TSG-RAN Meeting #12 *RP-010304*
Stockholm, Sweden, 12 - 15 June 2001

Title: **Agreed CRs (Release '99 and Rel-4 category A) to TS 25.303**

Source: **TSG-RAN WG2**

Agenda item: **8.2.3**

Doc-1st-	Status-	Spec	CR	Rev	Phase	Subject	Cat	Version	Versio
R2-011408	agreed	25.303	045	1	R99	Corrections to procedure examples	F	3.7.0	3.8.0
R2-011409	agreed	25.303	046		Rel-4	Corrections to procedure examples	A	4.0.0	4.1.0

3GPP TSG-RAN WG2 Meeting #21
Busan, Korea, May 21st-25th 2001

Tdoc R2-011408

CR-Form-v3

CHANGE REQUEST

⌘ **25.303 CR 045** ⌘ rev **r1** ⌘ Current version: **3.7.0** ⌘

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Proposed change affects: ⌘ (U)SIM ☐ ME/UE **X** Radio Access Network **X** Core Network ☐

Title: ⌘	Corrections to procedure examples	
Source: ⌘	TSG-RAN WG2	
Work item code: ⌘	TEI	***Date:*** ⌘ 2001-05-25
Category: ⌘	**F**	***Release:*** ⌘ R99

Use one of the following categories:
F *(essential correction)*
A *(corresponds to a correction in an earlier release)*
B *(Addition of feature),*
C *(Functional modification of feature)*
D *(Editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
REL-4	*(Release 4)*
REL-5	*(Release 5)*

Reason for change: ⌘ The inter-layer procedure examples are not in line with the protocol specifications. Even if these diagrams are said informative (see clause 1), there is no reason why there should be differences if 25.303 should be useful.

Summary of change: ⌘

- Names on RRC messages are corrected for the procedures “UE initiated signalling connection establishment”, “Dynamic resource allocation control of uplink DCHs”, “Hard handover”, “RRC connection re-establishment”, Inter-system handover: UTRAN to GSM/BSS”, “UTRAN originated paging”, “UTRAN co-ordinated paging using DCCH”,
- For the procedure “UE initiated signalling connection establishment”, the point when the confirmation of signalling connection establishment is done in the UE is aligned with the RRC specification (when RRC has requested RLC to transmit the INITIAL DIRECT TRANSFER message).
- Clarification on that the procedure “Dynamic resource allocation control of uplink DCHs” only applies to UEs that are capable of simultaneous reception of Secondary CCPCH and DPCH.
- Failure cases for the procedure “Combined cell/URA update and SRNS relocation” corrected. CELL/URA UPDATE FAILURE messages do not exist, and the error handling is made by transmitting a new CELL/URA UPDATE. Since these sequences are just examples, it is proposed to not describe the error cases in the same sequence as the normal case.
- The procedure “Combined hard handover and SRNS relocation” is changed to only show one example (using PHYSICAL CHANNEL RECONFIGURATION) and only the normal case, instead of trying to cover all messages and also error cases.
- Minor corrections in the UTRAN to GSM inter-RAT handover procedure.
- The procedure “RRC connection re-establishment” is corrected to use the messages and semantics of the cell update procedure with cause “radio link failure”.
- The UE CAPABILITY INFORMATION CONFIRM message is added to the “UE capability information” procedure.

		Backward compatibility Correction to a functional descriptions where the specification was ambiguous or not sufficiently explicit. The proposed changes do not change the behaviour, since the inter-layer procedure examples in 25.303 are informative only and an alignment is made towards the RRC protocol specification.
Consequences if not approved:	⌘	Inconsistency between specifications.

Clauses affected:	⌘	6.1.2, 6.2.5, 6.4.7, 6.4.8.1, 6.4.8.2, 6.4.8.3, 6.4.8.4, 6.4.9, 6.4.11, 6.5.1, 6.6, 6.7.1		
Other specs affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications	⌘	
Other comments:	⌘			

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at: http://www.3gpp.org/3G_Specs/CRs.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.
2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 TSG meetings.
3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

6.1.2 UE Initiated Signalling Connection Establishment

NOTE 1: In case additional UE capability information is needed at RRC Connection Establishment, it is transmitted in the RRC Connection Setup Complete message.

The sequence in figure 2 shows the establishment of the first Signalling Connection for the UE, initiated by the UE.

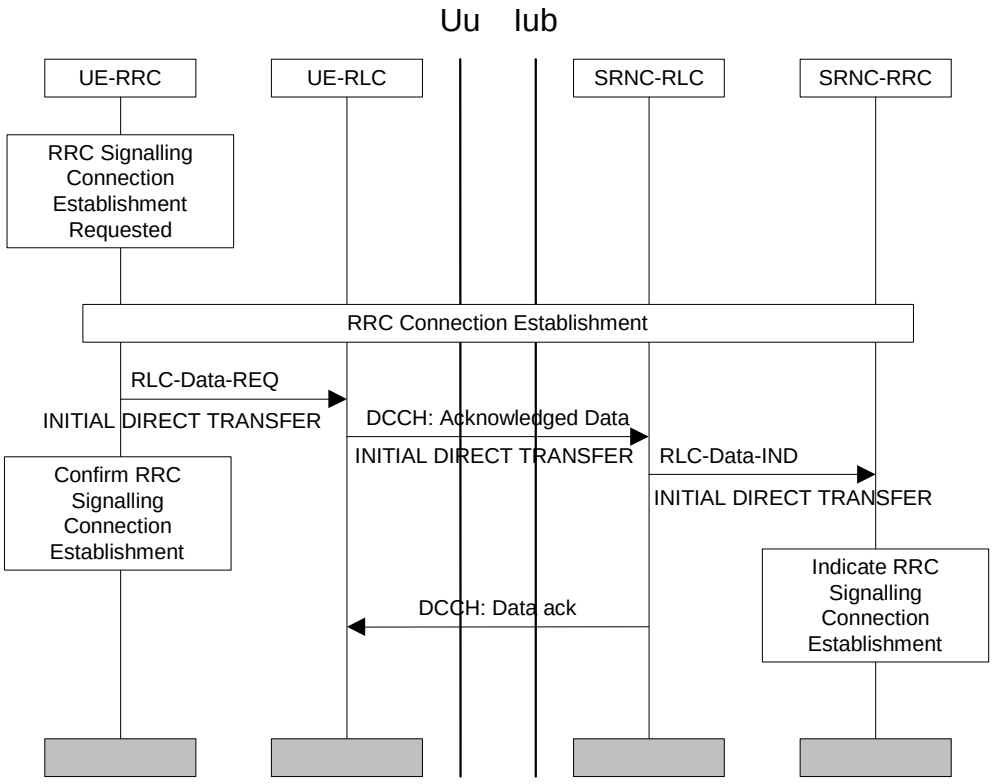
RRC Signalling Connection Establishment is requested by the non access stratum in the UE with a primitive over the Dedicated Control (DC) SAP. The primitive contains an initial message to be transferred transparently by RRC to the non-access stratum entity on the network side.

NOTE 2: The initial NAS message could for a GSM based Core Network be e.g. CM Service Request, Location Update Request etc.

If no RRC connection exists, the RRC layer makes an RRC connection establishment, which includes the transmission of UE capability information. When the RRC connection establishment is completed, the signalling connection establishment can be resumed.

The initial message from NAS is transferred in the RRC message "Initial Direct Transfer" using acknowledged mode on the DCCH, to the network, where it is passed on with an RRC Signalling Connection Establish IND primitive over the DC-SAP.

When the UE-RRC has requested UE-RLC to transmit the INITIAL DIRECT TRANSFER message , the Signalling Connection Establishment is confirmed by the UE-RRC.



