Tdoc WHS-99008

3GPP Joint Meeting on GSM-UTRAN handover and SRNS relocation
Sophia Antipolis, France
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Agenda Item: 3
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Introduction

This document presents the status of RAN WG3 with respect to the GSM / UTRAN handover and SRNS Relocation issues of the joint meeting. For more details, please refer to the RANAP specification (25.413, v 1.1.2). The annex contains some extracts from the 25.931 report on example signalling sequences (v 1.1.1, not updated since last meeting). In case of conflict with 25.413, the interface specification is the valid one.

The timeplan is very critical and RAN WG3 needs to focus on completing the existing procedures and functions. Functions of release 99 which cannot be clarified urgently, and which are not essential for basic operation, will be considered as study items for future releases.

GSM/UTRAN handover (CS services)

The procedures have been stable for a long time but some details are lacking. The issue of partial relocation for UTRAN-to-GSM handover (e.g. dropping some bearers) due to limitations in target GSM BSS is being investigated.

UTRAN -> GSM handover: Over Iu, the function is initiated from the Source SRNS to the CN. RANAP procedures used: RELOCATION REQUIRED / RELOCATION COMMAND and IU RELEASE.

GSM -> UTRAN handover: Over Iu, the function is initiated from the CN to the target SRNS. RANAP procedures used: RELOCATION REQUEST / RELOCATION REQUEST ACK, RELOCATION DETECT and RELOCATION COMPLETE.

The issues of NAS message integrity and duplication detection have not been discussed in any detail (considered primarily as a RAN WG2 issue).

GSM/UTRAN handover (PS services)

Requirements: Need to clarify whether this must be “lossless” or not.

Current RANAP procedures can support GSM/UTRAN handover, but may imply loss of data. Issues related to simultaneous CS and PS services have not been discussed.

UTRAN -> GSM handover: Over Iu, the function is initiated from the CN to the source SRNS. RANAP procedures used: IU RELEASE.

GSM -> UTRAN handover: Over Iu, the function is initiated from the target SRNS to the CN. RANAP procedures used: INITIAL UE MESSAGE, DIRECT TRANSFER and RAB ASSIGNMENT.

SRNS Relocation (PS services)

Requirements: assumed that “lossless” SRNS Relocation shall be possible. Need confirmation/clarification from the joint meeting.

Overall procedures supporting SRNS Relocation agreed. Over Iu, the function is initiated by the Source SRNS to the CN. The decision to initiate SRNS Relocation is made by the SRNC. This could be triggered by Uu mobility or could be done later or not at all by using Iur for data transfer between SRNC and DRNC. The SRNS Relocation procedures can support simultaneous PS and CS services.

Two principle solutions have been discussed for the lossless requirement:

- Forwarding of packets from Source SRNS to target SRNS
- Wait with SRNS Relocation until buffers are empty, possibly combined with some suspend/resume mechanism towards the CN.

Procedures used over Iu: RELOCATION REQUIRED / RELOCATION COMMAND, RELOCATION REQUEST / RELOCATION REQUEST ACK, RELOCATION DETECT, RELOCATION COMPLETE and IU RELEASE. Also the RELOCATION CANCEL procedure is available to rollback the full operation.

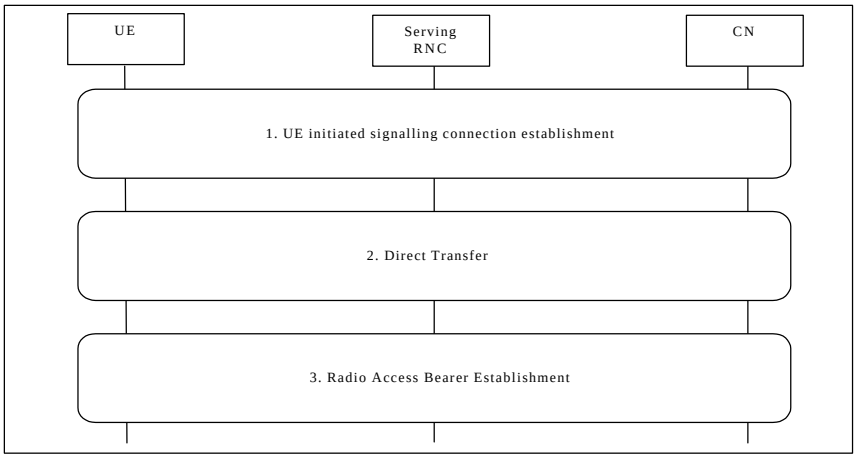
ANNEX: Example signalling sequences extracted from 25.931.

