TSGW3#1(99)063

Agenda Item: 8.3 and 8.2

Source: **Alcatel**

Title: **Inter-RNS Handover**

Document for:

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Inter-RNS Handover

1 Introduction

It was agreed in SMG2 UMTS ARC EG meeting #9 in Sophia Antipolis that in UMTS ZZ.11 [1], Section 9.2.2.2 "Inter RNS hard handover" should be restructured to show the elementary procedures and should also be harmonized with UMTS ZZ.02 [2].

Furthermore, it is proposed to remove the HO Proceeding 2 message and to allocate Iu bearers before sending it because it is agreed that the Iu bearer allocation procedure is initiated by the RNS and not by the CN. For an harmonisation with the GSM BSSMAP messages, it is also proposed to rename HO Proceeding 1 message by Handover Request Ack.

This contribution proposes following modifications to the referred section.

2 Proposed modifications to section 9.2.2.2 in UMTS ZZ.11

The proposed modified text for Section 9.2.2.2 Inter RNS hard handover is as follows:

9.2.2.2   Inter RNS hard handover

[Editor's note: The RANAP procedures for Inter RNS hard handover have been included from Tdoc SMG2 UMTS-ARC 091/98 with the modifications as approvedn ARC EG meeting #4.]

[Editor's note: The contents of this chapter must be restructured to show the elementary procedures over the Iu interface. Also, it need to be aligned with the corresponding procedures in ZZ.02.]

Inter RNS hard handover is used to relocate the serving RNS functionality from one RNS to an other and to change the radio resources assigned for the corresponding UE by a hard change. This procedure can be used within one UTRAN if the Iur interface can not (or is not desired to) be used for active set management, between two UTRANs or at UTRAN side in handovers between two Radio Access systems (e.g. UMTS to GSM).

Inter RNS hard handover is carried over Iu interface, ~~namely~~ by the RANAP protocol. ~~The required functionality is described below by introducing an example Iu interface RANAP procedure for the purpose.~~
Note that, in order to use the same messages for both inter-RNS handovers and GSM to/from UMTS handovers, the source SRNS does not know whether the handover is an inter-RNS handover or a UMTS to GSM handover. In the same way, the target RNS does not know whether the handover is an inter-RNS handover or a GSM to UMTS handover.
This also allows the Core Network to chose the preferred type of handover.

9.2.2.2.1   Hard handover required indication

When the serving RNS makes an algorithmic decision to start a ~~Inter RNS~~ CN handover procedure a RANAP message to indicate requirement for hard handover is sent to each ~~the~~ Core Network element which is having an active RANAP connection related to the UE in question. ~~The message is the same as for the SRNS relocation, except that it contains an indication that the switching procedure will be performed as it is defined for Inter RNS hard handover instead of as it is defined for SRNS relocation.~~

This HARD HANDOVER~~RELOCATION~~ REQUIRED message includes essentially a list of one or several target RNS and cell identifiers, and an UTRAN information field.

The signalling flow for hard handover required indication is shown in Fig. 6.
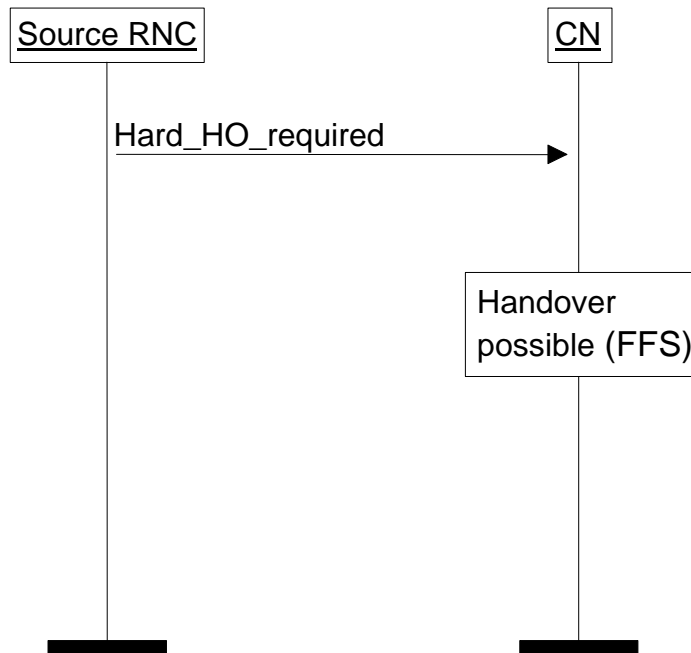
<u>Source RNC</u>   <u>CN</u>