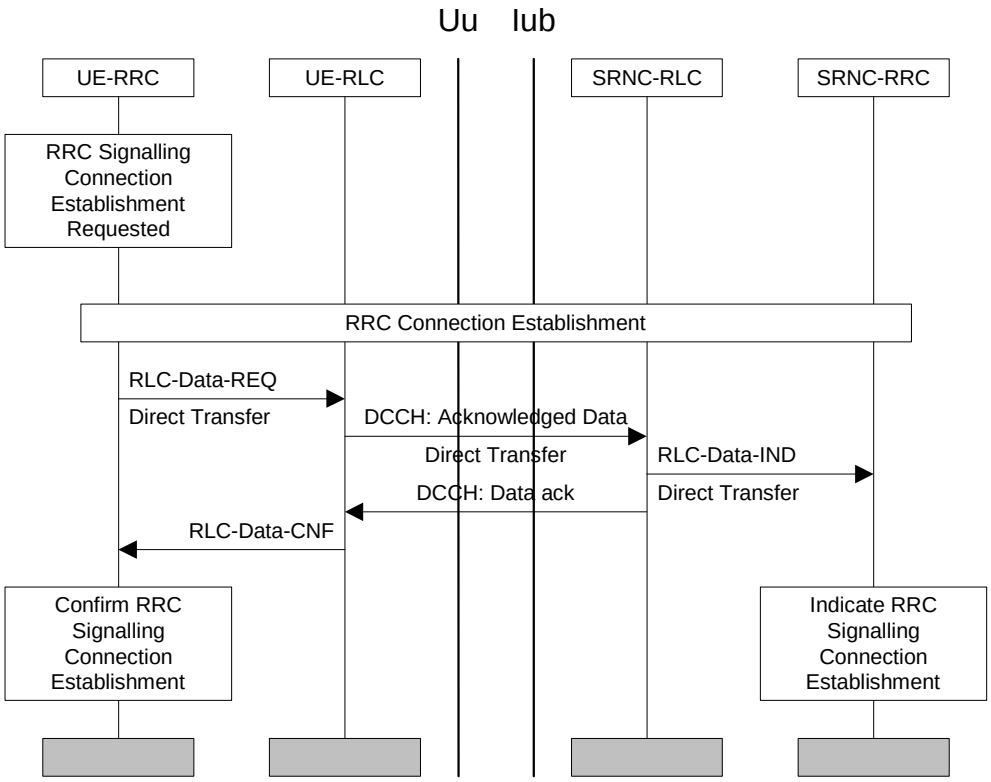


Figure 2: UE initiated Signalling Connection Establishment

6.2.5 Dynamic Resource Allocation Control of Uplink DCHs

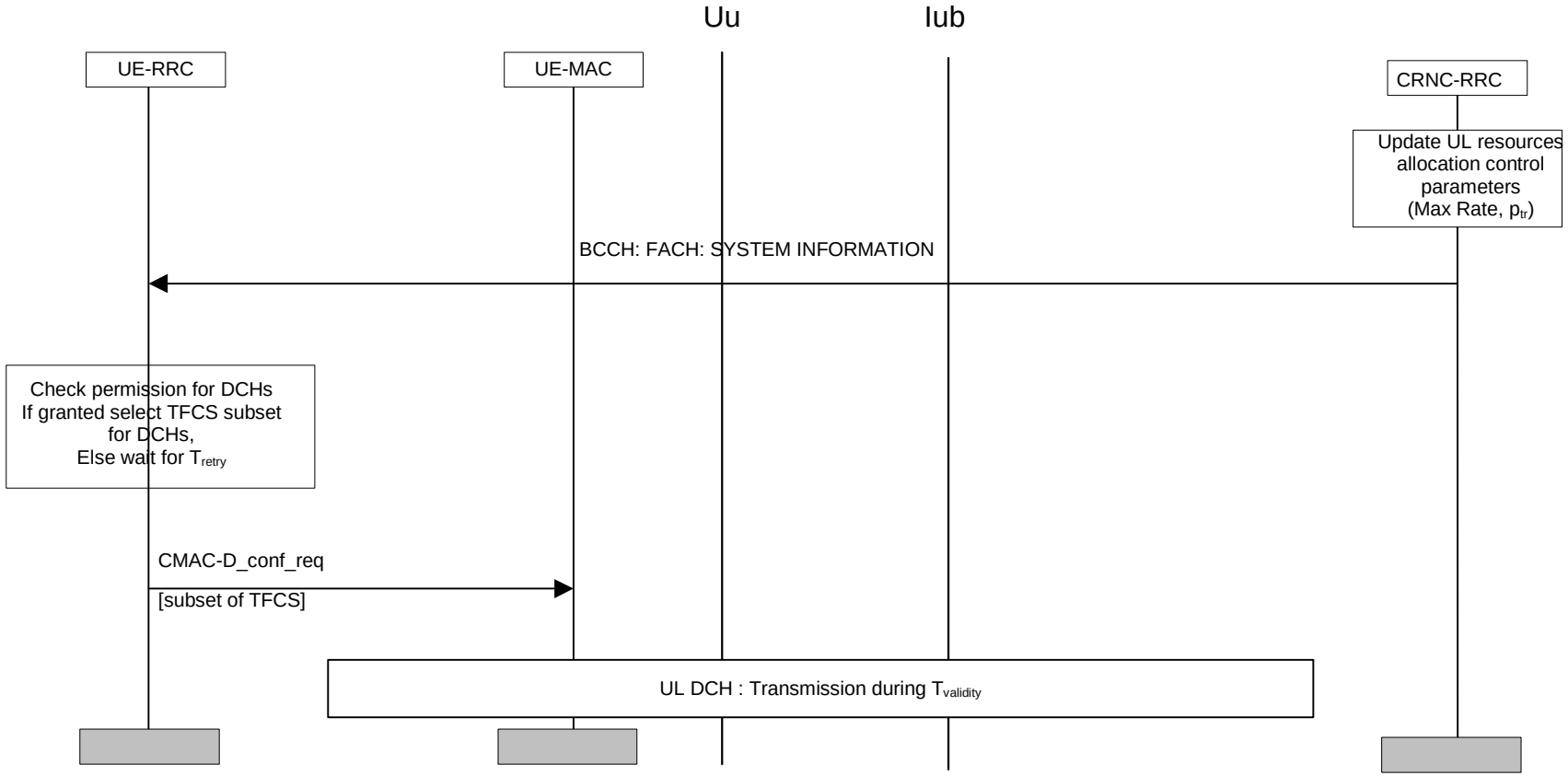


Figure 17: Dynamic Resource Allocation Control of Uplink DCHs

Figure 17 illustrates an example of a Dynamic Resource Allocation Control (DRAC) procedure of uplink DCHs. The CRNC regularly broadcasts the following parameters:

- transmission probability ptr, which indicates the probability for a UE to be allowed to transmit on its DCHs, which are under control by this procedure, during the next period $T_{validity}$;

- maximum total bit rate allowed to be used by the UE on its DCH which are under controlled by this procedure, during the next allowed period $T_{validity}$.

Besides these parameters, the RNC has allocated the following parameters to the UE:

- transmission time validity, $T_{validity}$, which indicates the time duration for which an access for transmission is granted;

- reaccess time T_{retry}, which indicates the time duration before retrying to access the resources, in case transmission has not been granted.

This procedure is initiated with a SYSTEM INFORMATION message containing the above DRAC parameters regularly broadcast by the CRNC on the FACH. It applies to all UEs capable of simultaneous reception of Secondary CCPCH and DPCH and having DCHs that can be controlled dynamically. The UEs have to listen to this message prior to transmission on these DCHs. The UE RRC checks whether transmission is allowed, and then reconfigures MAC with a new subset of TFCS derived from the maximum total bit rate parameter. This TFCS subset shall control only the DCHs that are under control by this procedure.

In case of soft handover on the uplink DCH, The UE is requested either to listen to broadcast information from its primary cell (the one with the lowest pathloss), or from all cells involved in its Active Set, depending on its class. In the latter case, the UE is expected to react according to the stricter control information.

6.4.7 Hard Handover (FDD and TDD)

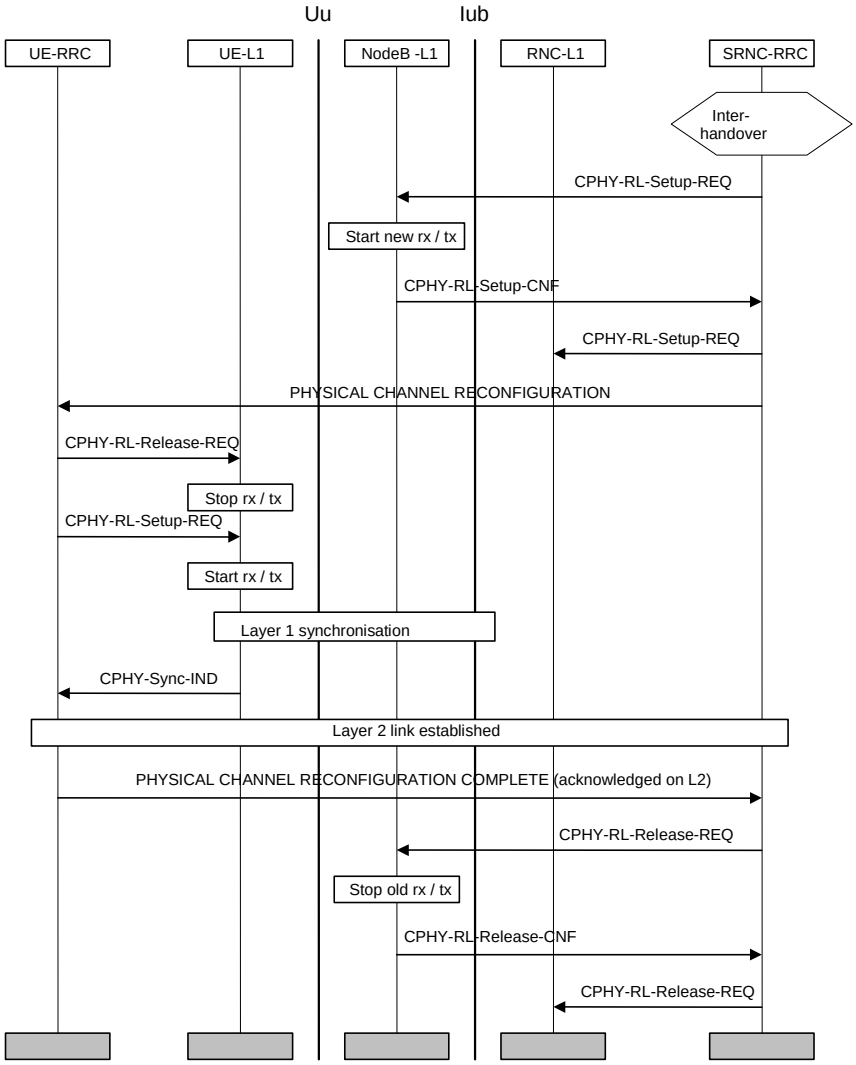


Figure 33: Hard handover

Figure 33 illustrates a hard handover. The NW RRC determines the need for hard handover based on received measurement reports or load control algorithms.

For inter-frequency handover the measurements are assumed to be performed in slotted mode.

The NW RRC first configures the NW L1 to activate the new radio links. The NW L1 begins transmission and reception on the new links immediately. The NW RRC then sends the UE RRC a PHYSICAL CHANNEL RECONFIGURATION message (several other messages e.g. RADIO BEARER RECONFIGURATION and TRANSPORT CHANNEL RECONFIGURATION can also be used to perform hard handover). The message indicates the radio resources that should be used for the new radio link. The UE RRC configures the UE L1 to terminate reception on the old radio link and begin reception on the new radio link.

After the UE L1 has achieved downlink synchronisation on the new frequency, a L2 link is established and the UE RRC sends a PHYSICAL CHANNEL RECONFIGURATION COMPLETE message to the NW RRC. After having received the L3 acknowledgement, the NW RRC configures the NW L1 to terminate reception and transmission on the old radio link.

6.4.8 SRNS Relocation

The SRNS relocation procedure can be divided into two phases. The first phase is relocation preparation; where the resources are reserved, new RABs are established while the second phase is the transfer of the Serving RNS from source to target RNC.

There are three cases in which an SRNS relocation can be performed:

- Serving SRNS relocation: This is used to move the UTRAN to CN connection point at the UTRAN side from the source SRNC to the target RNC.
- Combined Hard Handover and SRNS relocation: This is used to move the UTRAN to CN connection point at the UTRAN side from the source SRNC to the target RNC, while performing a hard handover decided by the UTRAN.
- Combined Cell/URA update and SRNS relocation: This is used to move the UTRAN to CN connection point at the UTRAN side from the source SRNC to the target RNC, while performing a cell re-selection in the UTRAN.

and these are described in subclause 6.4.8.1, 6.4.8.2 (for lossless radio bearers), 6.4.8.3, 6.4.8.4 (for seamless radio bearers), and in more detail in [6].

6.4.8.1 Combined Cell/URA Update and SRNS relocation (lossless radio bearers)

The procedure is initiated by the source RNC deciding to perform a SRNS relocation. Case I represents the situation when the UE is not involved and this is shown in Figure 34. Case II represents the situation when the UE is involved and a Combined Cell/URA update and SRNS relocation is performed, also shown in Figure 34.

A RANAP Relocation Command is received by the source RNC from the CN, indicating the RABs to be released and the RABs that are subject to data forwarding. Lossless SRNS relocation is always, and only, configured for RABs that are subject to data forwarding. The PDCP layer shall support PDCP sequence numbering when lossless SRNS relocation is supported [7].

For the affected radio bearers, the RLC entity is stopped and the PDCP sequence numbers are retrieved by RRC. The PDCP send and receive sequence numbers are then transferred in the RNSAP Relocation Commit message from source to target RNC for RABs that support lossless SRNS relocation. The target RNC becomes the serving RNC when the RANAP Relocation Detect message is sent.

