**3GPP TSG-RAN3 #115-e R3-221912**

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Title: (TP for TS 38.413): Impacts on RAN of AN Release of L2 U2N Relay UE

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1. Introduction

In this contribution, one cross-layer issue for L2 U2N relay will be discussed that is the RAN impact of AN release of relay UE.

1. Discussion

According to the description in [1], the AN release procedure is as below:



Figure-1 AN Release procedure

The initiation of AN release may be due to:

* **(R)AN-initiated** with cause e.g. O&M Intervention, Unspecified Failure, (R)AN (e.g. Radio) Link Failure, User Inactivity, Inter-System Redirection, request for establishment of QoS Flow for IMS voice, Release due to UE generated signalling connection release, mobility restriction, Release Assistance Information (RAI) from the UE, etc.; or
* **AMF-initiated** with cause e.g. Unspecified Failure, etc.

Regarding to the (R)AN-initiated AN release, the corresponding description in [2] is as below:

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| **8.3.2 UE Context Release Request (NG-RAN node initiated)**  **8.3.2.1 General**  The purpose of the UE Context Release Request procedure is to enable the NG-RAN node to request the AMF to release the UE-associated logical NG-connection due to NG-RAN node generated reasons. The procedure uses UE-associated signalling.  **8.3.2.2 Successful Operation**    Figure 8.3.2.2-1: UE context release request  The NG-RAN node controlling a UE-associated logical NG-connection initiates the procedure by sending a UE CONTEXT RELEASE REQUEST message towards the affected AMF.  The UE CONTEXT RELEASE REQUEST message shall indicate the appropriate cause value, e.g., "TXnRELOCOverall Expiry", "Redirection", for the requested UE-associated logical NG-connection release.  ……  **9.2.2.4 UE CONTEXT RELEASE REQUEST**  This message is sent by the NG-RAN node to request the release of the UE-associated logical NG-connection over the NG interface.  Direction: NG-RAN node → AMF   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality | | Message Type | M |  | 9.3.1.1 |  | YES | ignore | | AMF UE NGAP ID | M |  | 9.3.3.1 |  | YES | reject | | RAN UE NGAP ID | M |  | 9.3.3.2 |  | YES | reject | | **PDU Session Resource List** |  | *0..1* |  |  | YES | reject | | **>PDU Session Resource Item** |  | *1..<maxnoofPDUSessions>* |  |  | - |  | | >>PDU Session ID | M |  | 9.3.1.50 |  | - |  | | Cause | M |  | 9.3.1.2 |  | YES | ignore |   ……  9.3.1.2 Cause  The purpose of the *Cause* IE is to indicate the reason for a particular event for the NGAP protocol.   |  |  |  |  |  | | --- | --- | --- | --- | --- | | IE/Group Name | Presence | Range | IE type and reference | Semantics description | | CHOICE *Cause Group* | M |  |  |  | | >*Radio Network Layer* |  |  |  |  | | >>Radio Network Layer Cause | M |  | ……  User inactivity,  …… |  |  |  |  | | --- | --- | | User inactivity | The action is requested due to user inactivity on all PDU sessions, e.g., NG is requested to be released in order to optimise the radio resources. |   **8.3.3.2 Successful Operation**    Figure 8.3.3.2-1: UE context release: successful operation  ……  Upon reception of the UE CONTEXT RELEASE COMMAND message, the NG-RAN node shall release all related signalling and user data transport resources and reply with the UE CONTEXT RELEASE COMPLETE message. |

Based on the above description in [2], it is obvious that:

**Observation 1: For a UE, when there is no data transmission/reception requirement on all its PDU sessions, NG-RAN can initiate the UE context release procedure. Once receiving the UE context release command from AMF, NG-RAN will release all related signalling and user data transport resources of the UE.**

For L2 U2N relay UE, the UP protocol stack is as below. According to the UP protocol, for L2 U2N relay, the relay UE’s PDU session(s) is different from the remote UE’s PDU session(s).



