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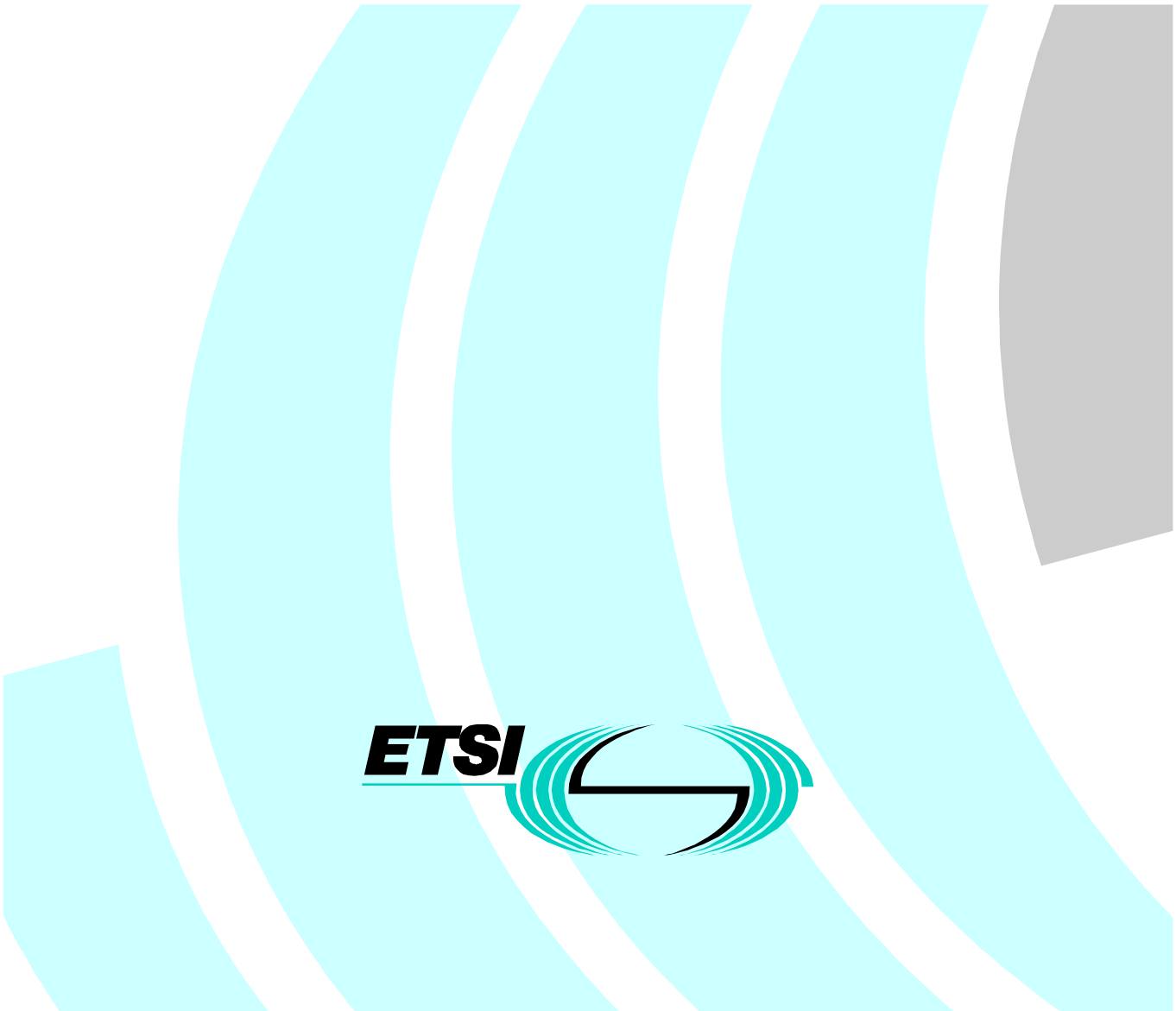

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Technical Report

UMTS Terrestrial Radio Access Network (UTRAN); Description of I_u Interface (UMTS ZZ.11 version 1.0.0)

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Contents

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Foreword

This Technical Report (TR) has been produced by the Special Mobile Group (SMG) of the European Telecommunications Standards Institute (ETSI).
This TR describes the UTRAN – CN (Iu) interface.The contents of this TR is subject to continuing work within TC-SMG and may change following formal TC-SMG approval.

1 Scope

This document shall provide a description of the UTRAN – CN interface (Iu) as agreed within the ETSI SMG2 UTRAN Architecture Expert Group.

2 References

[Editor´s note: Text copied from [1].*]*
The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

[1] UMTS ZZ.01, UTRAN Architecture Description,
[2] UMTS 23.10, UMTS Access Stratum Services and Function
[3] Tdoc SMG2 UMTS-L23 110/98, Vocabulary used in the UMTS L2&L3 Expert Group
[4] UMTS ZZ.12, Description of I_{ur} Interface
[5] UMTS ZZ.13, Description of I_{ub} Interface
[6] UMTS 23.30, Iu Principles

3 Definitions, Abbreviations and Symbols

3.1 Definitions

[Editor´s note: For list of definitions, see [1]. Only definitions specific to this document are listed below, in order to avoid inconsistency between documents. When list is stable, definitions relevant for this document should be extracted.]

3.2 Abbreviations

[Editor´s note: For list of abbreviations, see [1]. Only abbreviations specific to this document are listed below, in order to avoid inconsistency between documents. When list is stable, abbreviations relevant for this document should be extracted.]

3.3 Symbols

[Editor´s note: For list of symbolss, see [1]. Only symbols specific to this document are listed below, in order to avoid inconsistency between documents. When list is stable, symbols relevant for this document should be extracted.]

3.4 Notation

[Editor´s note: This text has been copied from [1].]
Parts of the document applying only to one one mode, FDD or TDD. Any such area will be tagged by [FDD — xxxxxxxxx] and [TDD — yyyyyyyyyyy] respectively. The tag applies to the text until the closing bracket.

4 General Aspects

4.1 UTRAN Architecture

[Editor´s note: This chapter should describe the UTRAN architecture from I_u point of view. In order to avoid inconsistency between documents, reference to [1], chapter 8.1, has been made. When finally approved, applicable parts should be included below.]
See [1], chapter 6.1.

4.2 I_u Interface Capabilities

[Editor´s note: This chapter should shortly describe the I_u –Interface Capabilities. In order to avoid inconsistency between documents, reference to [6], chapters 4 and 5, has been made]
See [6], chapters 4 and 5.

4.3 I_u Interface Specification Objectives

[Editor´s note: This chapter should shortly describe the I_u –Interface Specification Objectives.]

4.4 I_u Interface Characteristics

[Editor´s note: This chapter should shortly describe the I_u –Interface Characteristics. In order to avoid inconsistency between documents, reference to [6], chapters 4 and 5, has been made]

See [6], chapters 4 and 5.

5 Functions of the I_u Interface Protocol

[Editor´s note: This chapter should describe the functions of the I_u –Interface protocol]

6 I_u Interface Protocol Structure

[Editor´s note: This chapter should provide an introduction to the structure of the Iu interface protocols.]