The target RNC then sends a UTRAN MOBILITY INFORMATION (Case I) or a CELL/URA UPDATE CONFIRM (Case II); which configures the UE with the new U-RNTI and indicates the uplink receive PDCP sequence number for each radio bearer configured to support lossless SRNS relocation. The UE compares the uplink receive PDCP sequence number with the UE uplink send PDCP sequence number. If this confirms PDCP SDUs successfully transferred before the start of relocation i.e. already received by the source RNC then these are discarded by the UE.

If the UE has successfully configured itself, it shall send a UTRAN MOBILITY INFORMATION CONFIRM (Case I and Case II). These messages contain the START values and the downlink receive PDCP sequence number for each radio bearer configured to support lossless SRNS relocation. UTRAN compares the downlink receive PDCP sequence number with the downlink send PDCP sequence number For the affected radio bearers, the RLC entity is re-established [2] with the current configuration and in the UE RLC all the data buffers are flushed.

In case of failure; the UE shall send a UTRAN MOBILITY INFORMATION FAILURE (Case I) or CELL/URA UPDATE FAILURE (Case II) message.

Upon reception of the UTRAN MOBILITY INFORMATION CONFIRM/FAILURE (Case I and Case II) or CELL/URA UPDATE COMPLETE/FAILURE (Case II) message, UTRAN shall start the PDCP entity and the relocation procedure ends.

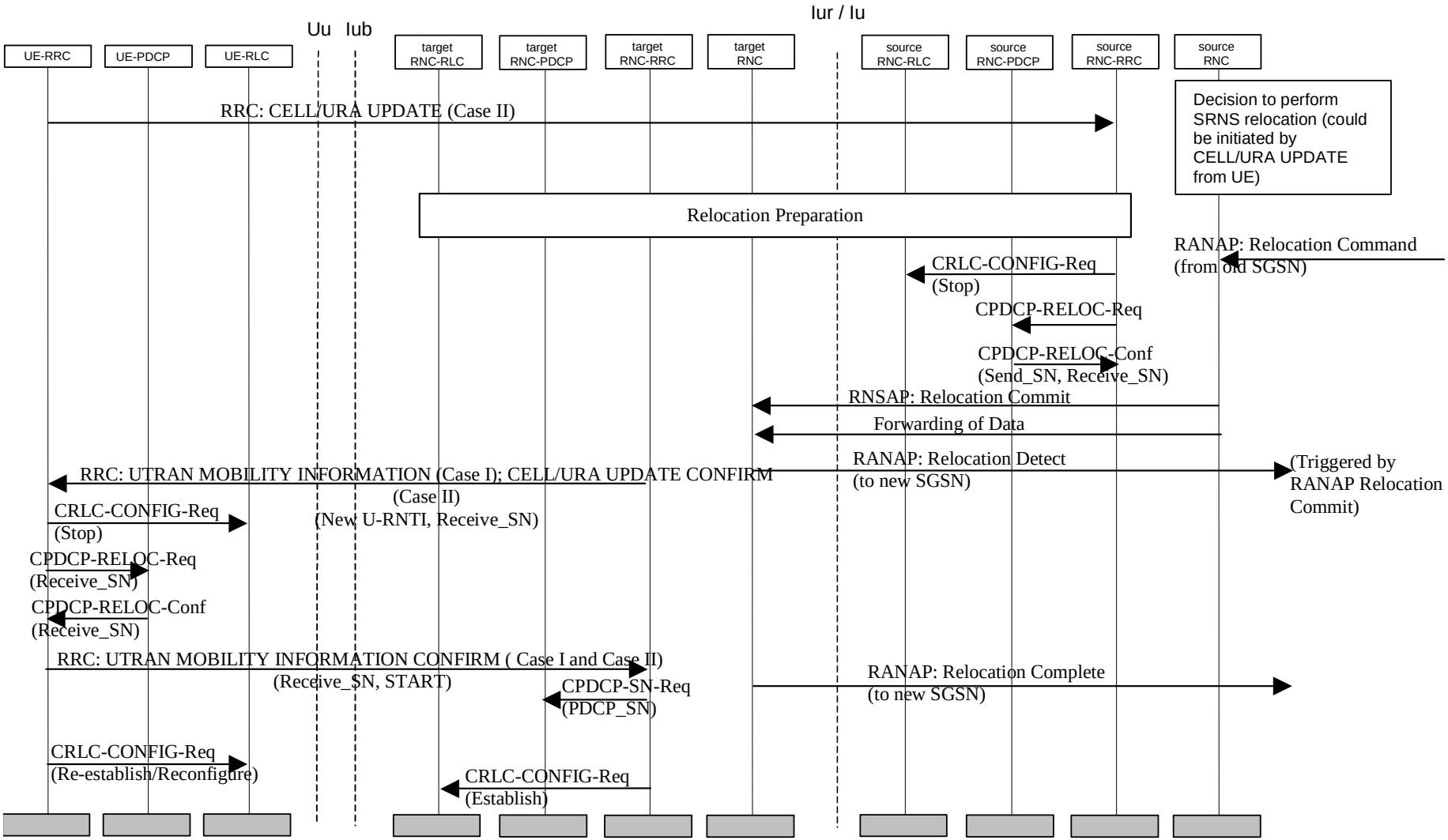


Figure 34: Combined Cell/URA Update and SRNS relocation (lossless radio bearers)

6.4.8.2 Combined Hard Handover and SRNS relocation (lossless radio bearers)

Based on measurement results and knowledge of the UTRAN topology, the source SRNC decides to initiate a combined hard handover and SRNS relocation. The UE is still under control of the SRNC but is moving to a location controlled by the target RNC.

A RANAP Relocation Command is received by the source RNC from the CN, indicating the RABs to be released, the Target RNC to Source RNC Transparent Container and the RABs that are subject to data forwarding. Lossless SRNS relocation is always, and only, configured for RABs that are subject to data forwarding. The PDCP layer shall support PDCP sequence numbering when lossless SRNS relocation is supported [7].

The Target RNC to Source RNC Transparent Container includes the RRC message (e.g. PHYSICAL CHANNEL RECONFIGURATION) for hard handover. Upon reception of the RANAP Relocation Command, the source RNC triggers the execution of the relocation of SRNS by sending the RRC message to the UE. This message includes the new U-RNTI and the uplink receive PDCP sequence number for each radio bearer configured to support lossless SRNS relocation. The UE compares the uplink receive PDCP sequence number with the uplink send PDCP sequence number. If this confirms PDCP SDUs successfully transferred before the start of relocation i.e. already received by the source RNC then these are discarded by the UE.

For the affected radio bearers, the RLC entity is stopped and the PDCP sequence numbers are retrieved by RRC. The PDCP send and receive sequence numbers are then transferred during the forwarding of SRNS contexts via the CN phase from source to target RNC for RABs that support lossless SRNS relocation. The target RNC becomes the serving RNC when the RANAP Relocation Detect message is sent.

If the UE has successfully configured itself, it shall send, in this case a PHYSICAL CHANNEL RECONFIGURATION COMPLETE message, to the target RNC. This message contains the START values and the downlink receive PDCP sequence number for each radio bearer configured to support lossless SRNS relocation. UTRAN compares the downlink receive PDCP sequence number with the downlink send PDCP sequence number. For the affected radio bearers, the RLC entity is re-established [2] with the current configuration and in the UE RLC all the data buffers are flushed.

Upon reception of the PHYSICAL CHANNEL RECONFIGURATION COMPLETE message, UTRAN shall start the PDCP entity and the relocation procedure ends.

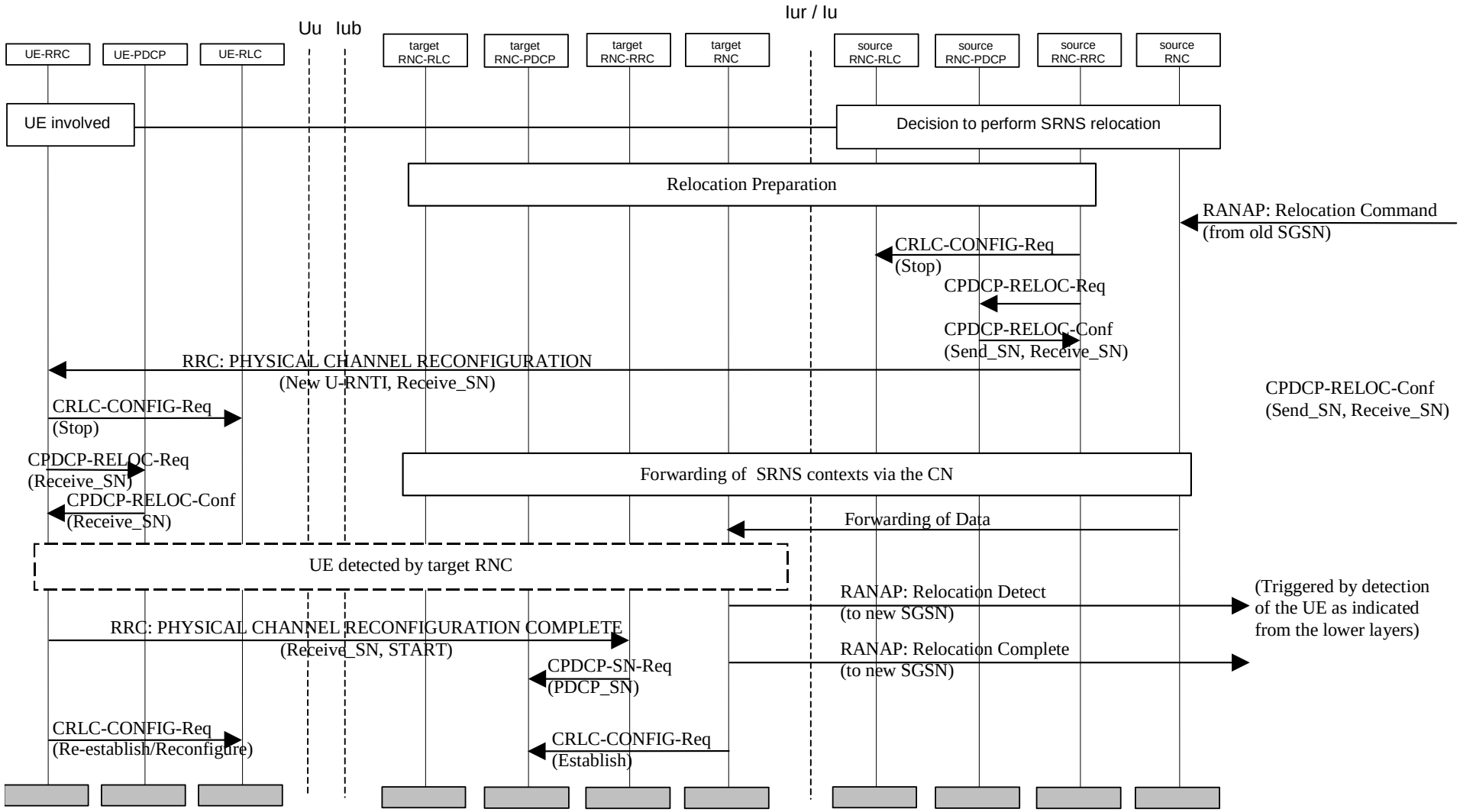


Figure 35: Combined Hard Handover and SRNS relocation (lossless radio bearers)

6.4.8.3 Combined Cell/URA Update and SRNS relocation (seamless radio bearers)

The procedure is initiated by the source RNC deciding to perform a SRNS relocation. Case I represents the situation when the UE is not involved and this is shown in Figure 36. Case II represents the situation when the UE is involved and a Combined Cell/URA update and SRNS relocation is performed, also shown in Figure 36.

