**3GPP T****SG-RAN WG3 Meeting #127bis R3-252336**

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**Agenda Item: 16.2**

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**Title: [TP to TS 38.413 BL CR] Interface management**

**Document for: Discussions & Approval**

# 1 Introduction

This TP follows online and offline discussions on Agenda Item 16.2 and is inspired by content of documents R3-251603 and R3-252057.

# 2 Text Proposal

<<<<<<<<<<<<<<<<<<<< First Change >>>>>>>>>>>>>>>>>>>>

## 8.7 Interface Management Procedures

### 8.7.1 NG Setup

#### 8.7.1.1 General

The purpose of the NG Setup procedure is to exchange application level data needed for the NG-RAN node and the AMF to correctly interoperate on the NG-C interface. This procedure shall be the first NGAP procedure triggered after the TNL association has become operational. The procedure uses non-UE associated signalling.

This procedure erases any existing application level configuration data in the two nodes, replaces it by the one received and clears AMF overload state information at the NG-RAN node. If the NG-RAN node and AMF do not agree on retaining the UE contexts this procedure also re-initialises the NGAP UE-related contexts (if any) and erases all related signalling connections in the two nodes like an NG Reset procedure would do.

If the NG-RAN node supports A-IoT and is communicating directly with an AIOTF, as specified in TS 23.xxx [z], the NG Setup procedure is, as shown in Figures 8.7.1.2-1 and 8.7.1.3-1 and specified in the respective sections, is executed between the NG-RAN node and the AIOTF.

#### 8.7.1.2 Successful Operation



Figure 8.7.1.2-1: NG setup: successful operation

If the NG Reset procedure is executed between the NG-RAN node and the AMF:

- The NG-RAN node initiates the procedure by sending an NG SETUP REQUEST message including the appropriate data to the AMF. The AMF responds with an NG SETUP RESPONSE message including the appropriate data.

- If the *Configured TAC Indication* IE set to "true” is included for a Tracking Area contained in the *Supported TA List* IE in the NG SETUP REQUEST message, the AMF may take it into account to optimise NG-C signalling towards this NG-RAN node.

- If the *UE Retention Information* IE set to “ues-retained“ is included in the NG SETUP REQUEST message, the AMF may accept the proposal to retain the existing UE related contexts and signalling connections by including the *UE Retention Information* IE set to “ues-retained“ in the NG SETUP RESPONSE message.

- If the AMF supports IAB, the AMF shall include the *IAB Supported* IE in the NG SETUP RESPONSE message. If the *IAB Supported* IE is included in the NG SETUP RESPONSE message, the NG-RAN node shall, if supported, store this information and use it for further AMF selection for the IAB-MT.

- The AMF shall include the *Backup AMF Name* IE, if available, in the *Served GUAMI List* IE in the NG SETUP -RESPONSE message. The NG-RAN node shall, if supported, consider the AMF as indicated by the *Backup AMF Name* IE when performing AMF reselection, as specified in TS 23.501 [9].

- If the *GUAMI Type* IE is included in the NG SETUP RESPONSE message, the NG-RAN node shall store the received value and use it for further AMF selection as defined in TS 23.501 [9].

- If the *RAN Node Name* IE is included in the NG SETUP REQUEST message, the AMF may use this IE as a human readable name of the NG-RAN node. If the *Extended RAN Node Name* IE is included in the NG SETUP REQUEST message, the AMF may use this IE as a human readable name of the NG-RAN node and shall ignore the *RAN Node Name* IE if also included.

- If the *Extended AMF Name* IE is included in the NG SETUP RESPONSE message, the NG-RAN node may use this IE as a human readable name of the AMF and shall ignore the *AMF Name* IE.

- If the *NB-IoT Default Paging DRX* IE is included in the NG SETUP REQUEST message, the AMF shall take it into account for paging.

- If the *RAT Information* IE is included in the NG SETUP REQUEST message, the AMF shall handle this information as specified in TS 23.502 [10].

- If the *NID* IE within the *NPN Support* IE is included within a *Broadcast PLMN Item* IE in the NG SETUP REQUEST message, the AMF shall consider that the NG-RAN node supports the indicated S-NSSAI(s) for the corresponding tracking area code for the SNPN identified by the *PLMN Identity* IE and the *NID* IE.

- If the *NID* IE within the *NPN Support* IE is included within a *PLMN Support Item* IE in the NG SETUP RESPONSE message, the NG-RAN node shall consider that the AMF supports the SNPN identified by the *PLMN Identity* IE and the *NID* IE.