1. GSM/UTRAN handover (PS services)

GPRS ⇒ UTRAN

[R3 chairmans note: From 25.931 v1.1.1.]

This section shows UTRAN signalling procedures for GPRS to UTRAN handover.

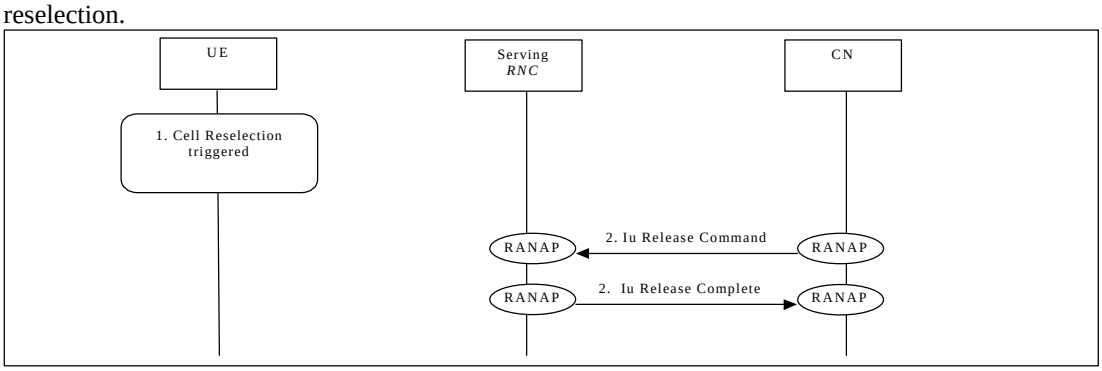


1. The UE selects a UTRAN cell, reads system information, and initiates establishment of a NAS signalling connection.
   See section UE Initiated Signalling Connection Establishment.
2. The NAS signalling connection between UE and CN can now be used for NAS message transfer (e.g. execution of security functions).
   See section Direct Transfer.
3. After necessary CN-GPRS preparations (e.g. UE context information retrieval), CN initiates establishment of RAB(s).
   See section Radio Access Bearer Establishment.

UTRAN ⇒ GPRS, UE Initiated

[R3 chairmans note: From 25.931 v1.1.1.]

This section shows UTRAN signalling procedures for UTRAN to GPRS handover initiated by UE cell reselection.



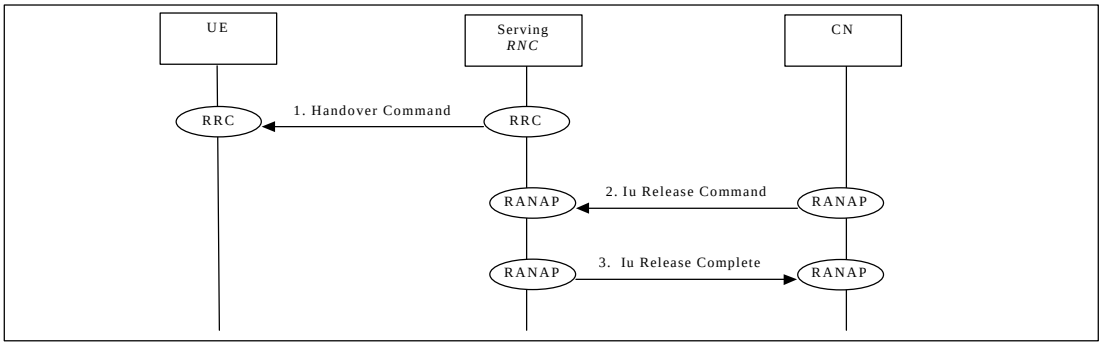
1. The UE selects a GPRS cell, reads system information, and initiates establishment of UE-GPRS connection.