A RANAP Relocation Command is received by the source RNC from the CN, indicating the RABs to be released. The source RNC continues the downlink data transmission on radio bearers supporting seamless SRNS relocation until the target RNC becomes the serving RNC. The target RNC becomes the serving RNC when the RANAP Relocation Detect message is sent.

The target RNC sends a UTRAN MOBILITY INFORMATION (Case I) or a CELL/URA UPDATE CONFIRM (Case II); which configures the UE with the new U-RNTI.

If the UE has successfully configured itself, it shall send a UTRAN MOBILITY INFORMATION CONFIRM (Case I and Case II). These messages contain the START values (to be used in integrity protection and in ciphering on radio bearers using UM and AM RLC). For the affected radio bearers, the RLC entity is re-established [2] with the current configuration.

Upon reception of the UTRAN MOBILITY INFORMATION CONFIRM (Case I and Case II) message in the UTRAN the relocation procedure ends.

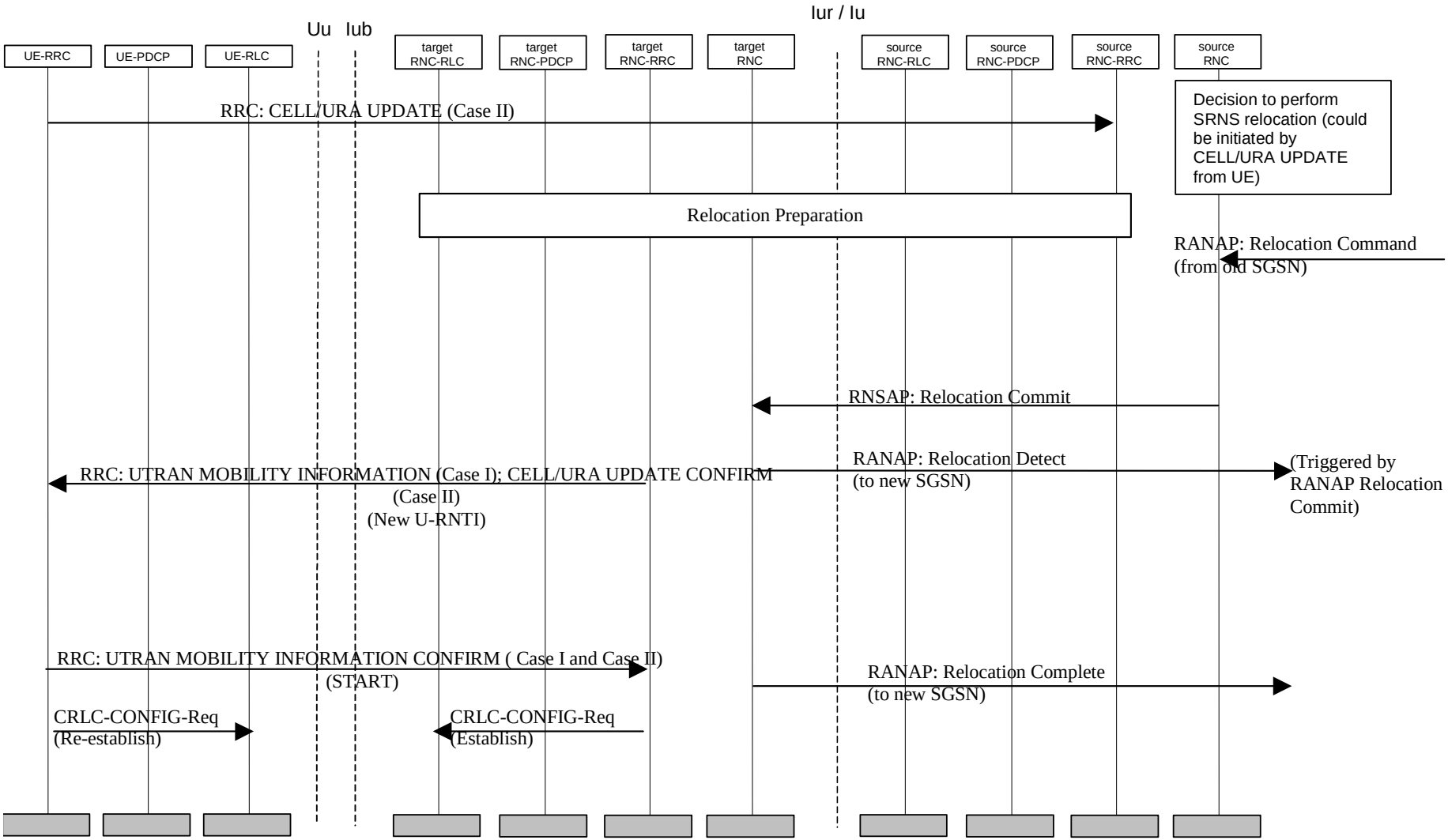


Figure 36: Combined Cell/URA Update and SRNS relocation (seamless radio bearers)

6.4.8.4 Combined Hard Handover and SRNS relocation (seamless radio bearers)

Based on measurement results and knowledge of the UTRAN topology, the source SRNC decides to initiate a combined hard handover and SRNS relocation. The UE is still under control of the SRNC but is moving to a location controlled by the target RNC.

The source RNC continues the downlink data transmission on radio bearers supporting seamless SRNS relocation until the target RNC becomes the serving RNC. The target RNC becomes the serving RNC when the RANAP Relocation Detect message is sent.

A RANAP Relocation Command is received by the source RNC from the CN, indicating the RABs to be released. The Target RNC to Source RNC Transparent Container includes the RRC message (e.g. PHYSICAL CHANNEL RECONFIGURATION) for hard handover. Upon reception of the RANAP Relocation Command, the source RNC triggers the execution of the relocation of SRNS by sending RRC message to the UE. This message includes the new U-RNTI.

If the UE has successfully configured itself, it shall send a response message, in this case PHYSICAL CHANNEL RECONFIGURATION COMPLETE message, to the target RNC. This message contains the START values (to be used in integrity protection and in ciphering on radio bearers using UM and AM RLC). For the affected radio bearers, the RLC entity is re-established [2] with the current configuration.

Upon reception of the PHYSICAL CHANNEL RECONFIGURATION COMPLETE message in the UTRAN the relocation procedure ends.

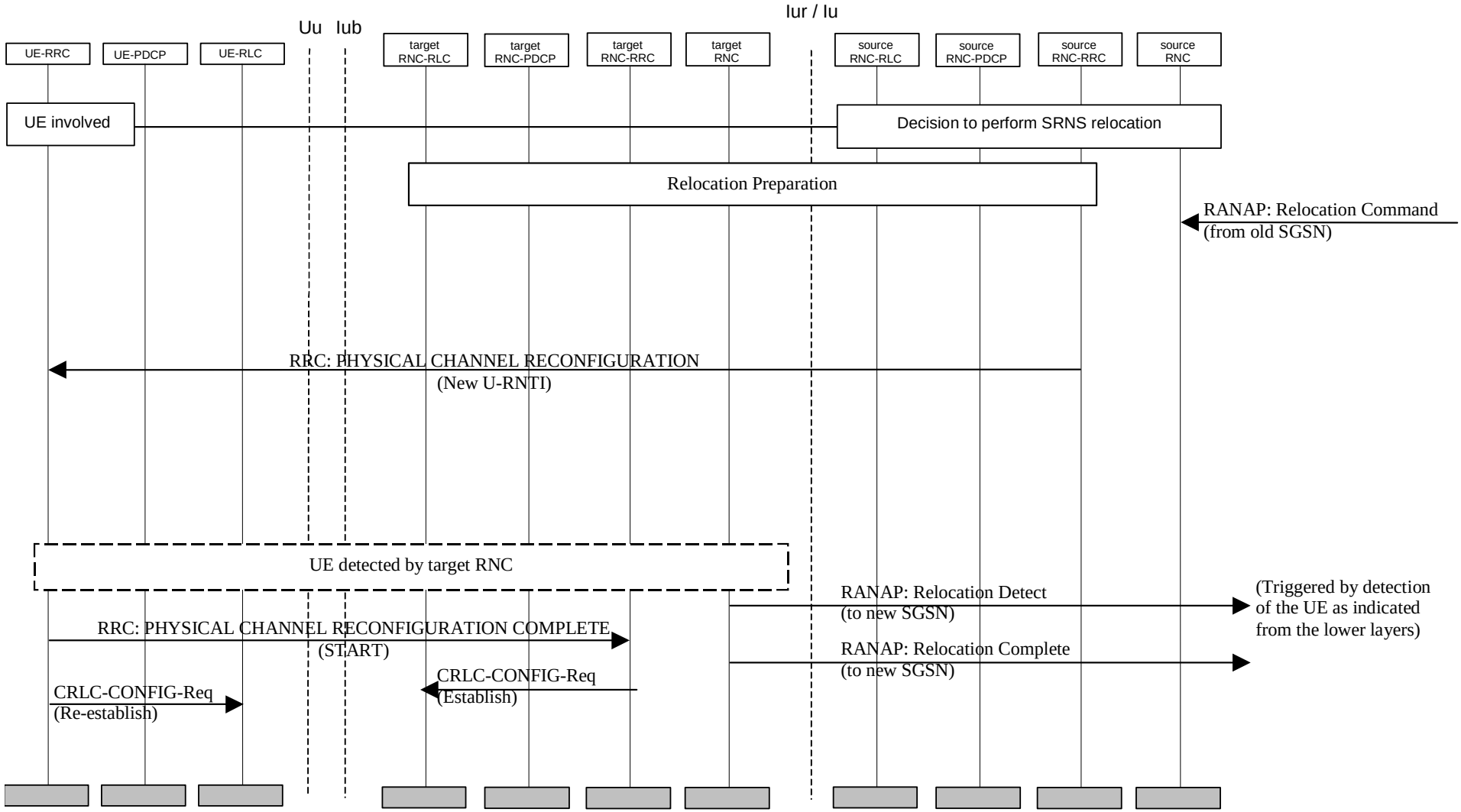


Figure 37: Combined Hard Handover and SRNS relocation (seamless radio bearers)