- If the *Onboarding Support* IE is also included within the same *PLMN Support Item* IE, the NG-RAN node shall, if supported, consider that the AMF supports UE onboarding for the identified SNPN, as specified in TS 23.501 [9].

- If the *TAI NSAG Support List* IE is included in the *Broadcast PLMN Item* IE in the NG SETUP REQUEST message, the AMF shall, if supported, use this information as specified in TS 23.501 [9].

- If the AMF supports mobile IAB, the AMF shall include the *Mobile IAB Supported* IE in the NG SETUP RESPONSE message. If the *Mobile IAB Supported* IE is included in the NG SETUP RESPONSE message, the NG-RAN node shall, if supported, store this information and further use it for AMF selection for the mobile IAB-MT.

If the NG Setup procedure is executed between the NG-RAN node and the AIOTF:

- The NG-RAN node initiates the procedure by sending an NG SETUP REQUEST message including the appropriate data to the AIOTF. The AIOTF responds with an NG SETUP RESPONSE message including the appropriate data.

If the NG Setup procedure is triggered by an NG-RAN node supporting A-IoT:

Editor’s Note: content of RAN Configuration Update related messages for A-IoT FFS

#### 8.7.1.3 Unsuccessful Operation



Figure 8.7.1.3-1: NG setup: unsuccessful operation

If the AMF cannot accept the setup, it should respond with an NG SETUP FAILURE message and appropriate cause value.

If the NG SETUP FAILURE message includes the *Time to Wait* IE, the NG-RAN node shall wait at least for the indicated time before reinitiating the NG Setup procedure towards the same AMF.

If the NG Setup procedure is executed between an NG-RAN node and an AIOTF the specification text above concerning the AMF applies for the AIOTF.

#### 8.7.1.4 Abnormal Conditions

If the AMF does not identify any of the PLMNs/SNPNs indicated in the NG SETUP REQUEST message, it shall reject the NG Setup procedure with an appropriate cause value.

If none of the RATs indicated by the NG-RAN node in the NG SETUP REQUEST message is supported by the AMF, then the AMF shall fail the NG Setup procedure with an appropriate cause value.

If the NG Setup procedure is executed between an NG-RAN node and an AIOTF the specification text above concerning the AMF applies for the AIOTF.

### 8.7.2 RAN Configuration Update

#### 8.7.2.1 General

The purpose of the RAN Configuration Update procedure is to update application level configuration data needed for the NG-RAN node and the AMF to interoperate correctly on the NG-C interface. This procedure does not affect existing UE-related contexts, if any. The procedure uses non UE-associated signalling.

If the NG-RAN node supports A-IoT and is communicating directly with an AIOTF, as specified in TS 23.xxx [z], the RAN Configuration Update procedure is, as shown in Figures 8.7.2.2-1 and 8.7.2.3-1 and specified in the respective sections, is executed between the NG-RAN node and the AIOTF.

#### 8.7.2.2 Successful Operation



Figure 8.7.2.2-1: RAN configuration update: successful operation

If the NG Reset procedure is executed between the NG-RAN node and the AMF:

- The NG-RAN node initiates the procedure by sending a RAN CONFIGURATION UPDATE message to the AMF including an appropriate set of updated configuration data that it has just taken into operational use. The AMF responds with a RAN CONFIGURATION UPDATE ACKNOWLEDGE message to acknowledge that it successfully updated the configuration data. If an information element is not included in the RAN CONFIGURATION UPDATE message, the AMF shall interpret that the corresponding configuration data is not changed and shall continue to operate the NG-C interface with the existing related configuration data.

- If the *Supported TA List* IE is included in the RAN CONFIGURATION UPDATE message, the AMF shall overwrite the whole list of supported TAs and the corresponding list of supported slices for each TA, and use them for subsequent registration area management of the UE.

- If the *Configured TAC Indication* IE set to "true” is included for a Tracking Area contained in the *Supported TA List* IE in the RAN CONFIGURATION UPDATE message, the AMF may take it into account to optimise NG-C signalling towards this NG-RAN node.

- If the *Global RAN Node ID* IE is included in the RAN CONFIGURATION UPDATE message, the AMF shall associate the TNLA to the NG-C interface instance using the Global RAN Node ID.

- If the RAN CONFIGURATION UPDATE message includes the *NG-RAN TNL Association to Remove List* IE, the AMF shall, if supported, initiate removal of the TNL association(s) indicated by NG-RAN TNL endpoint(s) and AMF TNL endpoint(s) if the *TNL Association Transport Layer Address at AMF* IE is present, or the TNL association(s) indicated by NG-RAN TNL endpoint(s) if the *TNL Association Transport Layer Address at AMF* IE is absent:

- if the received *TNL Association Transport Layer Address* IE includes the *Port Number* IE, the NG-RAN TNL endpoint is identified by the *Endpoint IP Address* IE and the *Port Number* IE. Otherwise, the NG-RAN TNL endpoints correspond to all NG-RAN TNL endpoints identified by the *Endpoint IP Address* IE and any port number(s).

