TSG-RAN Working Group 3 meeting #7
Sophia Antipolis, France, September 20-24, 1999

***TSGR3#7(99)C62***

**Agenda Item:** 23

**Source:** Alcatel

**Title:** Sequence charts for SRNS relocation

**Document for:** Approval

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## 1 INTRODUCTION

This contribution is based on contribution WHS-004 that was presented at the joint SA2/RAN3 meeting at Sophia Antipolis.

This contribution is intended to describe the different phases of SRNS Relocation procedure in particular for non real time but highly reliable data i.e. without loss of user data. The proposed sequence chart involves an UE that is connected to both domains CS and PS.

## 2 ASSUMPTIONS

It is based on the specification TS 23.121 v3.0.0 [2] which has been agreed at TSG SA in which:
Section 4.2.2.1 of [2] presents Data Retrieve principles in the PS domain for SRNS relocation, UMTS hard-handover via the CN and GPRS/UMTS handover.
Section 4.3.12.2 of [2] describes flow charts for SRNS relocation. The mechanisms proposed in these flow charts are similar to the mechanisms used in GPRS. In addition, they can be extended to UMTS/GPRS handover case.

In the following proposal, only two assumptions are made. These assumptions have a very low impact on the proposed texts and figures.

The first assumption consists of using Iu interface at lower layers to benefit from the ATM bandwidth sharing but having only one GTP-u tunnel between the two RNCs. The impact only consists in putting the IP address of the target SRNC instead of the IP address of the SGSN.
In the TS 23.121 v3.0.0, it is proposed to have several GTP tunnels. This could be modified by an appropriate CR. However, the proposed procedures are not impacted by the number of GTP tunnels between the SRNCs.

It is also assumed that the RLC connections between the UE and the target SRNC are established with re-initialised RLC sequence numbers. Continuing the RLC sequence numbering and the HFN numbering is not appropriate since the mechanism should also work in the case of GPRS/UMTS handover. In this case, the GPRS layer 2 and Ciphering function are different from the ones used in UMTS (LLC in GPRS, RLC in UMTS).

## 3 PROPOSAL

### 3.1 Proposed text for UMTS 25.931 [1] section 9.14.3 "Serving RNS Relocation"

It is proposed to modify [1] section 9.14.3 "SRNS Relocation" as follows:

## 9.14.3 SRNC Relocation (UE connected to CS and PS domains~~two CN nodes~~)

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This example shows SRNS Relocation, in situation in which the UE is connected to CS and PS domains~~two CN nodes~~ simultaneously. There is one CS logical node and one PS logical node. CS logical node is connected to the RNC via Iu-cs. PS logical node is connected to the RNC via Iu-ps. These logical nodes may be implemented in one single CN equipment or in two separate equipments.

It is assumed that:

- all cells in the active set are in one DRNC;
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**SRNC Relocation (UE connected to CS and PS domains~~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.

