

**Agenda Item:**

**source: Ericsson**

**Title: Abnormal Conditions and Unsuccessful Outcome of RANAP procedures**

**Document for: Decision**

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## **1 Introduction**

This contribution proposes some additions to the error handling on procedure level in [1].

## **2 Discussion**

The description of abnormal conditions and unsuccessful outcome is currently missing in [1] for some of the procedures and proposed with this document. The existing abnormal conditions in [1] are not affected. Some abnormal conditions for interactions between RANAP procedures are also presented.

The following timers, which are not previously specified in [1], are used in the description of the Abnormal conditions and unsuccessful outcome:

$T_{RELOCprep}$  (or  $T_{RELOCATION\ COMMAND}$  as in [1])

specifies the maximum time for Relocation Preparation in the source RNC, started at sending of RELOCATION REQUEST message and stopped at reception of either RELOCATION COMMAND or the RELOCATION PREPARATION FAILURE messages from the CN.

$T_{RELOCoverall}$

specifies the maximum time for the protection of overall Relocation procedure in the source RNC, started at reception of RELOCATION COMMAND message from the CN and stopped when the Iu Release procedure is initiated by the CN towards the source RNC or the source RNC detects that he acts again as the serving RNC.

$T_{RELOCalloc}$

specifies the maximum time for Relocation Resource Allocation in the CN, started at sending of RELOCATION REQUEST message and stopped at reception of either RELOCATION REQUEST ACKNOWLEDGE or the RELOCATION FAILURE messages from the target RNC.

$T_{RELOCcomplete}$

specifies the maximum time for waiting the Relocation Completion in the CN, started at sending of RELOCATION COMMAND message and stopped at reception of RELOCATION COMPLETE message from the target RNC.

### **2.1 Abnormal conditions**

### **2.1.1 Ref [1] 8.2.2 Relocation Preparation**

If the target RNC, which was indicated in the RELOCATION REQUIRED message, is not known to the CN node:

1. The CN node shall reject the Relocation by sending a RELOCATION PREPARATION FAILURE with a cause 'Unknown target RNC' to the source RNC.
2. The CN node shall continue to use the existing Iu connection towards the source RNC.

### **2.1.2 Ref [1] 8.2.3 Relocation Resource Allocation**

If after reception of the RELOCATION REQUEST message, the target RNC receives another RELOCATION REQUEST message on the same IU connection, then the later message will be discarded and the Relocation Resource Allocation continues normally.

If the RELOCATION REQUEST ACKNOWLEDGE message contains information which conflicts with the information in the request e.g. the RAB ID list is different, the CN shall reject the Relocation procedure as follows:

1. The CN node informs the source RNC that the Relocation procedure has been rejected by sending the RELOCATION PREPARATION FAILURE message with a cause 'Relocation rejected'.
2. The CN node shall release the Iu connection towards the target RNC that may already have been established by initiating the Iu Release procedure with a cause 'Relocation cancelled' (FFS).
3. The CN node shall continue to use the existing Iu interface towards the source RNC.
4. The CN node shall resume activation of suspended RANAP procedures, if any.
5. The CN node shall initiate the buffered RANAP procedures, if any.
6. If downlink Direct Transfer signaling has been suspended, the CN node shall resume sending of Direct Transfer signaling.
7. The CN node shall stop timer  $T_{RELOCalloc}$

### **2.1.3 Ref [1] 8.2.4 Relocation Detect**

If the RELOCATION DETECT message is not received at the CN from the target RNC before the reception of the RELOCATION COMPLETE message, the Relocation procedure shall continue normally. Generation of an alarm in the CN is an implementation option.

If CN is unable to switch the User Plane from the source to the target RNC at reception of the RELOCATION DETECT message, which indicates that the target RNC has switched to the new Iu interface. The CN node shall optionally either

- try the switch of the user plane again at reception of the RELOCATION COMPLETE message or
- terminate the Iu connection by initiating the Iu Release procedure with a cause 'User Plane error' towards the target RNC and towards the source RNC .

Note: The Relocation may be completed successfully for the other CN node and that Iu connection remains.