- if the received *TNL Association Transport Layer Address at AMF* IE includes the *Port Number* IE, the AMF TNL endpoint is identified by the *Endpoint IP Address* IE and the *Port Number* IE. Otherwise, the AMF TNL endpoints correspond to all AMF TNL endpoints identified by the *Endpoint IP Address* IE and any port number(s).

- If the RAN CONFIGURATION UPDATE message includes the *RAN Node Name* IE, the AMF may store it or update this IE value if already stored, and use it as a human readable name of the NG-RAN node. If the RAN CONFIGURATION UPDATE message includes the *Extended RAN Node Name* IE, the AMF may store it or update this IE value if already stored, and use it as a human readable name of the NG-RAN node and shall ignore the *RAN Node Name* IE if also included.

- If the *NB-IoT Default Paging DRX* IE is included in the RAN CONFIGURATION UPDATE message, the AMF shall overwrite any previously stored NB-IoT default paging DRX value for the NG-RAN node.

- If the *RAT Information* IE is included in the RAN CONFIGURATION UPDATE message, the AMF shall handle this information as specified in TS 23.502 [10].

- If the *NID* IE within the *NPN Support* IE is included within a *Broadcast PLMN Item* IE in the RAN CONFIGURATION UPDATE message, the AMF shall consider that the NG-RAN node supports the indicated S-NSSAI(s) for the corresponding tracking area code for the SNPN identified by the *PLMN Identity* IE and the *NID* IE.

- If the *TAI NSAG Support List* IE is included in the *Broadcast PLMN Item* IE in the RAN CONFIGURATION UPDATE message, the AMF shall, if supported, use this information as specified in TS 23.501 [9].

If the RAN Configuration Update procedure is executed between the NG-RAN node and the AIOTF:

- The NG-RAN node initiates the procedure by sending a RAN CONFIGURATION UPDATE message to the AIOTF including an appropriate set of updated configuration data that it has just taken into operational use. The AMF responds with a RAN CONFIGURATION UPDATE ACKNOWLEDGE message to acknowledge that it successfully updated the configuration data. If an information element is not included in the RAN CONFIGURATION UPDATE message, the AIOTF shall interpret that the corresponding configuration data is not changed and shall continue to operate the NG-C interface with the existing related configuration data.

If the RAN Configuration Update procedure is triggered by an NG-RAN node supporting A-IoT:

Editor’s Note: content of RAN Configuration Update related messages for A-IoT FFS

#### 8.7.2.3 Unsuccessful Operation



Figure 8.7.2.3-1: RAN configuration update: unsuccessful operation

If the AMF cannot accept the update, it shall respond with a RAN CONFIGURATION UPDATE FAILURE message and appropriate cause value.

If the *Time to Wait* IE is included in the RAN CONFIGURATION UPDATE FAILURE message, the NG-RAN node shall wait at least for the indicated time before reinitiating the RAN Configuration Update procedure towards the same AMF.

If the RAN Configuration Update procedure is executed between an NG-RAN node and an AIOTF the specification text above concerning the AMF applies for the AIOTF.

#### 8.7.2.4 Abnormal Conditions

If the NG-RAN node, after initiating the RAN Configuration Update procedure, receives neither a RAN CONFIGURATION UPDATE ACKOWLEDGE nor a RAN CONFIGURATION UPDATE FAILURE message, the NG-RAN node may reinitiate a further RAN Configuration Update procedure towards the same AMF, provided that the content of the new RAN CONFIGURATION UPDATE message is identical to the content of the previously unacknowledged RAN CONFIGURATION UPDATE message.

If the RAN Configuration Update procedure is executed between an NG-RAN node and an AIOTF the specification text above concerning the AMF applies for the AIOTF.

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### 8.7.4 NG Reset

#### 8.7.4.1 General

The purpose of the NG Reset procedure is to initialise or re-initialise the RAN, or part of RAN NGAP UE-related contexts, in the event of a failure in the 5GC or vice versa. This procedure does not affect the application level configuration data exchanged during, e.g., the NG Setup procedure. The procedure uses non-UE associated signalling.

If the NG-RAN node supports A-IoT and is communicating directly with an AIOTF, as specified in TS 23.xxx [z], the NG Reset procedure is, as shown in Figures 8.7.4.2.1-1 and 8.7.4.2.2-1 and specified in the respective sections, is executed between the NG-RAN node and the AIOTF.