2. After necessary CN-GPRS preparations (e.g. UE context information retrieval), CN initiates release of Iu connection. SRNC releases the RRC connection.

UTRAN ⇒ GPRS, Network Initiated

[R3 chairmans note: From 25.931 v1.1.1.]

This section shows UTRAN signalling procedures for UTRAN to GPRS handover triggered by Serving RNC.



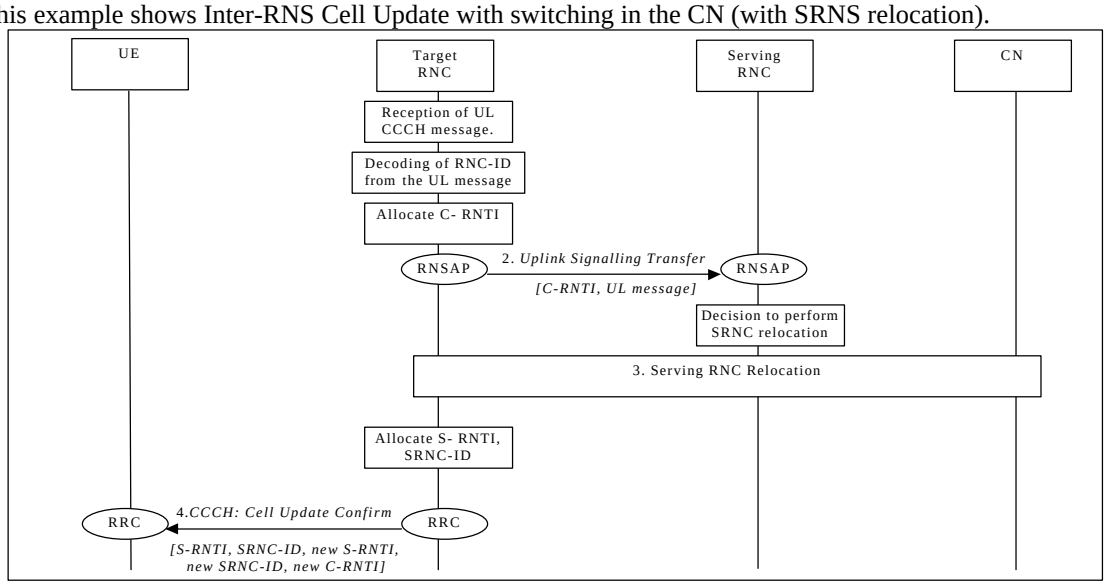
1. Based on UE measurements, SRNC triggers the handover to a GPRS cell by sending a Handover Command to the UE. UE initiates establishment of UE-GPRS connection.
2. After necessary CN-GPRS preparations (e.g. UE context information retrieval), CN initiates release of the RRC connection.
3. SRNC releases all resources reserved for the UE.

2. SRNS Relocation

Cell Update with with SRNS relocation

[R3 chairmans note: From 25.931 v1.1.1.]

This example shows Inter-RNS Cell Update with switching in the CN (with SRNS relocation).