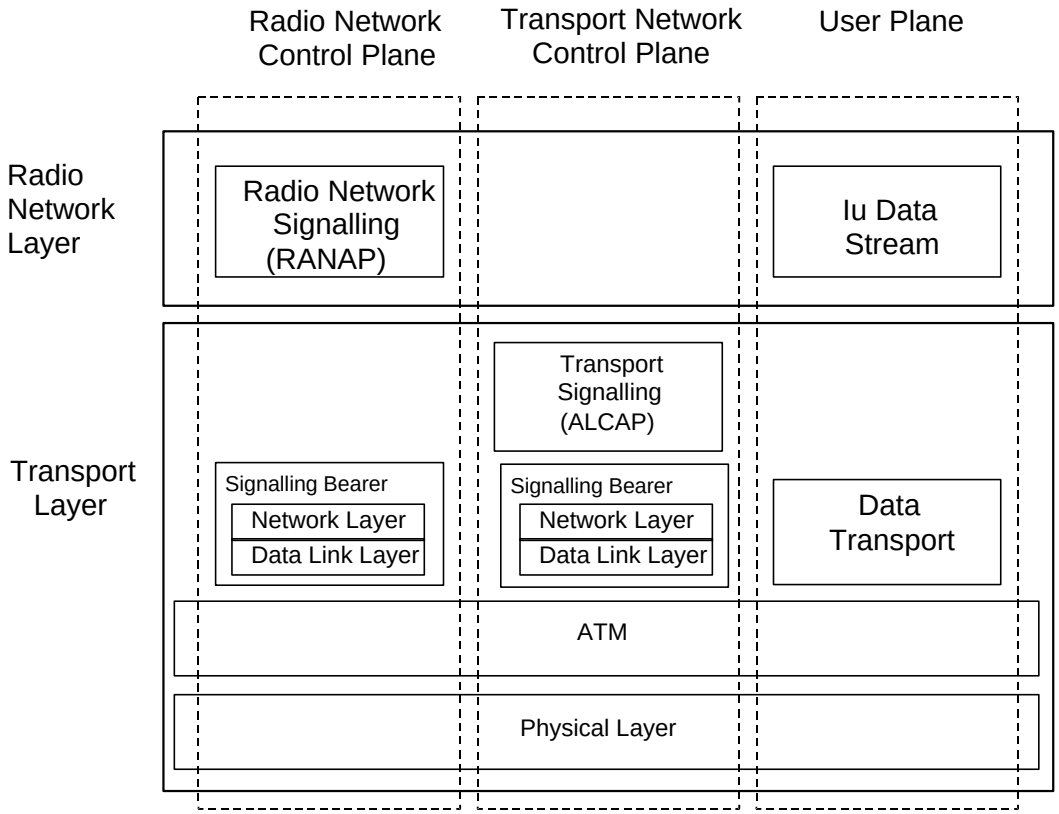

Figure 1. I_u –Interface Protocol Structure

7 I_u Interface Protocol Layer Specification for Radio Network Control Plane

7.1 Introduction

[Editor´s note: This chapter should give and introduction to the protocol layer specification for Radio Network Control Plane]

7.2 Radio Network Layer

7.2.1 General

[Editor´s note: This chapter should describe requirements on RANAP forward/backward compatibility, error handling principles, message coding principles etc.]

7.2.2 RANAP Procedures

[Editor´s note: This chapter should list RANAP procedures, including a text describing the procedure (triggering events, successful and unsuccessful outcome. Message sequences should be provided (using Word pictures for simple editing).]

7.2.2.1 Serving RNS relocation

[Editor's note: The RANAP procedures for Serving RNS Relocation have been included from Tdoc SMG2 UMTS-ARC 091/98 with the modifications as approved in 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.]

Serving RNS relocation is a procedure in which the serving RNS functionality of a specific RRC connection is relocated from one RNS to another without changing the radio resources or even without interrupting the user data flow.
Serving RNS Relocation is initiated by the Serving RNS (initiation by other network entities is FFS) and a precondition for the initiation is that the current active set is composed of only such a cells that belong to that RNS into which the serving RNS functionality is to be relocated (this is the simplest case that has been approved as the starting point, other cases are FFS).
When the serving RNS makes an algorithmic decision to relocate the serving RNS functionality to an other RNS a RANAP message to indicate that a Relocation is required is sent to the Core Network which is having an active RANAP connection related to the UE in question. This RELOCATION REQUIRED message includes essentially the target RNS identifier and an UTRAN information field (transparent to the core network).
Upon reception of the RELOCATION REQUIRED message the core network element should check whether the relocation is possible to be performed (This check is FFS). In successful case it sends a RELOCATION REQUEST message to the target RNS. The RELOCATION REQUEST contains essentially the received UTRAN information field and bearer identifier of each bearer to be established to the new Iu interface.
When the target RNS has received RELOCATION REQUEST message and all active bearers are identified, it should send a RELOCATION PROCEEDING1, message to the CN. This message contains essentially the Binding ID for each Iu leg to be established between UTRAN and CN.
Upon reception of RELOCATION PROCEEDING1 the CN should setup Iu legs (and indicate corresponding binding ID to UTRAN). After completion of this, the CN should send a RELOCATION PROCCEDING2 message to the target RNS.
Target RNS can, after having received RELOCATION PROCEEDING2 from CN element, start to act as the serving RNS for the RRC connection in question. After completing this, the target RNS (i.e. the new Serving RNS) sends RELOCATION COMPLETE to CN elements. CN elements will then release all bearers towards the old source RNS.
An example of a corresponding message flow at Iu interface in a successful situation is presented in Figure .