#### 8.7.4.2 Successful Operation

##### 8.7.4.2.1 NG Reset initiated by the AMF



Figure 8.7.4.2.1-1: NG reset initiated by the AMF: successful operation

If the NG Reset procedure is executed between the NG-RAN node and the AMF:

- In the event of a failure at the AMF which has resulted in the loss of some or all transaction reference information, an NG RESET message shall be sent to the NG-RAN node.

If the NG Reset procedure is executed between the NG-RAN node and the AIOTF:

- In the event of a failure at the AIOTF which has resulted in the loss of some or all transaction reference information, an NG RESET message shall be sent to the NG-RAN node.

At reception of the NG RESET message the NG-RAN node shall release all allocated resources on NG and Uu related to the UE association(s) indicated explicitly or implicitly in the NG RESET message and remove the indicated UE contexts including NGAP ID.

After the NG-RAN node has released all assigned NG resources and the UE NGAP IDs for all indicated UE associations which can be used for new UE-associated logical NG-connections over the NG interface, the NG-RAN node shall respond with the NG RESET ACKNOWLEDGE message. The NG-RAN node does not need to wait for the release of radio resources to be completed before returning the NG RESET ACKNOWLEDGE message.

If the NG RESET message contains the *UE-associated Logical NG-connection List* IE, then:

- The NG-RAN node shall use the *AMF UE NGAP ID* IE and/or the *RAN UE NGAP ID* IE to explicitly identify the UE association(s) to be reset.

- The NG-RAN node shall include in the NG RESET ACKNOWLEDGE message, for each UE association to be reset, the *UE-associated Logical NG-connection Item* IE in the *UE-associated Logical NG-connection List* IE. The *UE-associated Logical NG-connection Item* IEs shall be in the same order as received in the NG RESET message and shall include also unknown UE-associated logical NG-connections. Empty *UE-associated Logical NG-connection Item* IEs, received in the NG RESET message, may be omitted in the NG RESET ACKNOWLEDGE message.

- If the *AMF UE NGAP ID* IE is included in the *UE-associated Logical NG-connection Item* IE for a UE association, the NG-RAN node shall include the *AMF UE NGAP ID* IE in the corresponding *UE-associated Logical NG-connection Item* IE in the NG RESET ACKNOWLEDGE message.

- If the *RAN UE NGAP ID* IE is included in the *UE-associated Logical NG-connection Item* IE for a UE association, the NG-RAN node shall include the *RAN UE NGAP ID* IE in the corresponding *UE-associated Logical NG-connection Item* IE in the NG RESET ACKNOWLEDGE message.

**Interactions with other procedures:**

If the NG RESET message is received, any other ongoing procedure (except for another NG Reset procedure) on the same NG interface related to a UE association, indicated explicitly or implicitly in the NG RESET message, shall be aborted.

##### 8.7.4.2.2 NG Reset initiated by the NG-RAN node



Figure 8.7.4.2.2-1: NG reset initiated by the NG-RAN node: successful operation

If the NG Reset procedure is executed between the NG-RAN node and the AMF:

- In the event of a failure at the NG-RAN node which has resulted in the loss of some or all transaction reference information, an NG RESET message shall be sent to the AMF.

- At reception of the NG RESET message the AMF shall release all allocated resources on NG related to the UE association(s) indicated explicitly or implicitly in the NG RESET message and remove the NGAP ID for the indicated UE associations.

If the NG Reset procedure is executed between the NG-RAN node and the AIOTF:

- At reception of the NG RESET message the AIOTF shall release all allocated NG resources.

After the AMF has released all assigned NG resources and the UE NGAP IDs for all indicated UE associations which can be used for new UE-associated logical NG-connections over the NG interface, the AMF shall respond with the NG RESET ACKNOWLEDGE message.

If the NG RESET message contains the *UE-associated Logical NG-connection List* IE, then:

- The AMF shall use the *AMF UE NGAP ID* IE and/or the *RAN UE NGAP ID* IE to explicitly identify the UE association(s) to be reset.

- The AMF shall include in the NG RESET ACKNOWLEDGE message, for each UE association to be reset, the *UE-associated Logical NG-connection Item* IE in the *UE-associated Logical NG-connection List* IE. The *UE-associated Logical NG-connection Item* IEs shall be in the same order as received in the NG RESET message and shall include also unknown UE-associated logical NG-connections. Empty *UE-associated Logical NG-connection Item* IEs, received in the NG RESET message, may be omitted in the NG RESET ACKNOWLEDGE message.