Hard_HO_required

Handover
possible (FFS)

<u>Figure 6. Hard handover required indication.</u>

<u>9.2.2.2.2</u>   <u>Hard handover</u>UTRAN and Iu resource allocation

Upon reception of the <u>HARD HANDOVER</u>~~RELOCATION~~ REQUIRED message the Core Network element
should check whether the handover is possible to be performed (this check is FFS) <u>and chose the preferred</u>
<u>target cell</u>. In successful case the CN element sends a <u>HARD HANDOVER</u>~~RELOCATION~~ REQUEST to the
target RNS. The <u>HARD HANDOVER</u>~~RELOCATION~~ REQUEST contains essentially the <u>target cell identifier</u>
and bearer identifier of each bearer to be established to the new Iu interface.

<u>When receiving a HARD HANDOVER REQUEST message, the RNS allocates necessary resources within</u>
<u>UTRAN to support radio links to be used after completion of the hard handover procedure.</u>
<u>The target RNS also sets up the corresponding Iu connection(s) via the ALCAP procedures.</u>

When the target RNS has received <u>all</u> HARD HANDOVER~~RELOCATION~~ REQUEST messages <u>from the</u>
<u>different CN elements</u> ~~and all active bearers are identified in these~~, it ~~should~~ send<u>s</u> a <u>HARD HANDOVER</u>
<u>REQUEST ACK</u> ~~RELOCATION,~~ message <u>per</u> CN<u>element</u>. This message contains essentially the Binding ID
for each Iu leg and UTRAN information field (containing the Handover command for the UE).

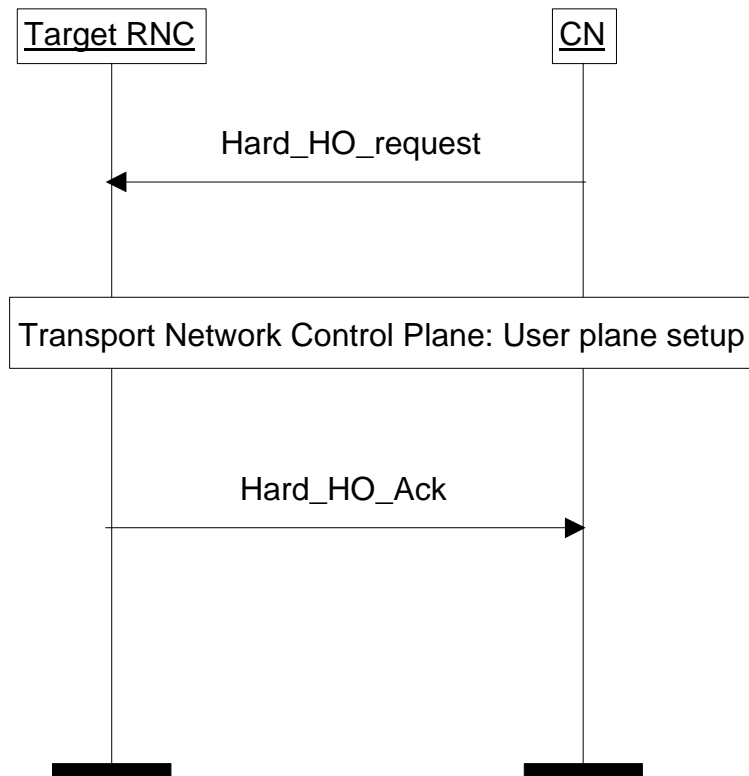<u>Fig. 7 shows the UTRAN and Iu resource allocation step.</u>

Figure 7. UTRAN and Iu resource allocation for hard handover.