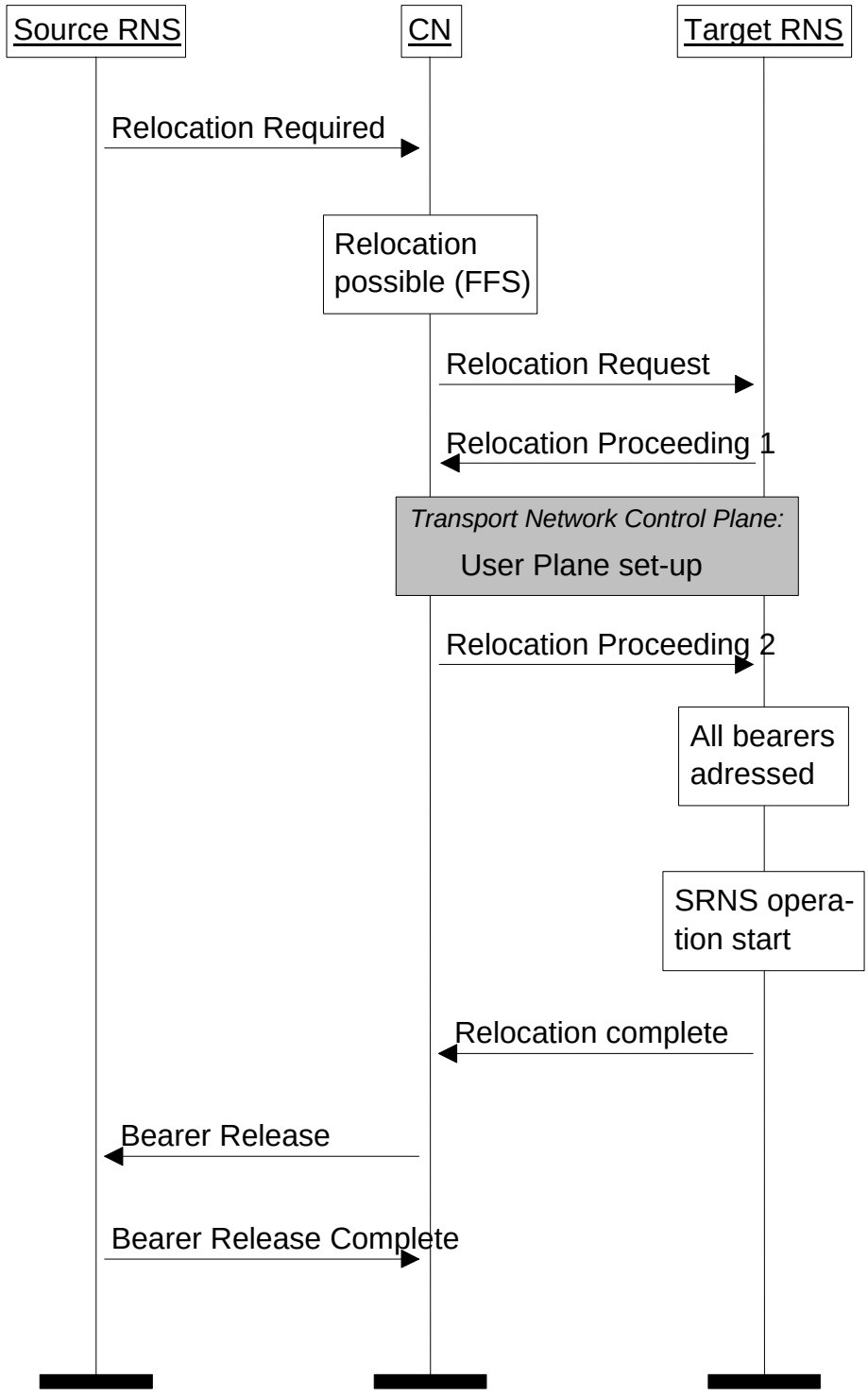

Figure 2. An example RANAP protocol message flow at Iu interface related to relocation of the Serving RNS functionality. A succesful case.

7.2.2.2 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 approved in 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.
When the serving RNS makes an algorithmic decision to start Inter RNS handover procedure a RANAP message to indicate requirement for hard handover is sent to 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 RELOCATION REQUIRED message includes essentially the target RNS identifier and an UTRAN information field.
Upon reception of the RELOCATION REQUIRED message the Core Network element should check whether the handover is possible to be performed (this check is FFS). In successful case the CN element sends a RELOCATION REQUEST to the target RNS. The RELOCATION REQUEST contains essentially the UTRAN information field and bearer identifier of each bearer to be established to the new Iu interface.
When the target RNS has received RELOCATION REQUEST messages and all active bearers are identified in these, it should send a RELOCATION PROCEEDING1, message to CN. This message contains essentially the Binding ID for each Iu leg and UTRAN information field (containing the Handover command for the UE).
Upon reception RELOCATION PROCEEDING1 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 RAN information field received in the RELOCATION PROCEEDING1 message to the source RNS in HANDOVER COMMAND message.
When source serving RNS has received 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) (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 RELOCATION COMPLETE to the CN.
CN will then release all bearers towards the old serving RNS.
An example of a corresponding message flow at Iu interface in a successful situation is presented in Figure.

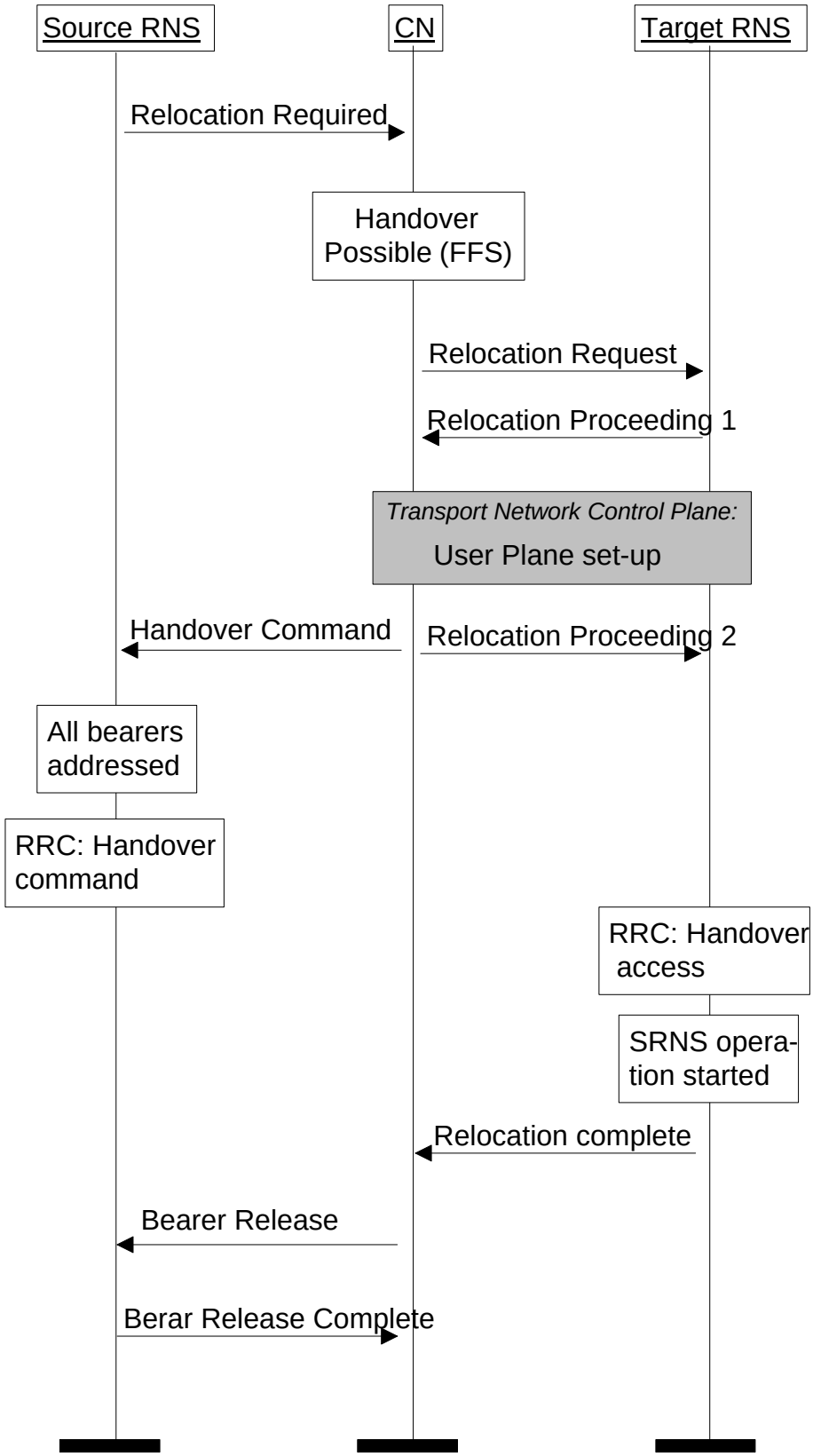

Figure 3. An example RANAP protocol message flow at Iu interface related to Inter RNS Hard Handover. A successful case.