Cell Update with SRNS Relocation

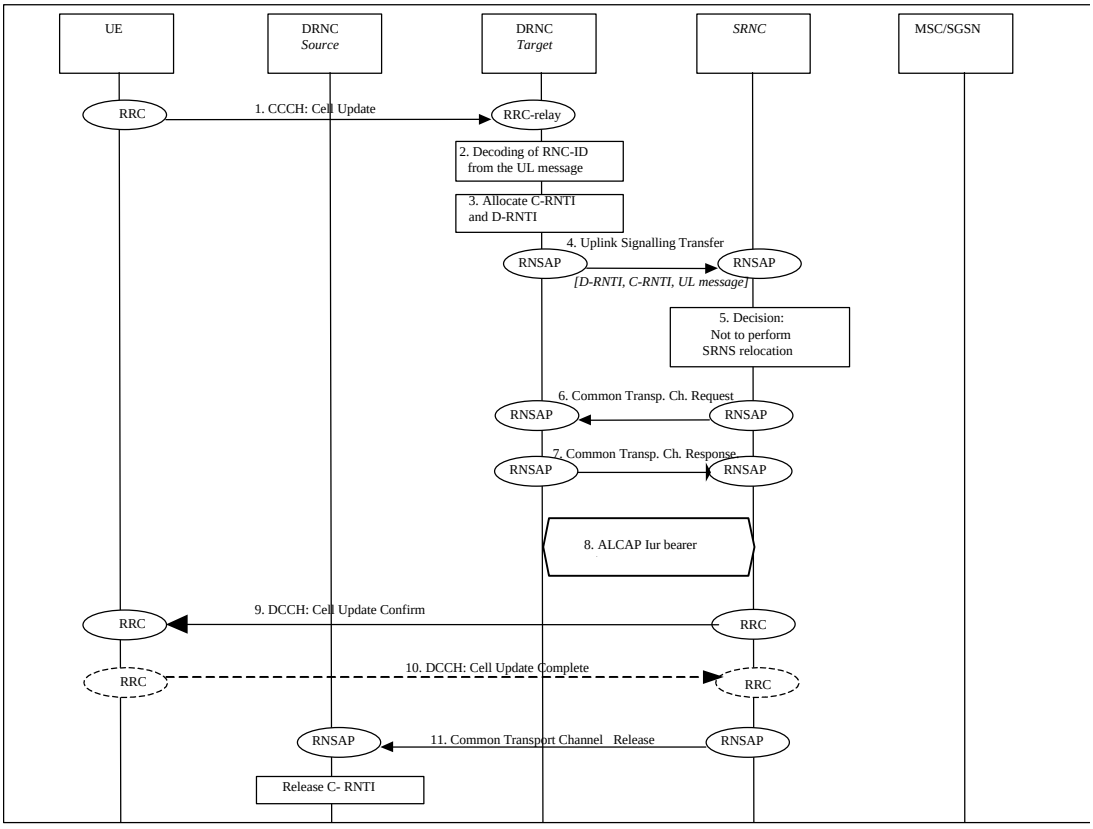
1. UE sends a RRC message Cell Update to the UTRAN, after having made cell re-selection. Upon reception of a CCCH message from a UE, controlling RNC allocates a C-RNTI for the UE.
2. Controlling RNC forward the received uplink CCCH message towards the SRNC by RNSAP Cell/URA Update Indication message. C-RNC includes the allocated C-RNTI to the RNSAP message, which is used as a UE identification within the C-RNC. Upon reception of the RNSAP message SRNC decides to perform a SRNS Relocation towards the target RNC.
3. Serving RNC relocation procedure is executed as defined in Chapter SRNS Relocation (UE connected to a single CN node). After completing SRNS Relocation, target RNC allocates new S-RNTI for the UE.
4. Serving RNC responds to UE by RRC Cell Update Confirm, including old S-RNTI and SRNC ID as UE identifiers. Message contains also the new S-RNTI, SRNC-ID and C-RNTI.

It is ffs. whether a Cell Update Complete is needed to confirm the successful reception of Cell Update Confirm. The decision is to be made by 3GPP RAN WG2.

Cell Update via Iur without SRNS relocation

[R3 chairmans note: From Tdoc R3-99734 with agreed modifications included.]

This example shows an Inter RNS cell update in DRNS without SRNS relocation when no Iur RACH/FACH transport bearer exists. In this example target RNS, source RNS and serving RNS are all located separately from each other. Other scenarios can be easily derived from this most comprehensive signalling procedure.



Cell Update via Iur without SRNS Relocation, no Iur RACH/FACH transport bearer exists

1. UE sends an RRC message Cell Update to the UTRAN, after having made cell re-selection.
2. Upon reception of a CCCH message from a UE, the target DRNC decodes the SRNC ID and the S-RNTI.