6.4.9 RRC Connection re-establishment

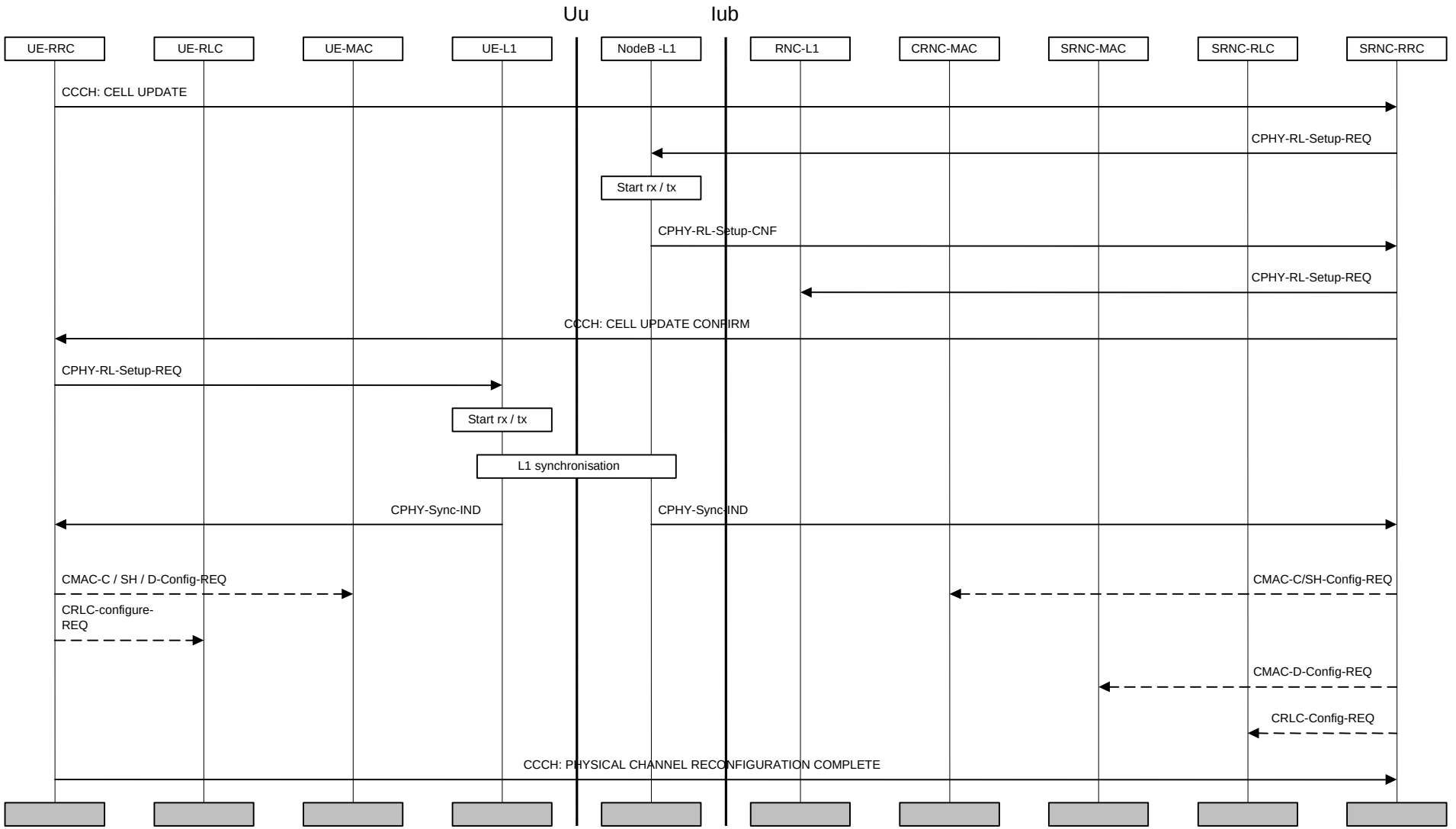


Figure 38: RRC connection re-establishment

Figure 38 shows an example of the procedure, when a UE loses radio connection due to e.g. radio link failure. After having selected a new cell, the UE RRC sends the NW RRC a CELL UPDATE message. The CELL UPDATE message contains information to the network that it was sent due to a radio link failure. The NW RRC configures the NW and acknowledges the connection re-establishment to the UE RRC with a CELL UPDATE CONFIRM message. The UE RRC configures the UE L1 to activate the new radio link(s). After the UE has synchronised to at least one radio link, the MAC and RLC layers can be configured (if necessary).

When the procedure is completed on the UE side, an PHYSICAL CHANNEL RECONFIGURATION COMPLETE message is sent.

6.4.11 Inter-RAT Handover: UTRAN to GSM/BSS, CS domain services

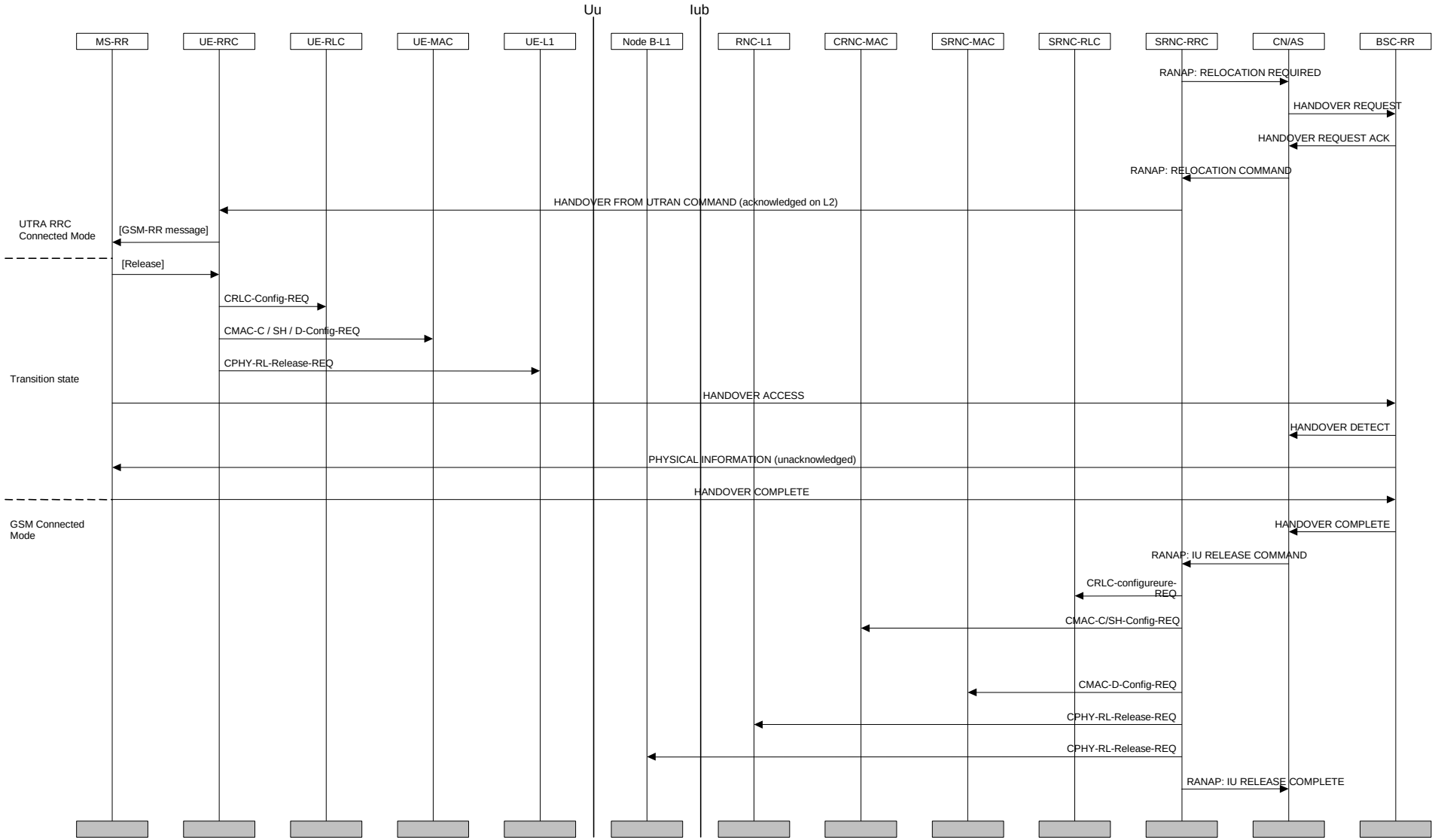


Figure 40: UTRAN to GSM inter-RAT handover

NOTE: The scope of this description is restricted to a UE having a connection only to CS domain services, i.e. no simultaneous PS signalling connection.

For CS domain services UTRAN to GSM inter-RAT Handover procedure is based on measurement reports from the UE but initiated from the UTRAN. HANDOVER FROM UTRAN COMMAND is sent using acknowledged data transfer on the DCCH. The UE transition from UTRAN Connected Mode starts when an HANDOVER FROM UTRAN COMMAND is received. The transition to GSM Connected mode is finished when HANDOVER COMPLETE message is sent from the UE.

UTRAN sends a RELOCATION REQUIRED to CN/AS. This message contains information needed for the GSM system to be able to perform a handover (e.g. serving cell, target cell). Some parts of this information (e.g. MS classmark) have been obtained at setup of the RRC Connection and are stored in CN.

The CN/AS sends a HANDOVER REQUEST message to BSC-RR allocating the necessary resources to be able to receive the GSM MS and acknowledge this by sending HANDOVER REQUEST ACKNOWLEDGE to CN/AS. The HANDOVER REQUEST ACKNOWLEDGE contains an GSM-RR message all radio-related information that the UE needs for the handover.

CN/AS sends a RELOCATION COMMAND (type UTRAN-to-BSS HARD HANDOVER) to the UTRAN to start the execution of the handover. This message contains an GSM-RR message with all the information needed for the UE to be able to switch to the GSM cell and perform a handover to GSM.

Upon reception of the HANDOVER FROM UTRAN COMMAND message in the UE, the UE-RRC entity forwards the GSM-RR message to the MS-RR entity. To release the UTRA resources the MS-RR entity requests the UE-RRC entity to locally release the RRC connection. The UE-RRC entity can then locally release the resources on the RLC, MAC and physical layers of the UE.