7.2.2.3 Radio Access Bearer Assignment

This procedure is triggered from the CN side and is used to modifying the list of bearers established between the requesting CN element and a given MS for which a RRC connection exists with the requesting CN element prior the running of the procedure.

The procedure is started by the CN sending a RANAP RADIO ACCESS BEARER ASSIGNMENT REQUEST message. Such a message contains the information needed for the UTRAN to decide the new bearer configuration to build. This comprises :

- The list of the bearers to establish if possible, with their description and a identity;
- Bearer linking, building group of bearers which must be either all established, or all rejected ;
- The list of the identities of the bearers to keep if possible, with possibly a description when it is changed ;
- The list of the identities of the bearers to release ;

Each list may be empty. The bearers are only those related to RRC connection, i.e., used between the concerned MS and the requesting CN element. This excludes bearers set with other MS or with other CN elements.
For each bearer to establish, the following information is provided :

- An identity (bearer identity), used for eventual reference ;
- The characteristics of the MS-CN bearer, including such aspects as data rates, transmission quality of service, … Some of them may include negotiable values.
- Priority level and pre-emption indication ;
- Possibly a bit string to be passed to the upper layer on the UE side together with the bearer establishment indication.
- Binding Id used for associating the bearer identity and the corresponding User plane. The details of using the Binding Id are FFS.

For each bearer to keep if possible, none, part or all of the following information may be provided in addition to the bearer identity :

- The characteristics of the MS-CN bearer, including such aspects as data rates, transmission quality of service, …
- Priority level and pre-emption indication.

For each bearer to be released, only the bearer identity is provided. If a radio channel release is required because of a UTRAN generated reason (e.g. “O and M intervention”, “equipment failure”, or if transmission from the UE is lost) then, the RNC shall generate a BEARER RELEASE REQUEST message towards the CN. This message shall include a Cause Information Element, indicating the reason for the failure. On receipt of a BEARER RELEASE REQUEST the CN shall initiate the release, as defined above, by sending a RANAP RADIO ACCESS BEARER ASSIGNMENT REQUEST message. On receipt of this message the UTRAN shall, if the resources are not already internally released, release the resources in the normal way. The procedure is always terminated with a RANAP RADIO ACCESS BEARER ASSIGNMENT COMPLETE to the CN. This procedure handles both pre-configured and by-demand connections. The signalling flow for this procedure has been illustrated in Figure .

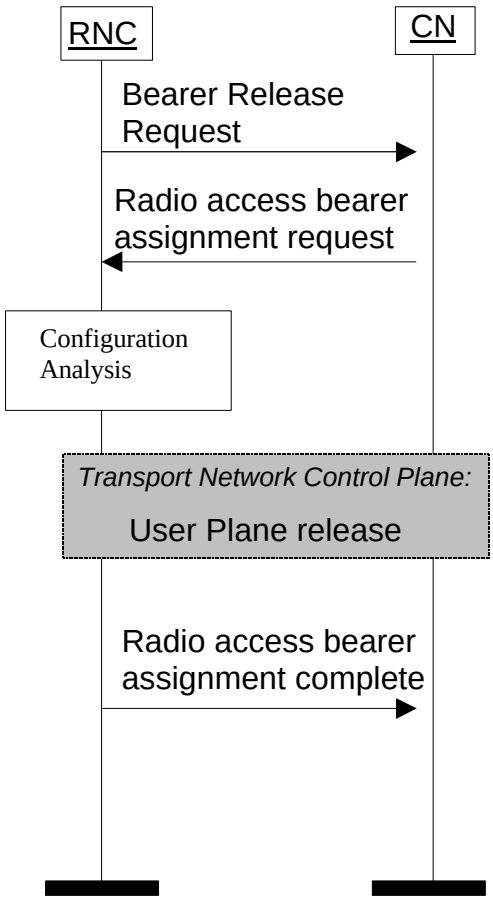

Figure 4. Radio Access Bearer Assignment procedure, UTRAN generated release.

On the basis of the information provided, of the MS capabilities, of the information pertaining to all bearers already established with the MS (in particular the priority level and pre-emption indication), the UTRAN decides on the new MS-UTRAN bearer configuration, and starts the AN-MS procedures to set this configuration, and, when applicable, the procedures to establish and release local AN-CN bearers. The algorithm applied to reach the decision is outside the scope of this protocol specification.
The UTRAN shall report to the different CN elements the changes of configuration when effective, or when put in queue. This can be done in one or several messages, depending on the case, and on UTRAN choices.
A RANAP RADIO ACCESS BEARER ASSIGNMENT COMPLETE message is sent to the requesting CN element when the whole request has been dealt with effectively. Such a message contains part or whole of the following information :

- The list of the bearer identities for the bearer successfully established or modified, if not already indicated ; with each bearer identity is provided the negotiable parameters as chosen by the UTRAN and the Binding Id used for associating the bearer identity and the corresponding User plane. The details of using the Binding Id are FFS.
- The list of the bearers which have been released, with for each a cause, if not already indicated.
- Localisation data, when the AN got more information on where is the MS while running the procedure.

The sending and the reception of this message ends the procedure between the UTRAN and the requesting CN element.
When at least one requested bearer has not been established, a RANAP RADIO ACCESS BEARER ASSIGNMENT FAILURE message is sent instead.
Such a message contains part or whole of the following information :

- The list of the bearer identities for the bearer successfully established or modified, if not already indicated ; with each bearer identity is provided the negotiable parameters as chosen by the UTRAN.
- The list of the bearers which has not been, and will not be, established, with for each a cause ;
- The list of the bearers which have been released, with for each a cause, if not already indicated.
- Localisation data, when the AN got more information on where is the MS while running the procedure.

A RANAP QUEUING INDICATION message can be sent to the requesting CN element prior to the RANAP RADIO ACCESS BEARER ASSIGNMENT COMPLETE or RANAP RADIO ACCESS BEARER ASSIGNMENT FAILURE message to indicate that only part of the request has been fulfilled, and that the rest has been in queue. This message contains the same kind of information as the RANAP RADIO ACCESS BEARER ASSIGNMENT COMPLETE message.
A RANAP BEARER CLEARED INDICATION message shall be sent to a CN element to indicate a bearer, or bearers, previously established between this element and the MS and which have been released that due to pre-emption.
The signalling flow for the Radio access bearer assignment procedure has been illustrated in Figure .