### **2.1.4 Ref [1] 8.2.5 Relocation Complete**

If the user plane is not already switched from the source to the target RNC and CN is unable to do that at reception of the RELOCATION COMPLETE message, which indicates that the target RNC has switched to the new Iu interface:

- The CN node shall terminate the Iu connection by initiating the Iu Release procedure with a cause 'User Plane error' towards the target RNC and towards the source RNC.

### **2.1.5 Ref [1] 8.3 RAB Assignment**

If the relocation becomes absolutely necessary during the RAB assignment in order to keep the communication with the UE, the RNC may initiate the Relocation procedure while the RAB assignment is in progress as follows:

1. The RNC shall terminate the RAB Assignment procedure unsuccessfully
  - for all queued RABs,
  - for RABs not already established or modified and
  - for RABs not already releasedwith the cause 'Relocation necessary'.
2. The RNC shall terminate the RAB Assignment procedure successfully
  - for RABs already established or modified but not yet reported to the CN and
  - for RABs already released but not yet reported to the CN.
3. The RNC shall report this outcome of the procedure in one RAB ASSIGNMENT RESPONSE message.
4. The RNC shall invoke relocation by sending the RELOCATION REQUIRED to the active CN node(s).
5. The CN node shall terminate the RAB Assignment procedure successfully at reception of the RAB ASSIGNMENT RESPONSE message.
6. At reception of the RELOCATION REQUIRED message, the CN node sends a RELOCATION REQUEST message to the target RNC containing
  - RABs already established before the RAB Assignment procedure and
  - RABs successfully established or modified with the RAB Assignment procedure prior the Relocation.

### **2.1.6 Ref [1] 8.5 Iu Release**

When the Relocation involves two CN nodes:

1. The source RNC shall expect that the Iu Release procedure is initiated by both CN nodes with a cause 'Relocation complete' after successful termination of the Relocation Preparation procedure.
2. The target RNC shall expect that the Iu Release procedure is initiated by both CN nodes with a cause 'Relocation cancelled' in case of the Relocation is terminated unsuccessfully but the Relocation Resource Allocation procedure was already executed successfully.

The target RNC shall not release the resources until both CN nodes instructs to do so with the Iu Release procedure or the Reset procedure is generated.

If the Iu Release procedure is not initiated towards the source RNC from one of the CN nodes before the expiry of timer  $T_{RELOCoverall}$ :

1. The source RNC shall release the dedicated radio resources for that UE towards both CN nodes.
2. The source RNC shall initiate the Iu Release Request procedure towards the CN node, which did not initiate the Iu Release procedure, with a cause "Radio Interface Message Failure". The terrestrial resource in the source RNC shall remain assigned until the Iu Release procedure is initiated by the CN.

## 2.2 Unsuccessful Outcome

### 2.2.1 Ref [1] 8.2.2 Relocation Preparation

If there is no response from one of the CN nodes to the RELOCATION REQUIRED message before timer  $T_{RELOCprep}$  expires in the source RNC:

1. The source RNC shall cancel the Relocation procedure by sending the RELOCATION CANCEL message to active CN node(s) with a cause 'Relocation Preparation Failure'.
2. The Relocation procedure is terminated at the source RNC at reception of the RELOCATION CANCEL ACKNOWLEDGE message from active CN node(s).

### 2.2.2 Ref [1] 8.2.3 Relocation Resource Allocation

If the CN node receives an IU RELEASE REQUEST message from the source RNC indicating that the Iu Connection shall be released before reception of the response message from the target RNC to the Relocation Resource Allocation:

1. The CN node shall stop timer  $T_{RELOCalloc}$ .
2. The CN node shall release the Iu connection towards the target RNC that may already have been established and towards the source RNC by initiating the Iu Release procedure with a cause 'Relocation cancelled'.

If the CN node receives a RELOCATION CANCEL message from the source RNC indicating that the Relocation procedure shall be cancelled before reception of the response message from the target RNC to the Relocation Resource Allocation:

1. The CN node shall stop timer  $T_{RELOCalloc}$ .
2. The CN node acknowledges the cancellation of the Relocation procedure by sending the RELOCATION CANCEL ACKNOWLEDGE message.
3. The CN node shall release the Iu connection towards the target RNC that may already have been established by initiating the Iu Release procedure with a cause 'Relocation cancelled'.
4. The CN node shall continue to use the existing Iu interface towards the source RNC.
5. The CN node shall resume activation of suspended RANAP procedures, if any.
6. The CN node shall initiate the buffered RANAP procedures, if any.
7. If downlink Direct Transfer signaling has been suspended, the CN node shall resume sending of Direct Transfer signaling.