9.2.2.2.3   Hard handover execution

Upon reception of HARD HANDOVER REQUEST ACK message~~RELOCATION~~ ~~the CN element should setup~~ ~~necessary Iu legs (and indicate corresponding binding ID to UTRAN). After completion of this~~ the CN element should send ~~a RELOCATION PROCEEDING2 message to the target RNS and~~ the HARD HANDOVER COMMAND message with the RAN information field received in the HARD HANDOVER REQUEST ACK ~~RELOCATION~~ message to the source RNS. ~~in~~ ~~HANDOVER COMMAND message.~~

At source RNS: When the source serving RNS has received all HARD HANDOVER COMMANDs from each active CN element ~~(and all active bearers are identified in these)~~, a RRC message HANDOVER COMMAND is transmitted to the UE. After this UE sends a HANDOVER ACCESS REQUEST to the new radio resources (indicated in HANDOVER COMMAND).

The signalling flow between the source RNS and the CN is shown in Fig. 8.

```
                  ┌─────────────┐                    ┌────┐
                  │ Source RNC  │                    │ CN │
                  └─────────────┘                    └────┘
                         │                              │
                         │        Hard_HO_command       │
                         │◄─────────────────────────────│
                         │                              │
                  ┌──────────────┐                      │
                  │ All bearers  │                      │
                  │ addressed    │                      │