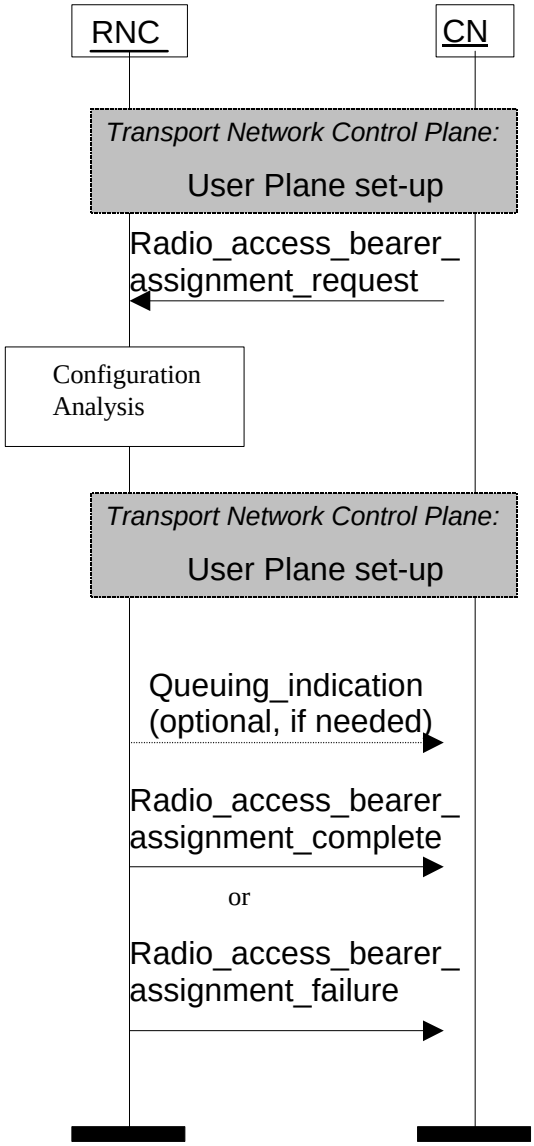

Figure 5. Radio Access Bearer Assignment procedure.

7.2.2.4 Iu Release

[Editor's note: In Mtg #9 it was agreed to include Iu Release procedure, but the details of this procedure are to be contributed.]
The CN uses the IU RELEASE COMMAND message to release all resources in the SRNS related to this Iu connection. The need for the IU RELEASE COMPLETE message is FFS.

7.2.2.5 Overload Control

These procedures are defined to give some degree of flow control. At the UTRAN processor overload and overload in the capability to send signalling messages to the UE are catered for, and at the CN processor overload is catered for.

7.2.2.5.1 Philosophy

The philosophy used is to stem the traffic at source with known effect on the service. The algorithm used is:

- On receipt of the first OVERLOAD message or signaling point congested information, the traffic is reduced by one step. At the same time, timers T(igOC)(T(igOR)) and T(inTC)(T(inTR)) are started. During T(igOC)(T(igOR)) all received overload messages or signaling point congested information are ignored in order not to reduce the traffic too rapidly. Reception of an OVERLOAD message or signaling point congested information after expiry of T(igOC)(T(igOR)) but still during T(inTC)(T(inTR)) , will decrease the traffic load by one more step, and restart T(igOC)(T(igOR)) and T(inTC)(T(inTR)).

- This step by step reduction of traffic is continued until maximum reduction is obtained by arriving at the last step. If T(inTC)(T(inTR)) expires (i.e. no OVERLOAD message or signaling point congested information is received during T(inTC)(T(inTR))) the traffic will be increased by one step and T(inTC)(T(inTR)) will be started, unless full load has been resumed.

NOTE: Timers T(igOC) and T(inTC) are running in the CN whilst Timers T(igOR) and T(inTR) are running in the UTRAN.

- The number of steps and the method of reducing the load is considered to be an implementation specific function.

There may be other traffic control mechanisms from O and M activities occurring simultaneously.

7.2.2.5.2 Overload at the CN

The CN can indicate to the RNC that it is in a congested state by sending an OVERLOAD message. This is sent as a connectionless global message.
At the UTRAN receipt of this message causes the reduction of traffic to the CN node sending the message using the method described in subclause 7.2.2.5.1.
The signalling flow for Overoad at the CN is shown in Figure .

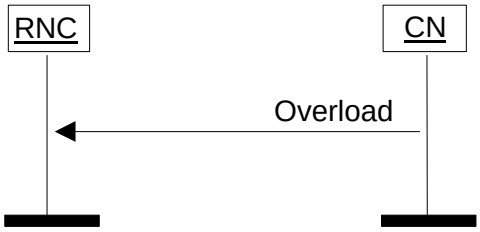

Figure 6. Overload at the CN.

7.2.2.5.3 Overload at the UTRAN

If the UTRAN is not capable to send signalling messages to the UE due to overloaded resources then the UTRAN sends an OVERLOAD message to the CN with the appropriate cause (Cause value: “overload in the capability to send signalling messages to the UE”).
If the UTRAN processing is overloaded then the RNC sends an OVERLOAD message with the Cause value: “processor overload”.
The CN originated traffic is reduced in accordance with the method described in subclause 7.2.2.5.1.
The signalling flow for Overload at the UTRAN is shown in Figure .

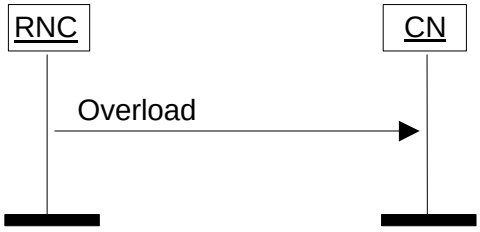

Figure 7. Overload at the UTRAN.

7.2.2.5.4 Message throughput congestion

If the lower layers of the protocol for Radio Network Control Plane Signaling Bearer become congested then it is assumed that the MTP congestion indication will take place and the source of the traffic will receive primitives from the transport protocols resulting in it reducing the generated load.
A suitable method to achieve this reduction could be based on that given in subclause 7.2.2.5.1.

7.2.2.6 Reset

The purpose of the reset procedure is to initialise the UTRAN and CN in the event of a failure. The procedure is a global procedure applying to a whole RNC (instead of a particular UE), and therefore all messages relating to the reset procedure are sent as global messages using the connectionless mode of the SCCP.
If only a limited part of the CN or UTRAN has suffered a failure then Radio Access Bearer Assignment Request procedures (indicating bearer release) can be used to clear only the affected Radio Access Bearers.

7.2.2.6.1 Reset at the UTRAN

In the event of a failure at the UTRAN which has resulted in the loss of transaction reference information, a RESET message is sent to the CN. This message is used by the CN to release affected Radio Access Bearers and erase all affected references.
After a guard period of T(RatR) seconds a RESET ACKNOWLEDGE message is returned to the UTRAN indicating that all references have been cleared.
The signalling flow for Reset at the UTRAN is shown in Figure .

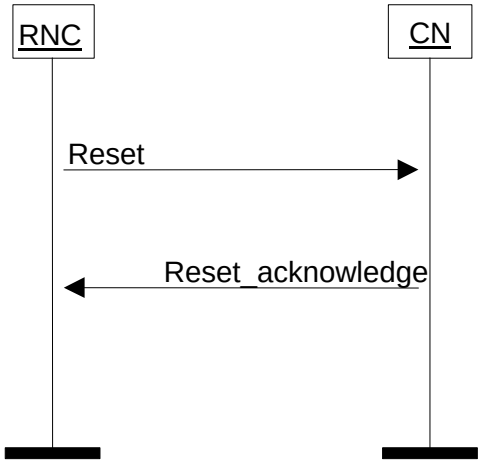

Figure 8. Reset at the UTRAN.