Figure-2 UP protocol stack of L2 U2N relay

**Observation 2: For L2 U2N relay, the PDU sessions of relay UE and remote UE are different.**

Based on the above observation 1 and observation 2, the issue is that if relay UE is only used for remote UE data forwarding and relay UE itself has no data transmission/reception requirement on its own all PDU sessions, according to the current TS 38.413, whether the (R)AN-initiated AN release should be initiated? Based on the definition of user inactivity in TS 38.413, it is unclear whether the all PDU sessions refers all PDU sessions of relay UE itself or all PDU sessions including relay UE and its connected remote UEs.

|  |  |
| --- | --- |
| User inactivity | The action is requested due to user inactivity on all PDU sessions, e.g., NG is requested to be released in order to optimise the radio resources. |

If “all the PDU session” refers to all the PDU sessions including relay UE itself and its connected remote UE, (R)AN-initiated AN release will not be initiated at least one remote UE has data transmission/reception requirement on any PDU session.

If “all the PDU session” refers to all the PDU sessions of relay UE itself, (R)AN-initiated AN release should not be initiated if relay UE is only used for remote UE’s data forwarding. Otherwise, the RRC connection of relay UE will be lost which will impact the remote UE’s data forwarding.

In our view, it had better clarify that in case of L2 U2N relay, all PDU sessions in the definition of user inactivity should include the PDU sessions of both relay UE and its served remote UE.

**Proposal 1: For L2 U2N relay UE, only when user inactivity on all the PDU sessions of the relay UE itself and its served remote UE(s) happens, the NG-RAN can initiate the UE CONTEXT RELEASE procedure for it.**

1. Conclusion

**Observation 1: For a UE, when there is no data transmission/reception requirement on all its PDU sessions, NG-RAN can initiate the UE context release procedure. Once receiving the UE context release command from AMF, NG-RAN will release all related signalling and user data transport resources of the UE.**

**Observation 2: For L2 U2N relay, the PDU sessions of relay UE and remote UE are different.**

**Proposal 1: For L2 U2N relay UE, only when user inactivity on all the PDU sessions of the relay UE itself and its served remote UE(s) happens, the NG-RAN can initiate the UE CONTEXT RELEASE procedure for it.**

1. Reference

[1] TS23.502, Procedures for the 5G System (5GS).

[2] TS38.413, NG Application Protocol (NGAP).

1. Text Proposal for 38.413

### 8.3.2 UE Context Release Request (NG-RAN node initiated)

#### 8.3.2.1 General

The purpose of the UE Context Release Request procedure is to enable the NG-RAN node to request the AMF to release the UE-associated logical NG-connection due to NG-RAN node generated reasons. The procedure uses UE-associated signalling.

#### 8.3.2.2 Successful Operation



Figure 8.3.2.2-1: UE context release request

The NG-RAN node controlling a UE-associated logical NG-connection initiates the procedure by sending a UE CONTEXT RELEASE REQUEST message towards the affected AMF.

The UE CONTEXT RELEASE REQUEST message shall indicate the appropriate cause value, e.g., "TXnRELOCOverall Expiry", "Redirection", for the requested UE-associated logical NG-connection release.

If the *PDU Session Resource List* IE is included in the UE CONTEXT RELEASE REQUEST message, the AMF shall handle this information as specified in TS 23.502 [10].

For L2 U2N relay, the UE Context Release procedure should be initiated when both L2 U2N relay UE and it served remote UE are user inactivity on all PDU sessions.

**Interactions with UE Context Release procedure:**

The UE Context Release procedure should be initiated upon reception of a UE CONTEXT RELEASE REQUEST message. If the UE was configured with DC radio resources at the time UE Context Release Request procedure was triggered, and the PSCell information was available, the NG-RAN node shall store the PSCell information in the UE context.