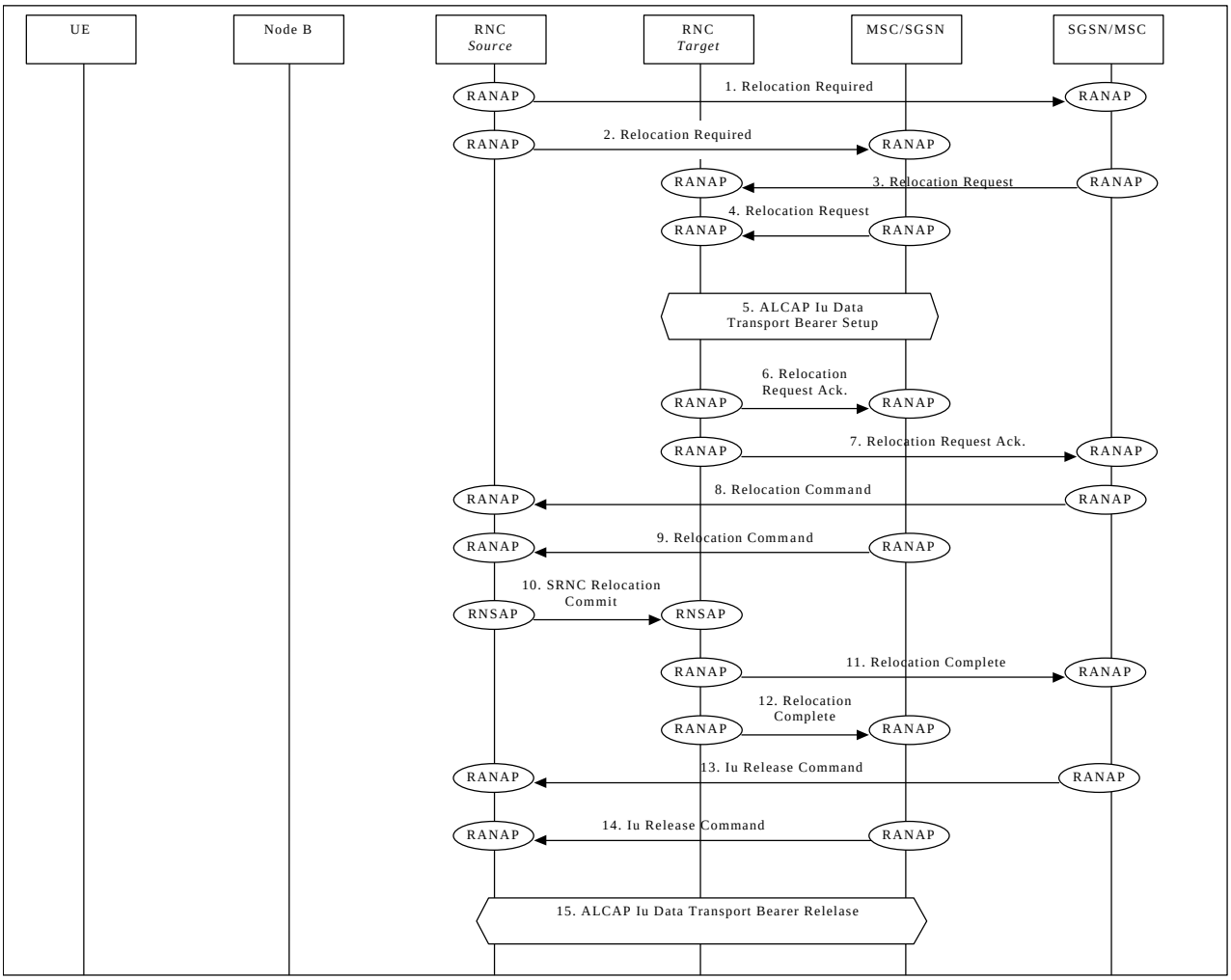
3. The UE is not registered in the target DRNC (RNC ID and SRNTI unknown), thus the target DRNC allocates a D-RNTI and C-RNTI for the UE.
4. The target DRNC forwards the received uplink CCCH message towards the SRNC in the RNSAP Uplink Signalling Transfer message. The Uplink Signalling Transfer message includes also the cell-ID of the cell from which the CCCH message was received and the allocated D-RNTI and C-RNTI.
5. Upon reception of the Uplink Signalling Transfer message the SRNC decides not to perform a SRNS Relocation towards the target RNC.
6. The SRNC initialises the UE context in the target RNC as well as requests transport layer address and binding identity with the RNSAP Common Transport Channel Request message. The message includes the D-RNTI and the cell identity previously received in the Uplink Signalling Transfer message.
7. The target DRNC sends the transport layer address, binding identity and optionally PHY parameters (FACH code, ..) to the SRNC with the RNSAP Common Transport Channel Response message.
8. The ALCAP Iur transport bearer is established from the SRNC, if not using an existing transport bearer.
9. The SRNC sends RRC Cell Update Confirm on DCCH to the UE. The message is sent in the Iur user plane. It will be sent by the target DRNC to the UE on the FACH coupled to the RACH. Subsequent FACH data may be sent on a different FACH if so decided by the target DRNC.
10. FFS in WG2 if needed: UE sends RRC Cell Update Complete on DCCH successful reception of Cell Update Confirm.
11. SRNC send the Common Transport Channel Release to source DRNC. Source DRNC releases the D-RNTI and C-RNTI.