If the CN node receives the RELOCATION FAILURE message from the target RNC indicating that the Relocation procedure has failed:

1. The CN node shall stop timer  $T_{\text{RELOCalloc}}$ .
2. The CN node shall inform the source RNC that the Relocation procedure has been rejected by sending the RELOCATION PREPARATION FAILURE message with a cause 'Relocation failure in Target RNC'.
3. The CN node shall release the Iu connection towards the target RNC that may already have been established by initiating the Iu Release procedure with a cause 'Relocation cancelled'.
4. The CN node shall continue to use the existing Iu interface towards the source RNC.
5. The CN node shall resume activation of suspended RANAP procedures, if any.
6. The CN node shall initiate the buffered RANAP procedures, if any.
7. If downlink Direct Transfer signaling has been suspended, the CN node shall resume sending of Direct Transfer signaling.

If there is no response to the RELOCATION REQUEST message is received from the target RNC before the timer  $T_{\text{RELOCalloc}}$  expires in the CN:

1. The CN node shall inform the source RNC that the Relocation procedure has been rejected by sending the RELOCATION PREPARATION FAILURE message with a cause 'Relocation timer'.
2. CN node shall release the Iu connection towards the target RNC by initiating the Iu Release procedure with a cause 'Relocation cancelled'.
3. The CN node shall continue to use the existing Iu interface towards the source RNC.
4. The CN node shall resume activation of suspended RANAP procedures, if any.
5. The CN node shall initiate the buffered RANAP procedures, if any.
6. The CN node shall ignore any response from the target RNC received after timer  $T_{\text{RELOCalloc}}$  has expired.

### **2.2.3 Ref [1] 8.2.5 Relocation Complete**

If the RELOCATION COMPLETE message is not received from the target RNC before timer  $T_{\text{RELOCcomplete}}$  expires:

- The CN node shall initiate release of Iu connections towards the source and the target RNC by initiating the Iu Release procedure with a cause 'Unsuccessful Relocation completion'.

If the CN node receives:

- a RELOCATION CANCEL message from the source RNC indicating that the Relocation procedure shall be cancelled or

after the Relocation Resource Allocation but before reception of the RELOCATION COMPLETE message from the target RNC:

1. The CN node shall stop timer  $T_{\text{RELOCcomplete}}$ .

2. If the Relocation was cancelled, the CN node acknowledges the cancellation by sending the RELOCATION CANCEL ACKNOWLEDGE message.
3. The CN node shall initiate release of Iu connection towards the target RNC by initiating the Iu Release procedure with a cause 'Relocation cancelled before completion'.

If the CN node receives:

- an IU RELEASE REQUEST message from the source RNC indicating that the Iu Connection shall be released

after the Relocation Resource Allocation but before reception of the RELOCATION COMPLETE message from the target RNC:

1. The CN node shall stop timer  $T_{RELOCcomplete}$ .
2. If the Relocation was cancelled, the CN node acknowledges the cancellation by sending the RELOCATION CANCEL ACKNOWLEDGE message.
3. The CN node shall initiate release of Iu connections towards the source and target RNC by initiating the Iu Release procedure with a cause 'Relocation cancelled before completion'.

### **3 Conclusion and Proposal**

It is proposed to add the description of Abnormal Conditions and Unsuccessful Outcome as presented in the chapters 2.1 and 2.2 of this document to the Iu Interface RANAP Description document [1] into the dedicated sections under respective subchapters either for Abnormal Conditions or for Unsuccessful Operation.

It is proposed to add the timers presented in the chapter 2 of this document to the Iu Interface RANAP Description document [1] into the chapter 9.5 dedicated for timers.

It is proposed to add the cause values used in the chapters 2.1 and 2.2 of this document to the cause code list referenced in the Iu Interface RANAP Description document [1] in the chapter 9.2.7.

### **4 References**

- [1] 3GPP 25.413, UTRAN Iu Interface RANAP Signalling V1.2.1