSetup* can also be sent in step 7 to fall back to the RRC Connection establishment procedure.

NOTE 2: If neither *RRCConnectionRelease* nor, in case of fallback, *RRCConnectionResume* is received in response to *RRCConnectionResumeRequest* for EDT,the UE considers the UL data transmission not successful.

For EDT for User Plane CIoT EPS Optimizations, an RRC connection can also be resumed in an eNB (the new eNB) different from the one where the connection was suspended (the old eNB). Inter eNB connection resumption is handled using context fetching, whereby the new eNB retrieves the UE context from the old eNB over the X2 interface. The new eNB provides the Resume ID which is used by the old eNB to identify the UE context. This is illustrated in Figure 7.3b-3.



Figure: 7.3b-3: EDT for User Plane CIoT EPS Optimizations in different eNB

1. Same as step 1 in the intra eNB connection resumption.

2. The new eNB locates the old eNB using the Resume ID and retrieves the UE context by means of the X2-AP Retrieve UE Context procedure.

3. The old eNB responds with the UE context associated with the Resume ID.

4. The new eNB initiates the S1-AP Path Switch procedure to establish a S1 UE associated signalling connection to the serving MME and to request the MME to resume the UE context.

5. The MME requests the S-GW to activate the S1-U bearers for the UE and updates the downlink path.

6. MME Acks step 5.

7. After the S1-AP Path Switch procedure the new eNB triggers release of the UE context at the old eNB by means of the X2-AP UE Context Release procedure.

8. Same as step 5 in the intra eNB connection resumption.

9. Same as step 6 in the intra eNB connection resumption.

10. Same as step 7 in the intra eNB connection resumption.

11. Same as step 8 in the intra eNB connection resumption.

EDT for User Plane CIoT EPS optimizations, as defined in TS 24.301 [20], is characterized as below:

- The UE has been provided with a *NextHopChainingCount* in the *RRCConnectionRelease* message with suspend indication;

- Uplink user data are transmitted on DTCH multiplexed with UL *RRCConnectionResumeRequest* message on CCCH;

- Downlink user data are optionally transmitted on DTCH multiplexed with DL *RRCConnectionRelease* message on DCCH;

- The short resume MAC-I is reused as the authentication token for *RRCConnectionResumeRequest* message and is calculated using the integrity key from the previous connection;

- The user data in uplink and downlink are ciphered. The keys are derived using the *NextHopChainingCount* provided in the *RRCConnectionRelease* message of the previous RRC connection;

- The *RRCConnectionRelease* message is integrity protected and ciphered using the newly derived keys;

- There is no transition to RRC CONNECTED.

The EDT procedure for User Plane CIoT EPS optimizations is illustrated in Figure 7.3b-2.



Figure 7.3b-2: EDT for User Plane CIoT EPS Optimizations

0. Upon connection resumption request for Mobile Originated data from the upper layers, the UE initiates the early data transmission procedure and selects a random access preamble configured for EDT.

1. The UE sends an *RRCConnectionResumeRequest* to the eNB, including its Resume ID, the establishment cause, and an authentication token. The UE resumes all SRBs and DRBs, derives new security keys using the *NextHopChainingCount* provided in the *RRCConnectionRelease* message of the previous connection and re-establishes the AS security. The user data are ciphered and transmitted on DTCH multiplexed with the *RRCConnectionResumeRequest* message on CCCH.

2. The eNB initiates the S1-AP Context Resume procedure to resume the S1 connection and re-activate the S1-U bearers.

3. The MME requests the S-GW to re-activate the S1-U bearers for the UE.

4. The MME confirms the UE context resumption to the eNB.

5. The uplink data are delivered to the S-GW.

6. If downlink data are available, the S-GW sends the downlink data to the eNB.

7. If no further data are expected from the S-GW, the eNB can initiate the suspension of the S1 connection and the deactivation of the S1-U bearers.

8. The eNB sends the *RRCConnectionRelease* message to keep the UE in RRC\_IDLE. The message includes the *releaseCause* set to *rrc-Suspend*, the *resumeID,* the *NextHopChainingCount* and *drb-ContinueROHC* which are stored by the UE. If downlink data were received in step 6, they are sent ciphered on DTCH multiplexed with the *RRCConnectionRelease* message on DCCH.

NOTE 1: If the MME or eNB decides the UE to move in RRC\_CONNECTED mode, *RRCConnectionResume* message is sent in step 7 to fall back to the RRC Connection resume procedure. In that case, the *RRCConnectionResume* message is integrity protected and ciphered with the keys derived in step 1 and the UE ignores the *NextHopChainingCount* included in the *RRCConnectionResume* message. Downlink data can be transmitted on DTCH multiplexed with the *RRCConnectionResume* message. In addition, an *RRCConnectionSetup* can also be sent in step 7 to fall back to the RRC Connection establishment procedure.

NOTE 2: If neither *RRCConnectionRelease* nor, in case of fallback, *RRCConnectionResume* is received in response to *RRCConnectionResumeRequest* for EDT,the UE considers the UL data transmission not successful.

For EDT for User Plane CIoT EPS Optimizations, an RRC connection can also be resumed in an eNB (the new eNB) different from the one where the connection was suspended (the old eNB). Inter eNB connection resumption is handled using context fetching, whereby the new eNB retrieves the UE context from the old eNB over the X2 interface. The new eNB provides the Resume ID which is used by the old eNB to identify the UE context. This is illustrated in Figure 7.3b-3.



Figure: 7.3b-3: EDT for User Plane CIoT EPS Optimizations in different eNB

1. Same as step 1 in the intra eNB connection resumption.

2. The new eNB locates the old eNB using the Resume ID and retrieves the UE context by means of the X2-AP Retrieve UE Context procedure.

3. The old eNB responds with the UE context associated with the Resume ID.

4. The new eNB initiates the S1-AP Path Switch procedure to establish a S1 UE associated signalling connection to the serving MME and to request the MME to resume the UE context.

5. The MME requests the S-GW to activate the S1-U bearers for the UE and updates the downlink path.

6. MME Acks step 5.

7. After the S1-AP Path Switch procedure the new eNB triggers release of the UE context at the old eNB by means of the X2-AP UE Context Release procedure.

8. Same as step 5 in the intra eNB connection resumption.

9. Same as step 6 in the intra eNB connection resumption.

10. Same as step 7 in the intra eNB connection resumption.

11. Same as step 8 in the intra eNB connection resumption.