After having switched to the assigned GSM channel received in the HANDOVER FROM UTRAN COMMAND, the GSM MS sends HANDOVER ACCESS in successive layer 1 frames, just as it typically would have done for a conventional GSM handover initiation.

When the BSC-RR has received the HANDOVER ACCESS it indicates this to the CN/AS by sending a HANDOVER DETECT message. The BSC-RR sends a PHYSICAL INFORMATION message to the GSM MS in unacknowledged mode that contains various fields of physical layer -related information allowing a proper transmission by the MS.

After layer 1 and 2 connections are successfully established, the GSM MS returns the HANDOVER COMPLETE message.

CN/AS is then able to release the UTRAN resources that were used for the UE in UTRAN Connected Mode. The CN/AS send a IU RELEASE COMMAND to UTRAN, after which UTRAN can release all NW resources from RLC, MAC and the physical layer. When the release operation is complete, a IU RELEASE COMPLETE message is sent to CN / AS.

6.5 CN originated paging request in connected mode

6.5.1 UTRAN coordinated paging using DCCH

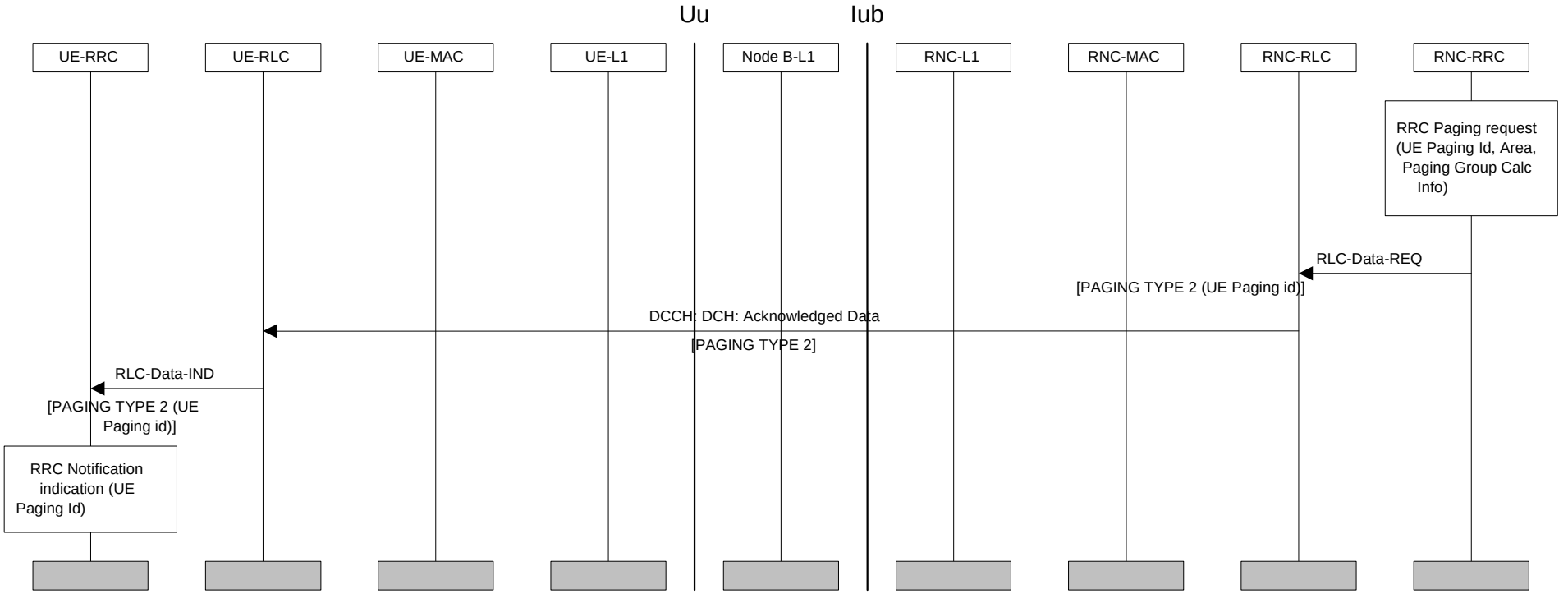


Figure 41: Example sequence of CN initiated paging request using DCCH

The above sequence illustrates a CN originated paging request, when the UE is in connected mode and can be reached on the DCCH. The coordination of the paging request with the existing RRC connection is done in UTRAN.

The entity above RRC on the network side requests paging of a UE over the Nt-SAP. The request contains a UE paging identity, an area where the page request is to be broadcast, information for calculation of the paging group.

Since the UE can be reached on the DCCH, the RRC layer formats a PAGING TYPE 2 message containing the UE paging identity, and the message is transmitted directly to the UE using acknowledged data transfer.

6.6 UTRAN originated paging request and paging response

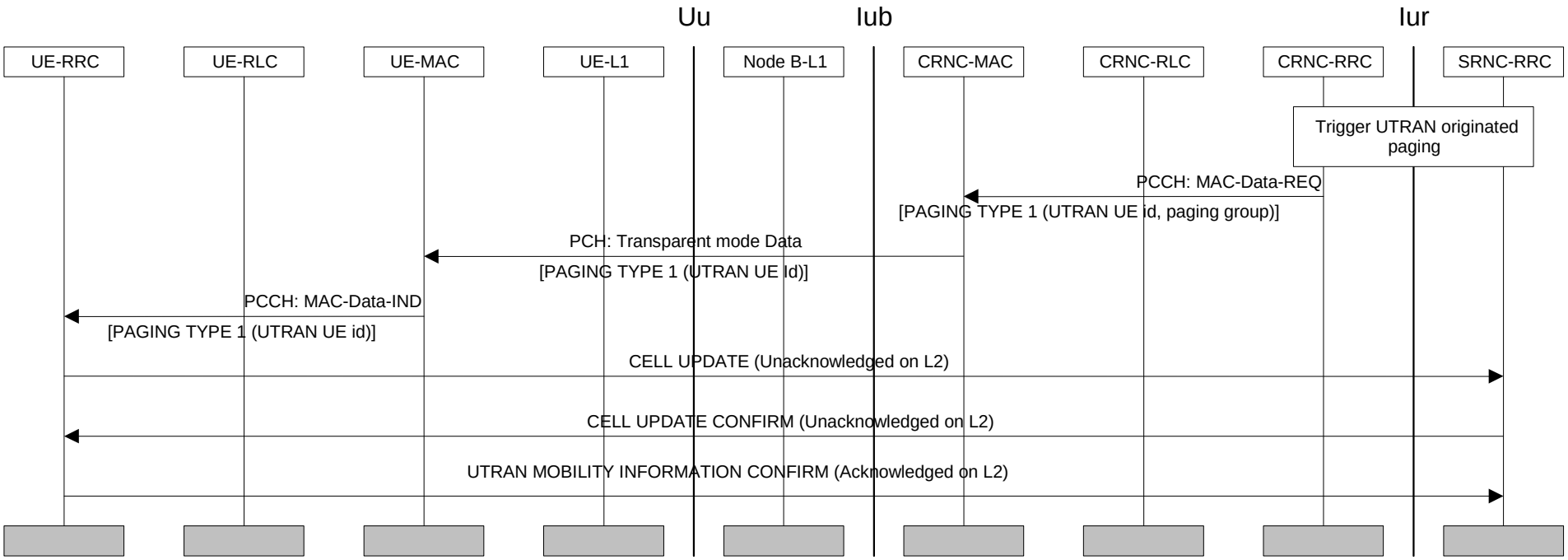


Figure 42: Example sequence for UTRAN initiated paging request with paging response

The RRC layer in the network uses this sequence to trigger a switch to CELL_FACH state, when the UE can only be reached on the PCH (the CELL_PCH state or the URA_PCH state). A Paging Type 1 message is prepared, containing the UTRAN UE identity (s-RNTI + RNC-ID). The RRC requests the transmission of the message by MAC on the PCCH, indicating the paging group.

In the UE, the RRC layer continuously monitors the paging group on the PCH and compares the UE identities in received paging request messages with its own identities. A match occurs, and in this case the RRC layer changes state to CELL_FACH state.

The UE prepares a Cell Update message, which is sent on CCCH.

When the network receives the Cell Update message, a c-RNTI is allocated and signalled to UE using the Cell Update Confirm message, which is sent on DCCH using unacknowledged mode. The latter message also acknowledges the reception of the Cell Update message. The UE configures MAC to use the new c-RNTI and prepares a UTRAN MOBILITY INFORMATION CONFIRM message. When the network receives the UTRAN MOBILITY INFORMATION CONFIRM message on DCCH it can delete any old c-RNTI and the DCCH/DTCH logical channels can be used also in the downlink using the new c-RNTI.

6.7 Other procedures

6.7.1 UE Capability Information

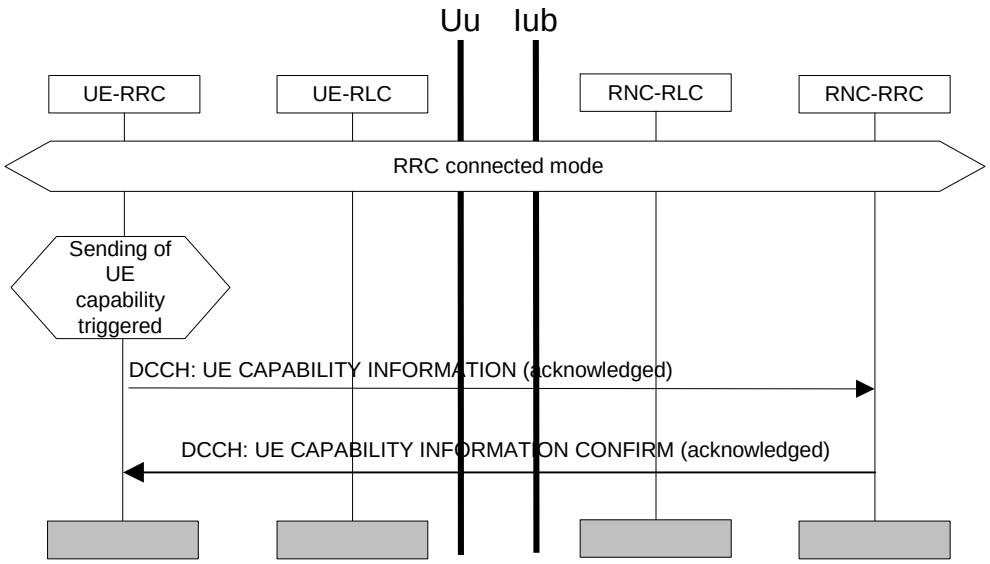


Figure 43: UE Capability Information

The UE transfers its capability information to the network by transmitting the RRC message UE Capability Information using acknowledged mode on the DCCH. UTRAN confirms the reception of the UE capabilities by transmitting an UE CPABILITY INFORMATION CONFIRM message using acknowledged mode on the DCCH. This procedure is performed during the lifetime of the RRC Connection if the UE capability information changes (e.g. due to change in UE power class). UE capability information can also explicitly be requested by UTRAN.