7.2.2.6.2 Reset at the CN

In the event of a failure at the CN which has resulted in the loss of transaction reference information, a RESET message is sent to the RNC. This message is used by the UTRAN to release affected Radio Access Bearers and erase all affected references.
After a guard period of T(RatC) seconds a RESET ACKNOWLEDGE message is returned to the CN, indicating that all Ues which were involved in a call are no longer transmitting and that all references at the UTRAN have been cleared.
Figure shows the signalling flow for Reset at the CN.

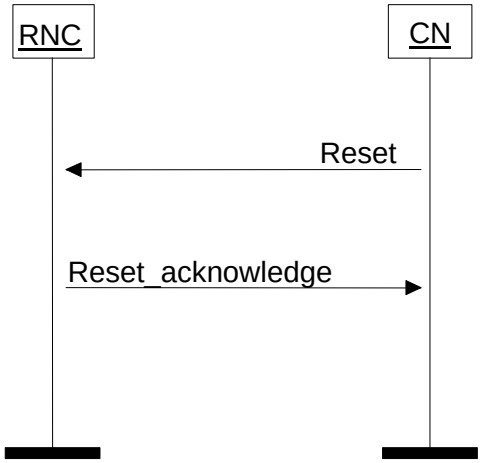

Figure 9. Reset at the CN.

7.2.2.6.3 Abnormal Conditions

7.2.2.6.3.1 Abnormal Condition at the UTRAN

If the RNC sends a RESET message to the CN and receives no RESET ACKNOWLEDGE message within a period T(RafC) then it shall repeat the entire reset procedure. The sending of the RESET message is repeated a maximum of “n” times where n is an operator matter. After the n-th unsuccessful repetition the procedure is stopped and the maintenance system is informed.

7.2.2.6.3.2 Abnormal Condition at the CN

If the CN sends a RESET message to the RNC and receives no RESET ACKNOWLEDGE message within a period T(RafR) then it shall repeat the entire reset procedure. The sending of the RESET message is repeated a maximum of "n" times where n is an operator matter. After the n-th unsuccessful repetition the procedure is stopped and the maintenance system is informed.

7.2.2.6.3.3 Crossing of Reset messages

Actions for the case, when the entity, which has sent a RANAP RESET message and is waiting for a RANAP RESET ACKNOWLEDGE message, but receives a RANAP RESET message are FFS.

7.2.2.7 Common Id

This procedure is needed, if the MM concept will require the UTRAN to send a page message on the existing RRC connection.
The purpose of the RANAP Common Id procedure is to allow the RNC to create a reference between the IMSI of a user and the RRC connection of that user. This is achieved by sending the IMSI of a verified user from the CN to the RNC. The RNC is then able to check whether there is already signaling bearer to the UE when a CN starts connection establishment by sending Paging message. The signaling bearer can be already used by an other CN, and if this is the case, the RNC uses it to send the Paging message to the MS.
The CN sends a COMMON ID message after it has ensured the identity of UE. The message contains the IMSI of the user. The RNC associates the permanent identity to the RRC Connection of that user and saves it for the duration of the RRC connection. The signalling flow Common Id procedure is shown in Figure .

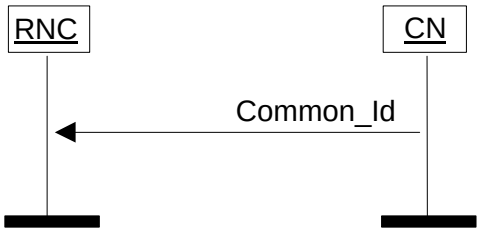

Figure 10. Common Id procedure.

7.2.2.8 Paging

PAGING messages for all Ues shall be sent via the RANAP as a connectionless message. These will include some information to allow derivation of the paging population number, the IMSI of the user to be used as the Common Id of the user in the RNC, the Id of the User to be used in the paging channel (e.g. TMSI); they may also include information on the subsequent transaction related to the paging. A corresponding radio interface paging message transmitted over the radio interface at the appropriate time. The issue of storing the RANAP PAGING message for future paging repetition is FFS.
It should be noted that each RANAP PAGING message on the CN-UTRAN interface relates to only one UE and therefore the UTRAN has to pack the pages into the relevant radio interface paging message.
If the UTRAN receives a radio interface PAGING RESPONSE message, this message is passed to the CN. The relevant connection to the CN is set up, if it doesn't exist. The mechanism of sending the radio interface PAGING RESPONSE message to the CN is FFS.
A single RANAP PAGING message across the CN to UTRAN interface contains information on the area in which the page shall be broadcast. This is indicated with UE location parameter (content FFS, e.g. LA or RA).
The signalling flow of the paging procedure is illustrated in Figure .

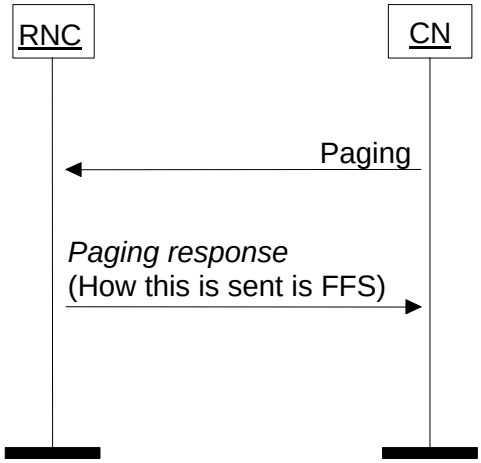

Figure 11. Paging procedure.

7.2.2.9 Trace Invocation

The purpose of the trace invocation procedure is to inform the receiving entity that it should begin producing a trace record on this particular transaction.
The trace is invoked by the CN sending a RANAP CN INVOKE TRACE message to the UTRAN.
The events and parameters to be recorded are indicated in the “Trace type” information element.
The element “OMCId”, if present, indicates the OMC to which the record is destined.
The CN may allocate and include an “CN transaction reference” (typically a call reference) into the RANAP CN INVOKE TRACE message. The transaction reference is contained in the information element “TransactionId”.
The message includes a trace reference which is allocated by the entity which triggered the trace.
The element “TriggerId”, if present, indicates the entity which triggered the trace.
The trace reference, triggerId and transactionId Information Elements are used to tag the trace record to allow simpler construction of the total record by the entity which combines trace records.
The messages are not acknowledged and are sent as a connection oriented message on the connection on which a trace is required.
The signalling flow of the Trace invocation procedure is shown in Figure .

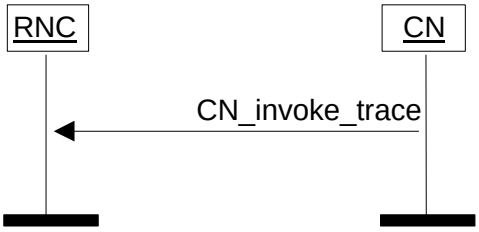

Figure 12. Trace Invocation procedure.