- If the *AMF UE NGAP ID* IE is included in the *UE-associated Logical NG-connection Item* IE for a UE association, the AMF shall include the *AMF UE NGAP ID* IE in the corresponding *UE-associated Logical NG-connection Item* IE in the NG RESET ACKNOWLEDGE message.

- If the *RAN UE NGAP ID* IE is included in a *UE-associated Logical NG-connection Item* IE for a UE association, the AMF shall include the *RAN UE NGAP ID* IE in the corresponding *UE-associated Logical NG-connection Item* IE in the NG RESET ACKNOWLEDGE message.

**Interactions with other procedures:**

If the NG RESET message is received, any other ongoing procedure (except for another NG Reset procedure) on the same NG interface related to a UE association, indicated explicitly or implicitly in the NG RESET message, shall be aborted.

#### 8.7.4.3 Unsuccessful Operation

Not applicable.

#### 8.7.4.4 Abnormal Conditions

##### 8.7.4.4.1 Abnormal Condition at the 5GC

If the NG RESET message includes the *UE-associated Logical NG-connection List* IE, but neither the *AMF UE NGAP ID* IE nor the *RAN UE NGAP ID* IE is present for a *UE-associated Logical NG-connection Item* IE, then the AMF shall ignore the *UE-associated Logical NG-connection Item* IE. The AMF may return the empty *UE-associated Logical NG-connection Item* IE in the *UE-associated Logical NG-connection List* IE in the NG RESET ACKNOWLEDGE message.

##### 8.7.4.4.2 Abnormal Condition at the NG-RAN

If the NG RESET message includes the *UE-associated Logical NG-connection List* IE, but neither the *AMF UE NGAP ID* IE nor the *RAN UE NGAP ID* IE is present for a *UE-associated Logical NG-connection Item* IE, then the NG-RAN node shall ignore the *UE-associated Logical NG-connection Item* IE. The NG-RAN node may return the empty *UE-associated Logical NG-connection Item* IE in the *UE-associated Logical NG-connection List* IE in the NG RESET ACKNOWLEDGE message.

##### 8.7.4.4.3 Crossing of NG RESET Messages

If an NG Reset procedure is ongoing in the NG-RAN node and the NG-RAN node receives an NG RESET message from the peer entity on the same NG interface related to one or several UE associations previously requested to be reset, indicated explicitly or implicitly in the received NG RESET message, the NG-RAN node shall respond with the NG RESET ACKNOWLEDGE message as described in 8.7.4.2.1.

If an NG Reset procedure is ongoing in the AMF and the AMF receives an NG RESET message from the peer entity on the same NG interface related to one or several UE associations previously requested to be reset, indicated explicitly or implicitly in the received NG RESET message, the AMF shall respond with the NG RESET ACKNOWLEDGE message as described in 8.7.4.2.2.

If an NG Reset procedure is ongoing in the AIOTF and the AIOTF receives an NG RESET message from the peer entity on the same NG interface, the AIOTF shall respond with the NG RESET ACKNOWLEDGE message as described in 8.7.4.2.2.

### 8.7.5 Error Indication

#### 8.7.5.1 General

The Error Indication procedure is initiated by a node in order to report detected errors in one incoming message, provided they cannot be reported by an appropriate failure message.

If the error situation arises due to reception of a message utilising UE-associated signalling, then the Error Indication procedure uses UE-associated signalling. Otherwise the procedure uses non-UE associated signalling.

If the NG-RAN node supports A-IoT and is communicating directly with an AIOTF, as specified in TS 23.xxx [z], the Error Indication procedure is, as shown in Figures 8.7.5.2.1-1 and 8.7.5.2.2-1 and specified in the respective sections, is executed between the NG-RAN node and the AIOTF.

#### 8.7.5.2 Successful Operation



Figure 8.7.5.2-1: Error indication initiated by the AMF



Figure 8.7.5.2-2: Error indication initiated by the NG-RAN node

When the conditions defined in clause 10 are fulfilled, the Error Indication procedure is initiated by an ERROR INDICATION message sent from the receiving node.

The ERROR INDICATION message shall contain at least either the *Cause* IE or the *Criticality Diagnostics* IE. In case the Error Indication procedure is triggered by utilising UE-associated signalling the *AMF UE NGAP ID* IE and the *RAN UE NGAP ID* IE shall be included in the ERROR INDICATION message. If one or both of the *AMF UE NGAP ID* IE and the *RAN UE NGAP ID* IE are not correct, the cause shall be set to an appropriate value, e.g., "Unknown local UE NGAP ID" or "Inconsistent remote UE NGAP ID".

#### 8.7.5.3 Abnormal Conditions

Void.

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