SRNS Relocation (UE connected to two CN nodes)

[R3 chairmans note: From 25.931 v1.1.1.]

This example shows SRNS Relocation, in situation in which the UE is connected to two CN nodes simultaneously. It is assumed that:

- all cells in the active set are in one DRNC;
- the CN performs hard switching of the user traffic.



SRNS Relocation (UE connected to two CN nodes)

Note that the SRNC makes the decision to perform the Serving RNC relocation procedure. The Serving RNC also decides into which RNC (Target RNC) the Serving RNC functionality is to be relocated.

1./2. The source SRNC sends **Relocation Required** messages to both CN nodes.
Parameters: target RNC identifier, Information field that the CN node(s) shall pass transparently to the target RNC. This transparent field contains the UE identifier, number of CN nodes and other TBD data.
Upon reception of **Relocation Required** message the CN element prepares itself for the switch and may also suspend user data traffic and/or signalling between UE and itself for some bearers.

3./4. When preparation is completed the CN node conveys a **Relocation Request** message to the target RNC.
Parameters: indication of which bearers should be routed towards this CN node, transparent information field sent by the source RNC, UE identifier.

The target RNC uses the UE identifier to link the requests from multiple CN nodes to each other and to the resources (e.g. Iub links) that the UE is currently using.
FFS: The target RNC allocates necessary Iur branches to be used after the SRNS Relocation switch will be made.

5. The target RNC and CN node establish the new Iu transport bearers for each Radio Access Bearer related to that CN node.

6./7. When the source RNC and the target RNC have completed its preparation phase, **Relocation Request Acknowledge** message is sent to CN.

8./9. When the CN node is ready for the SRNC move, the CN node indicates the completion of preparation phase at the CN side for the SRNS Relocation by sending the **Relocation Command** message. To the source RNC and the target RNC.

10. When the source RNC has received **Relocation Command** messages from all the CN nodes, the source RNC sends a **Relocation Commit** message to the target RNC. The target RNC executes both the DL and UL switch for all bearers at the earliest suitable time instance.
After the switch UL traffic from node-B's is routed via the newly established Macro Diversity Combiner to the new MAC/RLC entities and finally to the correct Iu transport bearer. UL data transmission to the old Iur transport bearer is ceased.
DL data arriving from the new Iu link is routed to newly established RLC entities, to the MAC and to the Macro Diversity Splitter and Nodes B. The DL data received from the old Iur is discarded.

11./12. Immediately after a succesfull switch at RNC, target RNC (=SRNC) sends **Relocation Complete** messages to the involved CN nodes.
Upon reception of messages 9 and 10, the CN switches from the old Iu transport bearers to the new ones.

13./14. After a successful switch at the CN node, the CN node initiates the release of the Iu connection to the source RNC by sending the RANAP message **Iu Release Command**.

15 Upon reception of the release requests from the CN nodes the old SRNC executes all necessary procedures to release all visible UTRAN resources that were related to the RRC connection in question.

At any phase, before the **SRNS Relocation Complete** message is sent, the old communication link between the CN and UE is all the time existing and working and the procedure execution can be stopped and original configuration easily restored. If any such abnormal thing occurs a **SRNS Relocation Failure** may be sent instead of any message numbered 3-11 described.