7.2.2.10 Cipher Mode Control

7.2.2.10.1 Successful operation

The cipher mode control procedure allows the CN to pass cipher mode information to the UTRAN to select and load the user data and signaling encryption device with the appropriate key.
This is achieved by sending the UTRAN a RANAP CIPHER MODE COMMAND message. Receipt of the message at the UTRAN will cause the generation of a radio interface CIPHERING MODE COMMAND message and, if applicable, invoke the encryption device and start stream ciphering.
If within the RANAP CIPHER MODE COMMAND, the signaling element “Cipher response mode” is present and indicates “IMEI must be included by the Mobile Station”, then the UTRAN shall request in the radio interface message CIPHERING MODE COMMAND the Mobile Station to include its IMEI in the radio interface CIPHERING MODE COMPLETE message.
In the RANAP CIPHER MODE COMMAND the CN specifies which of the ciphering algorithms may be used by the UTRAN. The UTRAN then selects an appropriate algorithm, taking into account the UE ciphering capabilities. The RANAP CIPHER MODE COMPLETE message returned to the CN indicates the chosen ciphering algorithm. The set of

permitted ciphering algorithms specified in the RANAP CIPHER MODE COMMAND shall remain applicable for subsequent Assignments and Intra-UTRAN Handovers.
The RANAP CIPHER MODE COMMAND and RANAP CIPHER MODE COMPLETE messages are sent as connection oriented messages via the appropriate SCCP connection.
Receipt of the radio interface CIPHERING MODE COMPLETE message (or other correctly deciphered layer 2 frame) from the radio interface is used internally within the UTRAN to achieve radio interface ciphering synchronisation. When the UTRAN receives the radio interface CIPHERING MODE COMPLETE from the UE a RANAP CIPHER MODE COMPLETE message is returned to the CN.
The handling of ciphering keys from two CN entities is FFS.
The signalling flow of the successful Cipher mode control procedure is shown in Figure .

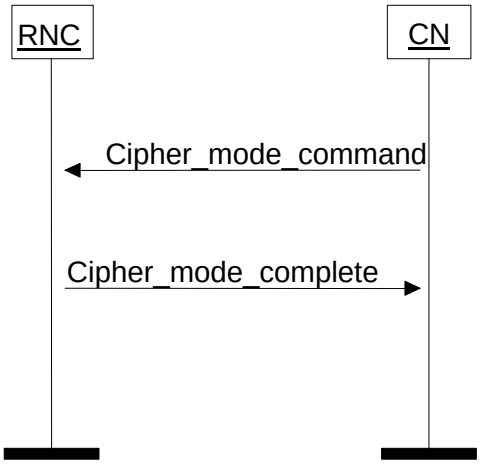

Figure 13. Cipher Mode Control procedure, successful case.

7.2.2.10.2 Abnormal conditions

If the UTRAN or the UE is unable to support the ciphering algorithm specified in the RANAP CIPHER MODE COMMAND message then it shall return a RANAP CIPHER MODE REJECT message with Cause value “Ciphering algorithm not supported”. A RANAP CIPHER MODE REJECT message shall also be returned if the CN requests a change of ciphering algorithm when ciphering is already active.
The signalling flow of the Cipher mode control procedure in abnormal conditions is shown in Figure .

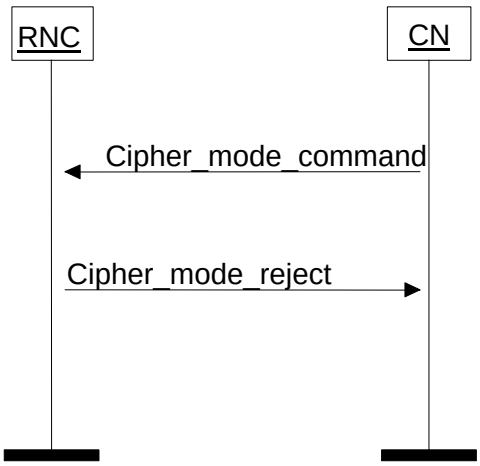

Figure 14. Cipher Mode Control procedure, unsuccessful case.

7.2.2.11 CN Information Broadcast

A functionality of the (UT)RAN is to broadcast repetitively to all users [in idle mode] system information as provided by the core network. A core network element sets or modifies the CN system information by sending a RANAP CN INFORMATION BROADCAST REQUEST message which indicates:

- The information pieces to be broadcast, as a number of bit strings. The internal structure of these bit strings is not known or analysed by the RAN, and is specified as part of the CN-MS protocols.
- With each bit string, a geographical area where to broadcast it.

- With each bit string, some categorisation parameters to be used by the RAN to determine how to schedule the repetition cycle.

If the UTRAN can broadcast the information as requested, a RANAP CN INFORMATION BROADCAST CONFIRM message is returned to the CN.
If the UTRAN can not broadcast the information as requested, a RANAP CN INFORMATION BROADCAST REJECT message is returned to the CN.
Each information piece is broadcast in the intersection between the indicated geographical area and the area under control by the receiving RNC. It is broadcast until explicitly changed or a reset occurs. A CN element will run this procedure typically after each reset, and whenever the information needs to be changed.
Between a reset and the first reception of this message, what is broadcast is FFS. However, great care shall be taken to ensure that UE's do not reselect another PLMN and cause e.g. a surge of location updating on that other PLMN.

7.2.2.12 Direct Transfer

The Direct Transfer procedure is used to carry UE – CN signaling messages over the Iu Interface. The UE – CN signalling messages are not interpreted by the UTRAN, and their content (e.g. MM or CC message) is outside the scope of this specification. The UE – CN signalling messages are transported as a parameter in the Direct Transfer messages. When the CN has message that has to be sent to the UE (e.g. a CC or MM message) it will send DIRECT TRANSFER REQUEST to the RNC including the CN to UE message as a parameter. The signalling flow for the CN originated Direct transfer procedure is shown in Figure .

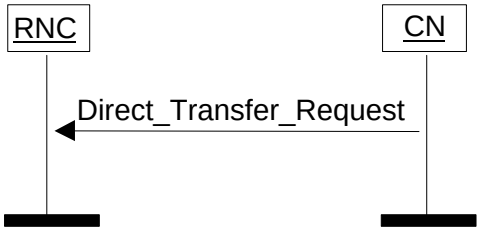

Figure 15. Direct Transfer, CN originated.

When the RNC has received a message from the UE that has to be sent to the CN without interpretation (e.g. a CC or MM message in response to the previously sent CC or MM message from the CN) it will send DIRECT TRANSFER REQUEST to the CN and including the UE to CN message as a parameter. The signalling flow for the UTRAN originated Direct transfer procedure is shown in Figure .

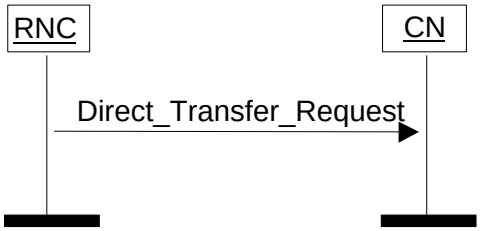

Figure 16. Direct Transfer, RNC originated.

7.2.3 RANAP Messages

[Editor's note: This chapter should describe RANAP messages]

7.2.4 RANAP information elements

[Editor's note: This chapter should describe RANAP information elements]

7.3 Transport Layer

7.3.1 General

[Editor´s note: This chapter should e.g. describe Radio Network Layer requirements on Transport Layer protocols.*]*
The following requirements on the SB can be stated:

- Provide reliable transfer of control plane signalling messages in both connectionless mode and connection-oriented mode;
- Provide separate independent connections for distinguishing transactions with individual Ues;

- Supervise the 'UE connections' and provide connection status information to the Upper Layers for individual Ues;
- Provide networking and routing functions;
- Provide redundancy in the signalling network;
- Provide load sharing.