3GPP TSG-RAN WG2 Meeting #21
Busan, Korea, May 21st-25th 2001

Tdoc R2-011409

CR-Form-v3

CHANGE REQUEST

⌘ **25.303 CR 046** ⌘ rev **-** ⌘ Current version: **4.0.0** ⌘

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Proposed change affects: ⌘ (U)SIM ☐ ME/UE **X** Radio Access Network **X** Core Network ☐

Title:	⌘	Corrections to procedure examples
Source:	⌘	TSG-RAN WG2
Work item code:	⌘	TEI
Date:	⌘	2001-05-25
Category:	⌘	**A**
Release:	⌘	REL-4

Use one of the following categories:
F *(essential correction)*
A *(corresponds to a correction in an earlier release)*
B *(Addition of feature),*
C *(Functional modification of feature)*
D *(Editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
REL-4	*(Release 4)*
REL-5	*(Release 5)*

Reason for change: ⌘ The inter-layer procedure examples are not in line with the protocol specifications. Even if these diagrams are said informative (see clause 1), there is no reason why there should be differences if 25.303 should be useful.

Summary of change: ⌘

- Names on RRC messages are corrected for the procedures “UE initiated signalling connection establishment”, “Dynamic resource allocation control of uplink DCHs”, “Hard handover”, “RRC connection re-establishment”, Inter-system handover: UTRAN to GSM/BSS”, “UTRAN originated paging”, “UTRAN co-ordinated paging using DCCH”,
- For the procedure “UE initiated signalling connection establishment”, the point when the confirmation of signalling connection establishment is done in the UE is aligned with the RRC specification (when RRC has requested RLC to transmit the INITIAL DIRECT TRANSFER message).
- Clarification on that the procedure “Dynamic resource allocation control of uplink DCHs” only applies to UEs that are capable of simultaneous reception of Secondary CCPCH and DPCH.
- Failure cases for the procedure “Combined cell/URA update and SRNS relocation” corrected. CELL/URA UPDATE FAILURE messages do not exist, and the error handling is made by transmitting a new CELL/URA UPDATE. Since these sequences are just examples, it is proposed to not describe the error cases in the same sequence as the normal case.
- The procedure “Combined hard handover and SRNS relocation” is changed to only show one example (using PHYSICAL CHANNEL RECONFIGURATION) and only the normal case, instead of trying to cover all messages and also error cases.
- Minor corrections in the UTRAN to GSM inter-RAT handover procedure.
- The procedure “RRC connection re-establishment” is corrected to use the messages and semantics of the cell update procedure with cause “radio link failure”.
- The UE CAPABILITY INFORMATION CONFIRM message is added to the “UE capability information” procedure.

		Backward compatibility Correction to a functional descriptions where the specification was ambiguous or not sufficiently explicit. The proposed changes do not change the behaviour, since the inter-layer procedure examples in 25.303 are informative only and an alignment is made towards the RRC protocol specification.
Consequences if not approved:	⌘	Inconsistency between specifications.

Clauses affected:	⌘	6.1.2, 6.2.5, 6.4.7, 6.4.8.1, 6.4.8.2, 6.4.8.3, 6.4.8.4, 6.4.9, 6.4.11, 6.5.1, 6.6, 6.7.1		
Other specs affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications	⌘	
Other comments:	⌘	Rel'99 version of this CR is present in R2-011408 CR 045r1.		

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at: http://www.3gpp.org/3G_Specs/CRs.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.
2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 TSG meetings.
3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

6.1.2 UE Initiated Signalling Connection Establishment

NOTE 1: In case additional UE capability information is needed at RRC Connection Establishment, it is transmitted in the RRC Connection Setup Complete message.

The sequence in figure 2 shows the establishment of the first Signalling Connection for the UE, initiated by the UE.

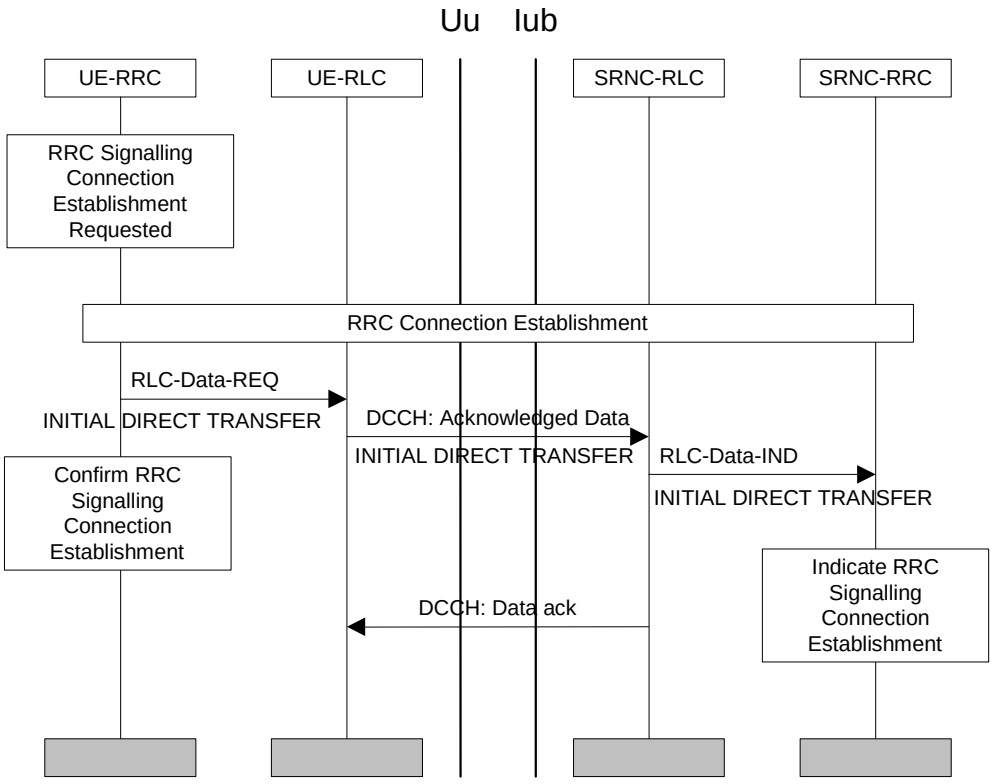
RRC Signalling Connection Establishment is requested by the non access stratum in the UE with a primitive over the Dedicated Control (DC) SAP. The primitive contains an initial message to be transferred transparently by RRC to the non-access stratum entity on the network side.

NOTE 2: The initial NAS message could for a GSM based Core Network be e.g. CM Service Request, Location Update Request etc.

If no RRC connection exists, the RRC layer makes an RRC connection establishment, which includes the transmission of UE capability information. When the RRC connection establishment is completed, the signalling connection establishment can be resumed.

The initial message from NAS is transferred in the RRC message "Initial Direct Transfer" using acknowledged mode on the DCCH, to the network, where it is passed on with an RRC Signalling Connection Establish IND primitive over the DC-SAP.

When the UE-RRC has requested UE-RLC to transmit the INITIAL DIRECT TRANSFER message , the Signalling Connection Establishment is confirmed by the UE-RRC.