                  └──────────────┘                      │
                         │                              │
                  ┌──────────────┐                      │
                  │ RRC: Handover│                      │
                  │ command      │                      │
                  └──────────────┘                      │
                         │                              │
                         │                       ┌──────────────┐
                         │                       │ Hard HO      │
                         │                       │ complete     │
                         │                       │ received     │
                         │                       └──────────────┘
                         │                              │
                  ┌────────────────────────────────────────┐
                  │              Iu Release                 │
                  └────────────────────────────────────────┘
                         │                              │
                         ▄▄▄▄▄                          ▄▄▄▄▄
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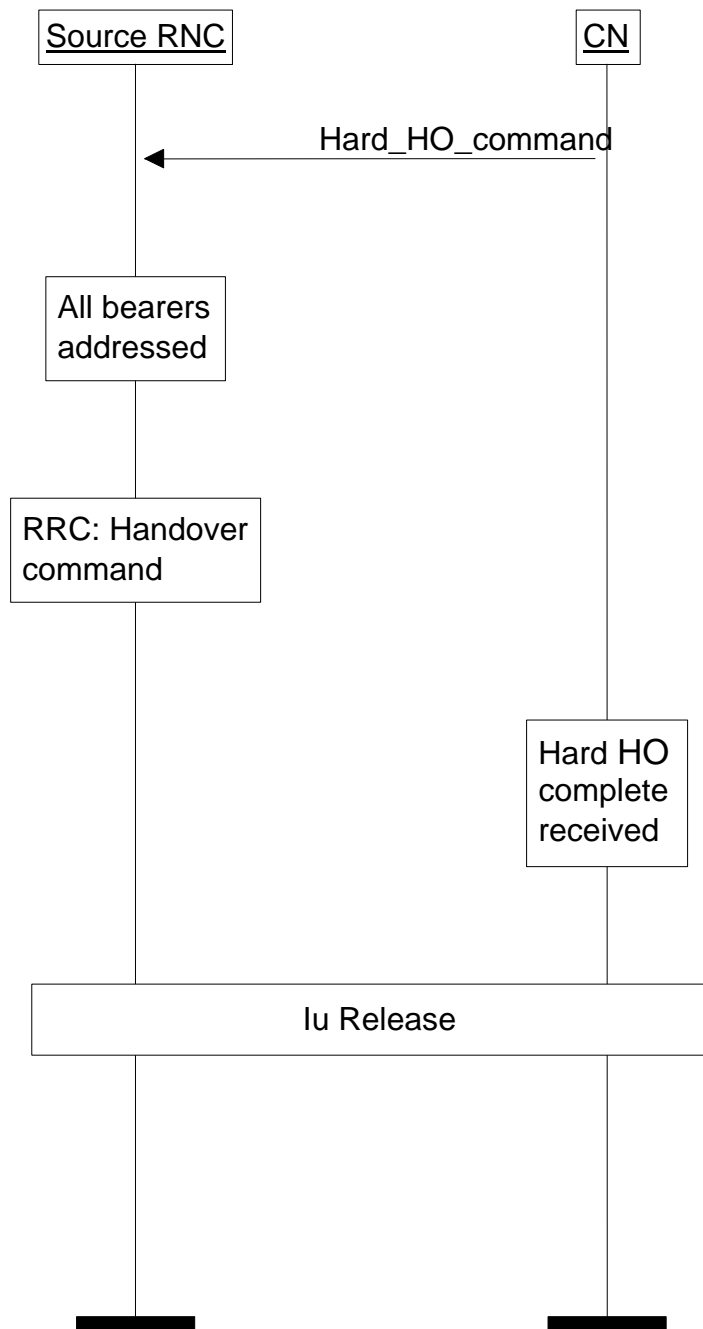
Figure 8. Hard handover execution between source RNS and CN.

At target RNS: When the target RNS has detected the UE, it sends a HARD HANDOVER DETECT to the CN and starts to act as an SRNS. (Optionally it is possible to send already handover complete, in case a full set of radio resources is given in HO COMMAND). After having established all necessary radio resources between the new Serving RNS and the UE the new Serving RNS sends a HARD HANDOVER~~RELOCATION~~ COMPLETE to the CN.