**"Resource reservation" Phase**

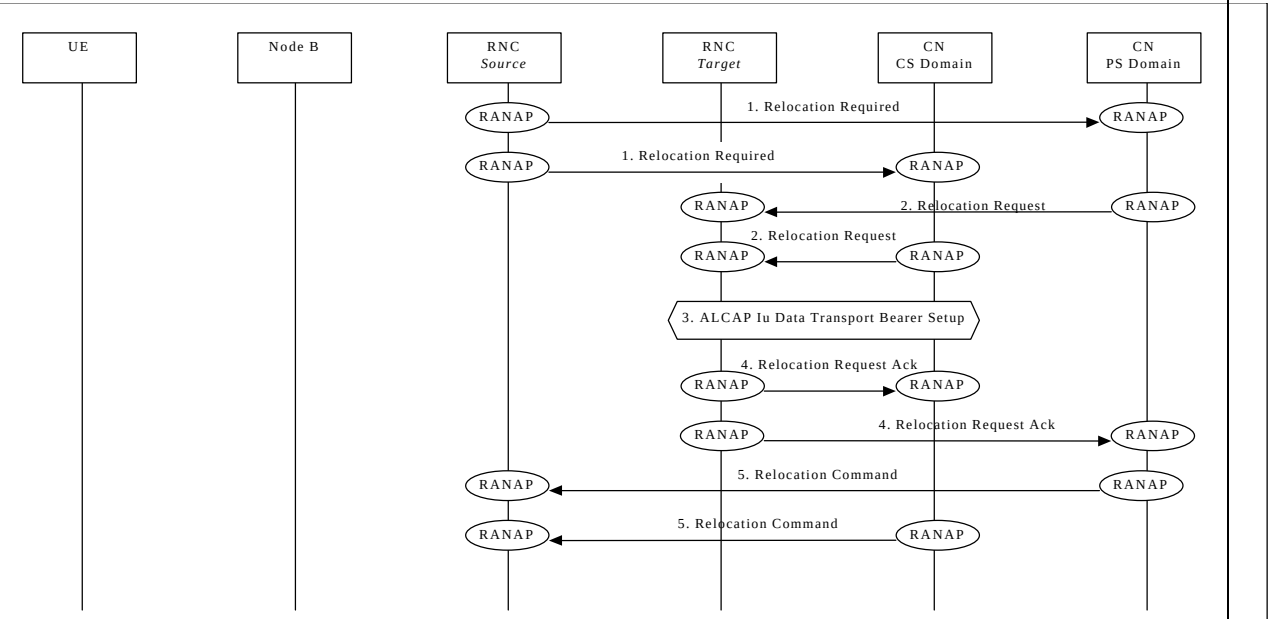



**Figure 1: SRNS Relocation, Reservation phase**

During this phase, the transmission of all packets (N-PDUs) between GGSN and UE through the source SRNC goes on.

1. The source SRNC sends **Relocation Required** messages to both CN domains~~nodes~~.
   *Parameters*: target RNC identifier, Information field that the CN logical node(s) shall pass transparently to the target RNC. This transparent field contains the UE identifier, number of CN logical nodes and other TBD data.
   Upon reception of **Relocation Required** message each~~the~~ logical CN element participates in the preparation for switching from old to new Iu interface. User data traffic is not suspended by the CN.~~prepares itself for the switch and may also suspend user data traffic and/or signalling between UE and itself for some bearers.~~

2. When preparation is completed the CN logical node conveys a **Relocation Request** message to the target RNC.
*Parameters*: indication of which bearers should be routed towards this CN logical node, transparent information field sent by the source RNC, UE identifier and for each bearer CN transport address (ATM or IP address) and Iu transport association (Binding ID or GTP flow label).

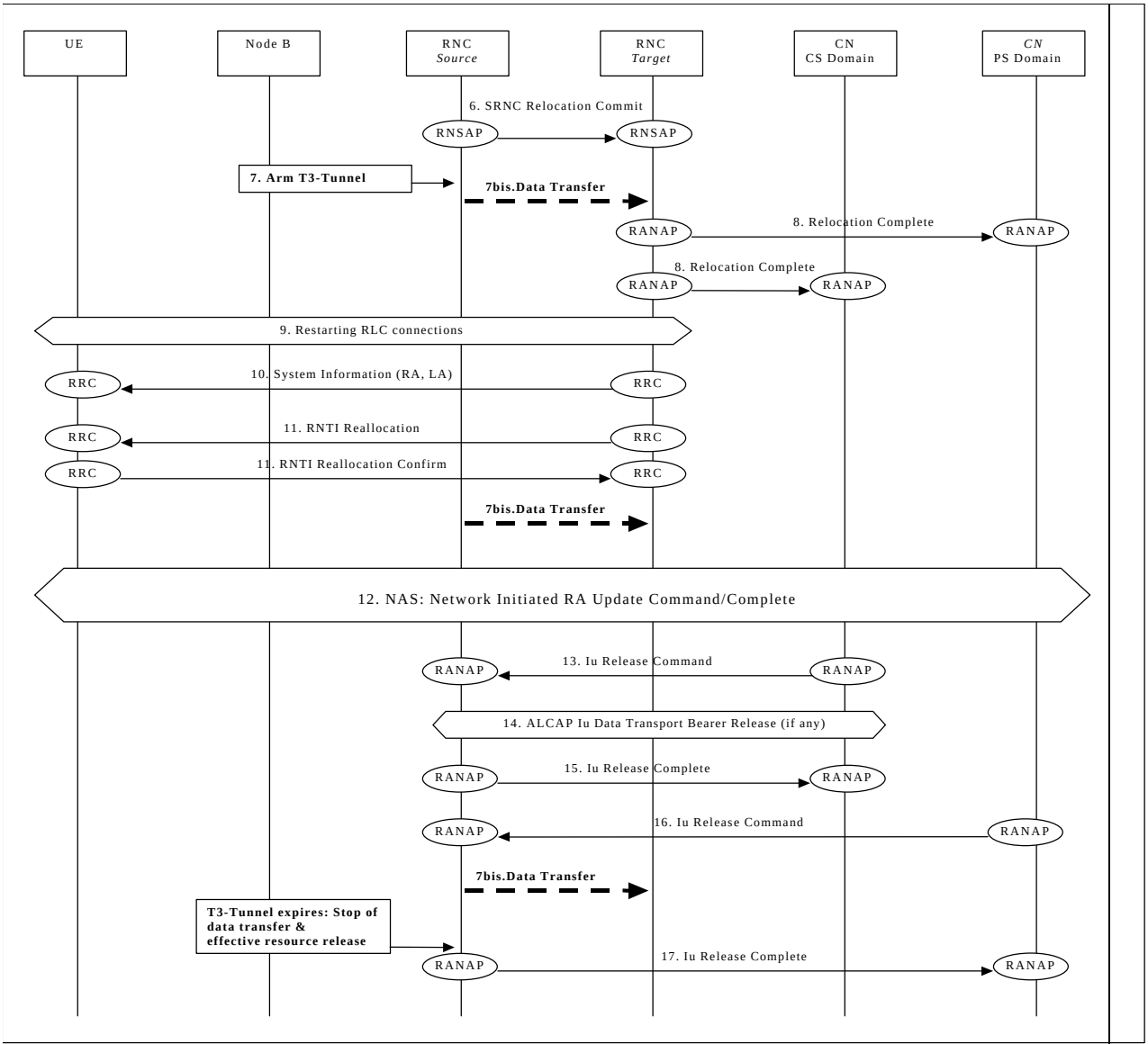
   The target RNC uses the UE identifier to link the requests from multiple CN logical nodes to each other and to the resources (e.g. Iub links) that the UE is currently using.
~~FFS: The target RNC allocates necessary Iur branches to be used after the SRNC relocation switch will be made.~~