7.3.2 Services provided by the signalling bearer

When considering the requirements that the upper layers, i.e. RANAP, have on the SB, there are a number of services it has to provide and a number of functions to perform.
Table 1 gives an overview of the minimum set of services that the signalling bearer shall provide to the upper layers.

Table 1: Network service primitives for the Signalling Bearer (SB)

Primitives	
Generic name	Specific name
N-CONNECT	Request Indication Response Confirm
N-DATA	Request Indication
N-DISCONNECT	Request Indication
N-UNITDATA	Request Indication
N-STATUS	Indication

7.3.3 Iu Signalling Bearer

Figure , below, illustrates a protocol model having Signalling System No.7 as the signalling bearer for RANAP over the Iu interface that fulfils the requirements.
Other protocol stacks that may fulfil the requirements are FFS. The need for multiple linksets is FFS.

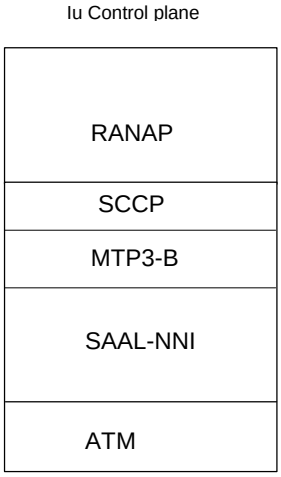

Figure 17. Iu Signalling bearer of RANAP.

-0 **SCCP** (Q.711 – Q.719)(Signalling Connection Control Part): Provides connectionless service, class 0, connectionless service with guaranteed order, class 1, connection oriented service, class 2, separation of the connections mobile by mobile basis on the connection oriented link and establishment of a connection oriented link mobile by mobile basis

-1 **MTP3-B** (Q.2210) (Message Transfer Part): Provides message routing, discrimination and distribution (for point-to-point link only), signalling link management load sharing and changeover/back between link within one link-set.

-2 **SAAL-NNI** (Q.2100)(Signalling ATM Adaptation Layer – Network-to-Network Interface): Consists of the following sub-layers; - **SSCF** (Q.2140) Service Specific Convergence Function, - **SSCOP** (Q.2110) Service Specific Connection Oriented Protocol and – **AAL5** (I.363.5) ATM Adaptation Layer Type 5. The SSCF maps the requirements of the layer above to the requirements of SSCOP. Also SAAL connection management, link status and remote processor status mechanisms are provided. SSCOP provides mechanisms for the establishment and release

of connections and the reliable exchange of signalling information between signalling entities. Adapts the upper layer protocol to the requirements of the Lower ATM cells.

-3 **ATM** (Asynchronous Transfer Mode). ATM is based on the ITU-T recommendation I.361."

8 I_u Interface Protocol Layer Specification for Transport Network Control Plane

8.1 Introduction

[Editor´s note:This chapter should describe general requirements and structure of the Transport Network Control Plane.]

8.2 Transport Layer

8.2.1 General

8.2.2 ALCAP

[Editor´s note: This chapter should refer to specifications of the transport signalling protocols represented by the generic name ALCAP. Limitations in usage of options of the protocol should be described.]

8.2.3 Iu Signalling Bearer

[Editor´s note: This chapter should refer to specifications of the Network Layer protocol(s).Limitations in usage of options of the protocol(s) should be described.]

9 I_u Interface Protocol Layer Specification for User Plane

9.1 Introduction

[Editor´s note: This chapter should describe the structure of the User Plane

9.2 Radio Network Layer

9.2.1 General

[Editor´s note: This chapter should describe structure of Iu Data Streams]

9.3 Transport Layer

[Editor´s note: This chapter should refer to specifications of the Transport Layer *protocol(s). Limitations in usage of options of the protocol(s) should be described.]*

10 Physical Layer

11 Example Sequences

[Editor's note: This chapter should contain examples of sequences including both User Plane and Transport Network Control Plane signalling.]

History

Document history		
Date	Version	Comment
Aug 1998	0.0.1	First draft
Sept 1998	0.0.2	Second draft edited according to decisions in mtg #5: Transport Network Control Plane procedures indicated in the signaling flows. *Functional division* section changed to *functions of the protocol*. Proposed list of RANAP procedures removed.
Sept 1998	0.0.3	Third draft edited according to decisions in mtg #6: UMTS 23.30 added to list of references, and reference made to it from sections 7.2 and 7.4.
Nov 1998	0.0.4	Fourth draft edited according to decisions in mtg #7: Radio Access Bearer Assignment procedure added according to Tdoc SMG2 UMTS-ARC 234/98with agreed modifications. CN Information Broadcast procedure added according to Tdoc SMG2 UMTS-ARC 233/98 with agreed modifications. Direct Transfer procedure added according to Tdoc SMG2 UMTS-ARC 216/98. Section 10.3.2 Iu Signalling Bearer assuming the use of SS7 signalling stack for RANAP was added according to Tdoc SMG2 UMTS-ARC 190/98 with agreed modifications. Old Sections 10.3.2 Network Layer and 10.3.3 Data Link Layer removed. Section 13 Physical Layer added.
Nov 1998	0.0.5	Changes from ARC EG meeting #8 incorporated. Minor editorial modifications made to harmonize the structure of this document with corresponding Iur and Iub documents.
Dec 1998	0.0.6	Updated according to the agreements in ARC EG meeting #9. Some earlier approved figures and the related text were revised to harmonize with other documents. Binding Id and UTRAN generated release request according to Tdoc SMG2 UMTS-ARC 369/98 were agreed to be included in RAB assignment procedure as modified. The following new RANAP procedures were agreed: Overload control procedure as in Tdoc SMG2 UMTS-ARC 370/98 with modifications. Reset procedure as in Tdoc SMG2 UMTS-ARC 371/98 with modifications. Common Id procedure as in Tdoc SMG2 UMTS-ARC 373/98 with modifications. Paging procedure as in Tdoc SMG2 UMTS-ARC 374/98 with modifications. Trace invocation procedure as in Tdoc SMG2 UMTS-ARC 375/98 with modifications. Cipher mode control procedure as in Tdoc SMG2 UMTS-ARC 376/98 with modifications. A list of requirements on the signalling bearer, a list of services provided by the signalling bearer and a statement that SCCP shall be used to carry RANAP over Iu interface added according to Tdoc SMG2 UMTS-ARC 346/98 with modifications.
Jan 1999	0.0.7	Same as 0.0.6 with revision marks accepted.

Jan 1999	0.0.8	Modified according to agreements in email reflector discussions. Sections 9.2.2.1 and 9.2.2.2 have been changed back to the status as they were in v. 0.0.5 with the note that these chapters will be restructured and aligned with ZZ.02. In section 9.2.2.4, a statement regarding the usage of Iu Release Command message has been added. Also a note that Iu Release Complete message is FFS has been added. In section 9.3.3, the statement that the SCCP shall be used to carry RANAP signalling over Iu interface, has been removed.
Jan 1999	0.0.9	Same as 0.0.8 with revision marks removed.
Jan 1999	0.1.0	Same as 0.0.9 approved as version 0.1.0. Submitted to SMG2.

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