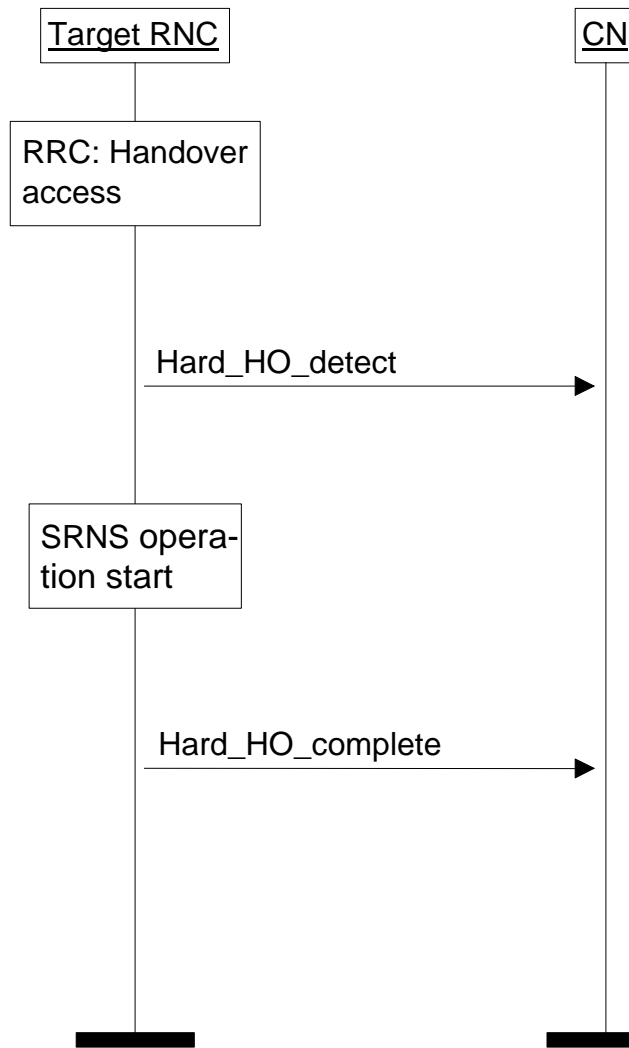The signalling flow between the target RNS and the CN is illustrated in Fig. 9.

Figure 9. Hard handover execution between target RNS and CN.

CN will then release all bearers (Fig. 8) as described in 9.2.2.4 towards the old serving RNS.

~~An example of a corresponding message flow at Iu interface in a successful situation is presented in Figure 1.~~
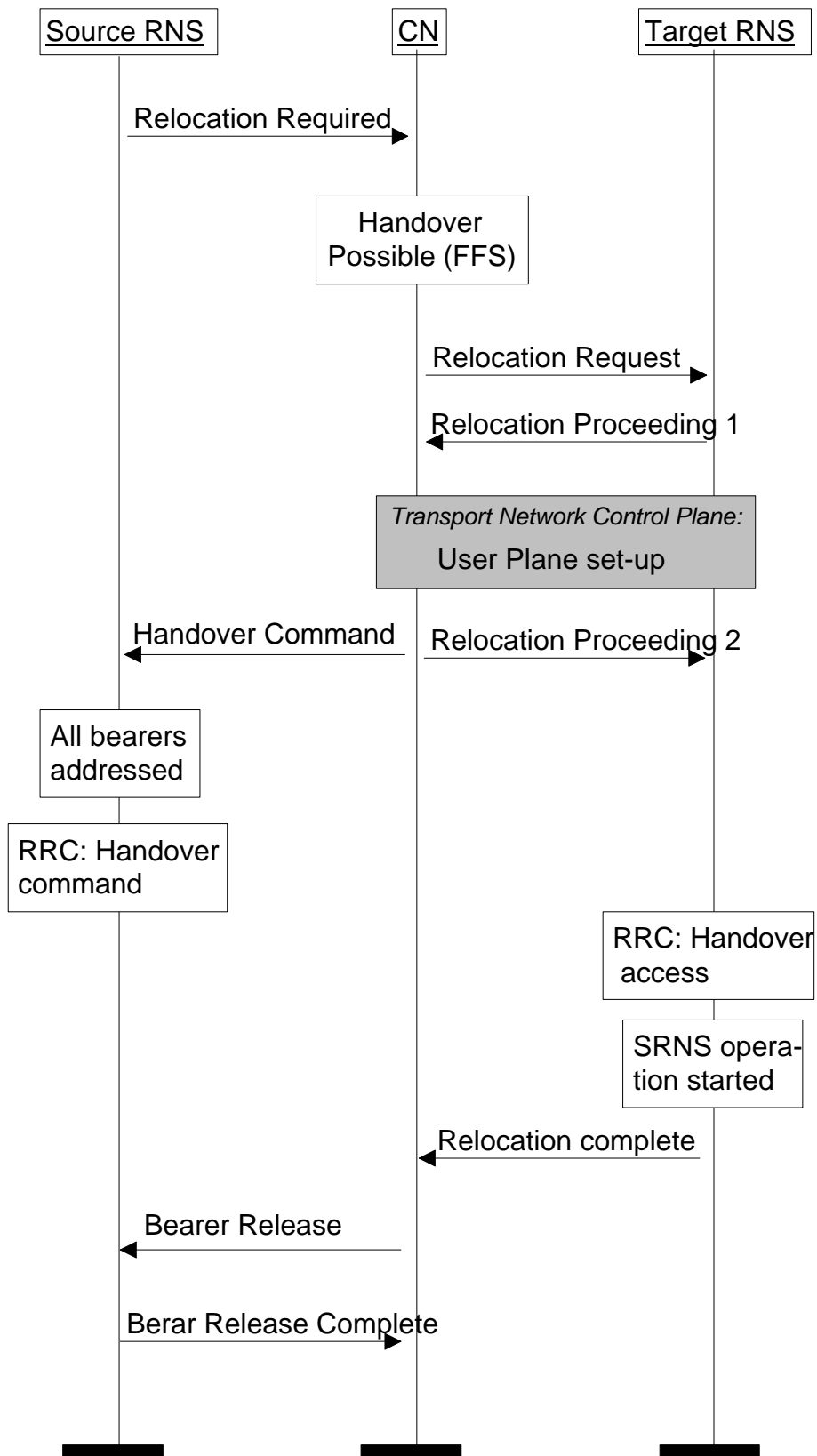
Figure 1. An example RANAP protocol message flow at Iu interface related to Inter RNS Hard Handover. A successful case.

3   Proposal

1- It is proposed to replace the existing text in Ref [1], Section 9.2.2.2 with the text of section 2 of this contribution.

2- It is also proposed to update the text and drawings of Ref [2] according to the text above, i.e.:
- In section 7.2.15.2 (SRNS relocation): set up the Iu user plane before sending SRNC Relocation Proceeding 1 (anyway drawing and text are not consistent on that subject).
- In section 7.2.16.3 (GSM => UTRAN via IWF): Replace Hard Handover Proceeding 1 by Handover Request Ack; Remove Hard Handover Proceeding 2.
- In section 7.2.16.4 (GSM => UTRAN via MAP/E): Replace Hard Handover Proceeding 1 by Handover Request Ack; Remove Hard Handover Proceeding 2.

4   References

[1] UMTS ZZ.11 V0.1.0; Description of Iu interface

[2] UMTS ZZ.02 V0.1.0; UTRAN Functions, Examples on Signalling Procedures