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

4. When the RNC has completed its preparation phase, **Relocation Request Acknowledge** ~~**Proceeding 1**~~ message is sent to CN. At this point, the target SRNC is ready to receive the downlink N-PDUs that have not been acknowledged by the UE, from the Source SRNC.

5. When the CN logical node is ready for the SRNC move, the CN logical node indicates the completion of preparation phase at the CN side for the SRNC relocation by sending the **Relocation Command**~~**Proceeding 2**~~ message ~~. T~~to the source RNC. Relocation Command message contains the IP addresses (possibly one address per PDP context) corresponding to the Target RNC and the GTP flow label for each GTP tunnel to be used for the transfer of non acknowledged user N-PDUs towards the target RNC.

**"Handover of SRNC" Phase**




6. When the source RNC has received **Relocation Command~~Proceeding 2~~** messages from all the CN logical nodes, the source RNC stops the exchange of N-PDUs with the UE for those data streams that require lossless relocation and sends a **Relocation Commit** message to the target RNC. The exchange of data with the UE continues normally for data streams that don't require lossless relocation. The **Relocation Commit** message contains all parameters required to ensure the sequence integrity of the N-PDUs of bearers requiring lossless relocation (e.g. avoid loss and duplications of N-PDUs to/from the UE).

7. The source SRNC arms a timer "T3-Tunnel" and starts tunneling copies of the buffered and arriving downstream N-PDUs towards the target SRNC via the established GTP tunnel(s) for all GTP data streams. The UL data that were still in the Source SRNC continue to be transmitted normally to the Source SGSN.

8. The target SRNC executes both the DL and UL switch for all bearers at the earliest suitable time instance.- Immediately after these successful switches, the target RNC (= new SRNC) sends **Relocation Detect** messages to the involved CN logical nodes. . Upon reception of the **Relocation Detect** message MSC shall switch all Iu data streams from the old Iu interface to the new Iu interface.

9. The target SRNC resets the RLC connections that use the acknowledged mode. This includes the exchange between the target SRNC and the UE of the UP_RLC_Ack and DOWN_RLC_ACK.

   - DOWN_RLC_ACK confirms all mobile-terminated packets successfully transferred before the start of the relocation procedure. If DOWN_RLC_ACK confirms reception of packets that were forwarded from the source SRNC, then these packets shall be discarded by the target SRNC.
   - UP_RLC Ack confirms all mobile-originated packets successfully transferred before the start of the relocation procedure. If UL-RLC Ack confirms reception of packets that were not acknowledged by source SRNC before the relocation, then these packets shall be discarder by the UE. From now on the exchange of the packets with the UE can restart (point (b)).

10. The target SRNC sends the RRC message **System Information** to the UE with RA and LA information. This may trigger a Location Update procedure when the UE is in CS-IDLE mode.

11. The target SRNC exchanges the new UTRAN parameters (S-RNTI and SRNC-ID) with the UE with the RNTI Reallocation procedure. With this procedure, the new System Information parameters are also exchanged with UE. When the UE has confirmed reception of the new s-RNTI, then the target SRNC immediately sends the RELOCATION COMPLETE to the CN nodes.

    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~~

    ~~Immediately after a successfull 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.~~

12. The target logical SGSN sends Network Initiated Update Request NAS message to the UE. This message includes the new RAI, and possible new TMSI. The UE makes necessary updates and sends Network Initiated Update Complete NAS message to the SGSN.

13. After reception of RELOCATION COMPLETE ~~a successful switch~~ at the CS-CN logical node (CS domain), the CS-CN logical node ~~initiates the release of the Iu connection to the source RNC by sending~~ sends the RANAP message **Iu Release Command**.

14. Upon reception of the **Iu Release Command** message from the CS-CN logical, the source SRNC releases all UTRAN resources associated with the CS domain for the UE.

15. In particular, it releases the corresponding Iu resources via ALCAP.

16. ~~7ter.~~ Upon reception of the **Iu ~~r~~Release Command** message ~~requests~~ from the PS-CN logical node (PS domain)~~s~~, the source SRNC releases all UTRAN resources associated with the PS domain except the resources required for the N-PDUs forwarding, which are released only when the T3-Tunnel timer has expired. When CS and PS domain resources have been released, the source~~old~~ SRNC executes all necessary procedures to release all visible UTRAN resources that were related to the RRC connection in question.

17. ~~11~~When these resources are released, the Source SRNC sends Iu Release Complete message to the CN logical nodes.

At any phase, before the **SRNC 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 **SRNC Relocation Failure** may be sent instead of any message numbered 3-11 described.

**~~Note: The whole described procedure is FFS~~**

## 4 REFERENCES


[1] UMTS 25.931 UTRAN functions, Examples on signalling procedures
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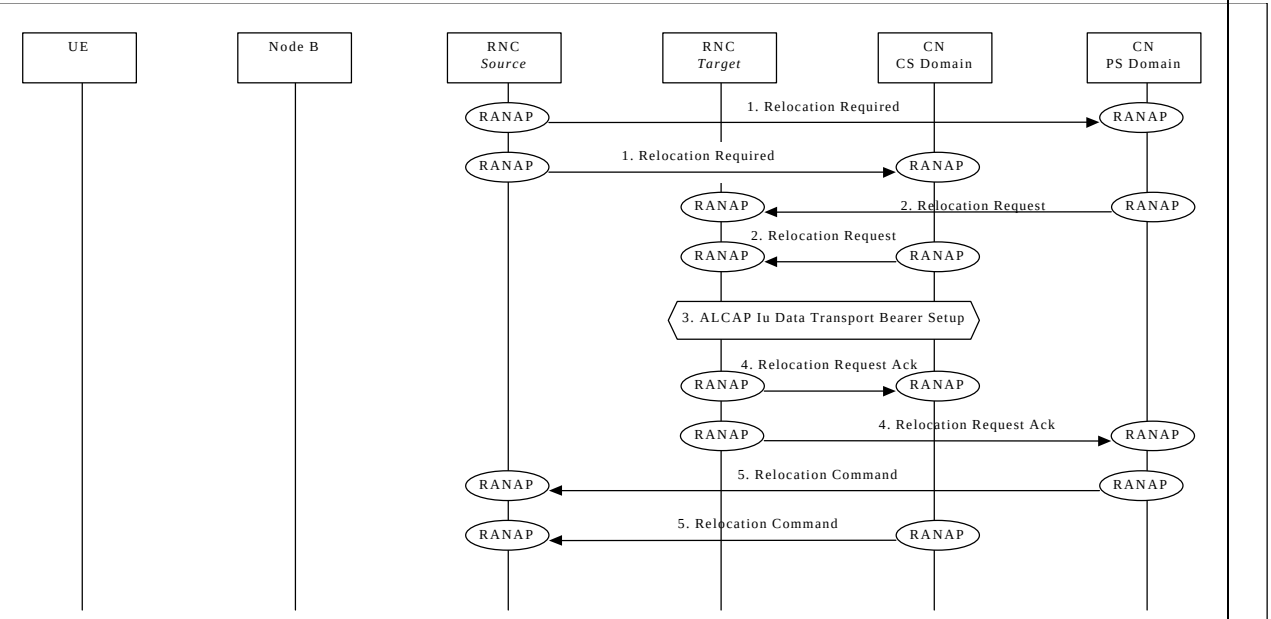


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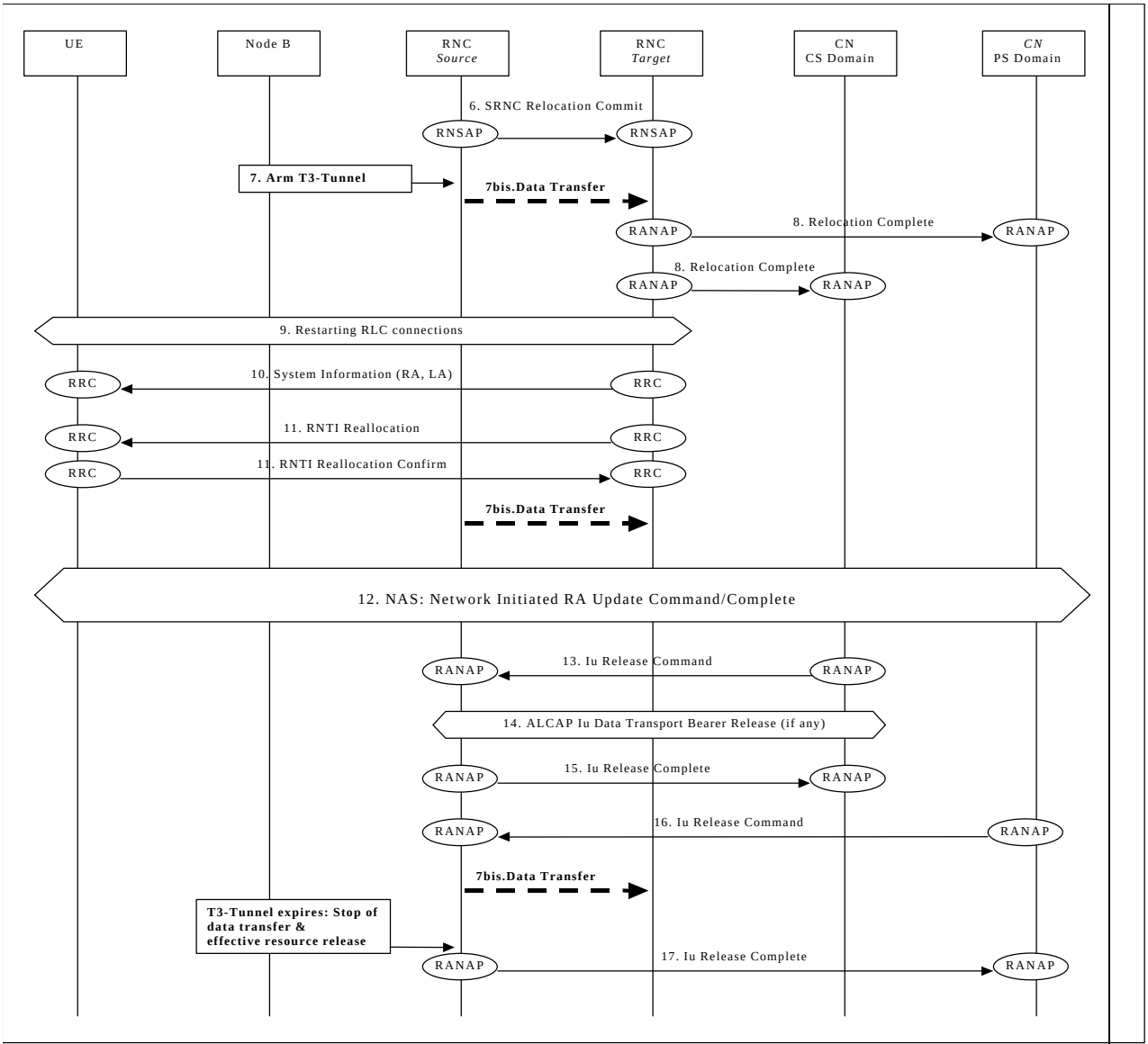


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