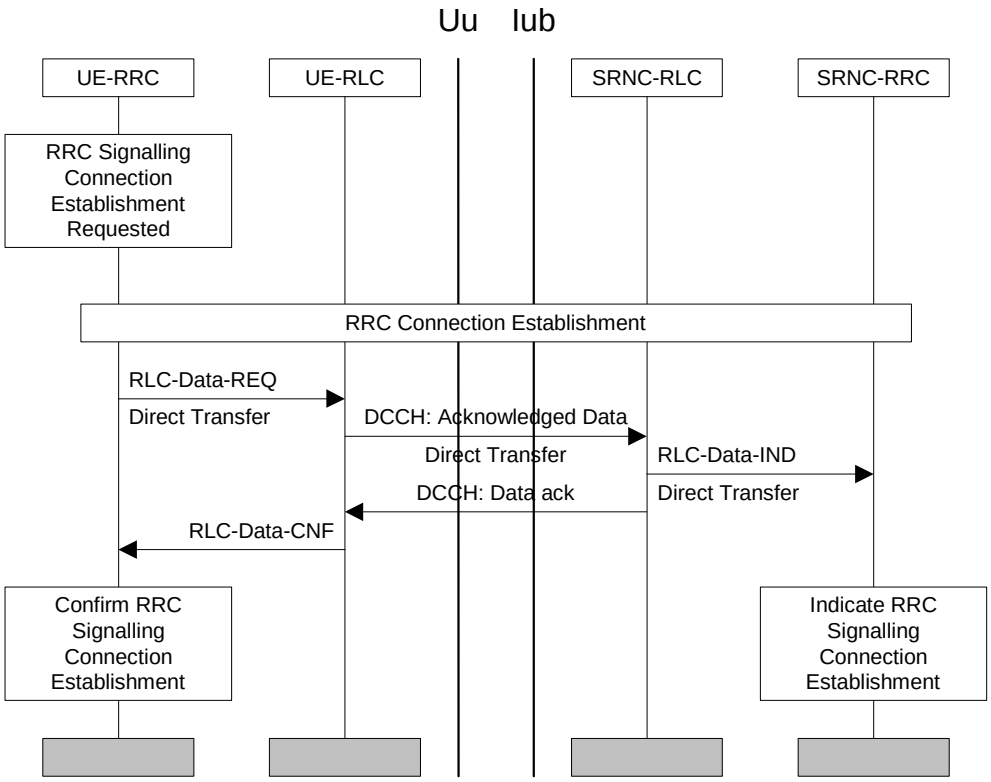


Figure 2: UE initiated Signalling Connection Establishment

6.2.5 Dynamic Resource Allocation Control of Uplink DCHs

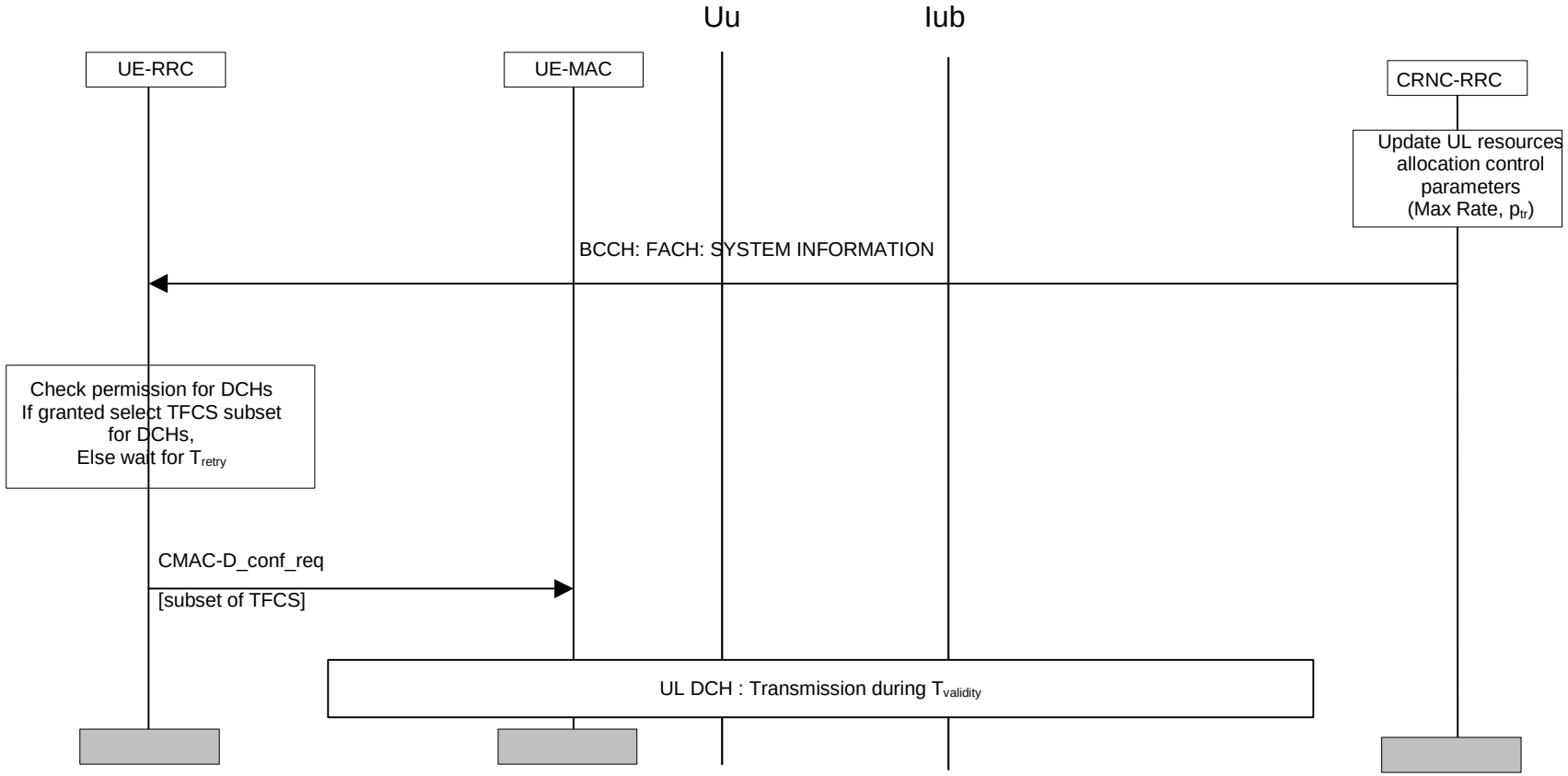


Figure 17: Dynamic Resource Allocation Control of Uplink DCHs

Figure 17 illustrates an example of a Dynamic Resource Allocation Control (DRAC) procedure of uplink DCHs. The CRNC regularly broadcasts the following parameters:

- transmission probability ptr, which indicates the probability for a UE to be allowed to transmit on its DCHs, which are under control by this procedure, during the next period $T_{validity}$;

- maximum total bit rate allowed to be used by the UE on its DCH which are under controlled by this procedure, during the next allowed period $T_{validity}$.

Besides these parameters, the RNC has allocated the following parameters to the UE:

- transmission time validity, $T_{validity}$, which indicates the time duration for which an access for transmission is granted;

- reaccess time T_{retry}, which indicates the time duration before retrying to access the resources, in case transmission has not been granted.

This procedure is initiated with a SYSTEM INFORMATION message containing the above DRAC parameters regularly broadcast by the CRNC on the FACH. It applies to all UEs capable of simultaneous reception of Secondary CCPCH and DPCH and having DCHs that can be controlled dynamically. The UEs have to listen to this message prior to transmission on these DCHs. The UE RRC checks whether transmission is allowed, and then reconfigures MAC with a new subset of TFCS derived from the maximum total bit rate parameter. This TFCS subset shall control only the DCHs that are under control by this procedure.

In case of soft handover on the uplink DCH, The UE is requested either to listen to broadcast information from its primary cell (the one with the lowest pathloss), or from all cells involved in its Active Set, depending on its class. In the latter case, the UE is expected to react according to the stricter control information.

6.4.7 Hard Handover (FDD and TDD)

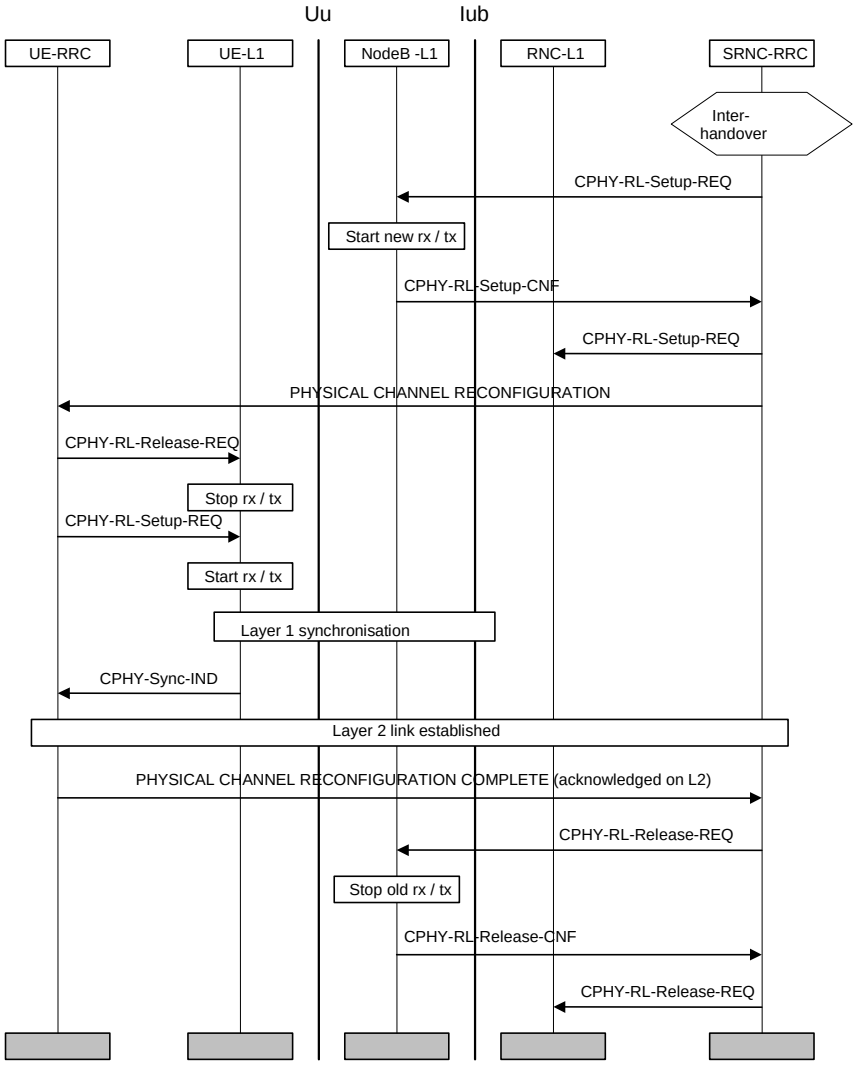


Figure 33: Hard handover

Figure 33 illustrates a hard handover. The NW RRC determines the need for hard handover based on received measurement reports or load control algorithms.

For inter-frequency handover the measurements are assumed to be performed in slotted mode.

The NW RRC first configures the NW L1 to activate the new radio links. The NW L1 begins transmission and reception on the new links immediately. The NW RRC then sends the UE RRC a PHYSICAL CHANNEL RECONFIGURATION message (several other messages e.g. RADIO BEARER RECONFIGURATION and TRANSPORT CHANNEL RECONFIGURATION can also be used to perform hard handover). The message indicates the radio resources that should be used for the new radio link. The UE RRC configures the UE L1 to terminate reception on the old radio link and begin reception on the new radio link.

After the UE L1 has achieved downlink synchronisation on the new frequency, a L2 link is established and the UE RRC sends a PHYSICAL CHANNEL RECONFIGURATION COMPLETE message to the NW RRC. After having received the L3 acknowledgement, the NW RRC configures the NW L1 to terminate reception and transmission on the old radio link.

6.4.8 SRNS Relocation

The SRNS relocation procedure can be divided into two phases. The first phase is relocation preparation; where the resources are reserved, new RABs are established while the second phase is the transfer of the Serving RNS from source to target RNC.

There are three cases in which an SRNS relocation can be performed:

- Serving SRNS relocation: This is used to move the UTRAN to CN connection point at the UTRAN side from the source SRNC to the target RNC.
- Combined Hard Handover and SRNS relocation: This is used to move the UTRAN to CN connection point at the UTRAN side from the source SRNC to the target RNC, while performing a hard handover decided by the UTRAN.
- Combined Cell/URA update and SRNS relocation: This is used to move the UTRAN to CN connection point at the UTRAN side from the source SRNC to the target RNC, while performing a cell re-selection in the UTRAN.

and these are described in subclause 6.4.8.1, 6.4.8.2 (for lossless radio bearers), 6.4.8.3, 6.4.8.4 (for seamless radio bearers), and in more detail in [6].

6.4.8.1 Combined Cell/URA Update and SRNS relocation (lossless radio bearers)

The procedure is initiated by the source RNC deciding to perform a SRNS relocation. Case I represents the situation when the UE is not involved and this is shown in Figure 34. Case II represents the situation when the UE is involved and a Combined Cell/URA update and SRNS relocation is performed, also shown in Figure 34.

A RANAP Relocation Command is received by the source RNC from the CN, indicating the RABs to be released and the RABs that are subject to data forwarding. Lossless SRNS relocation is always, and only, configured for RABs that are subject to data forwarding. The PDCP layer shall support PDCP sequence numbering when lossless SRNS relocation is supported [7].

For the affected radio bearers, the RLC entity is stopped and the PDCP sequence numbers are retrieved by RRC. The PDCP send and receive sequence numbers are then transferred in the RNSAP Relocation Commit message from source to target RNC for RABs that support lossless SRNS relocation. The target RNC becomes the serving RNC when the RANAP Relocation Detect message is sent.

The target RNC then sends a UTRAN MOBILITY INFORMATION (Case I) or a CELL/URA UPDATE CONFIRM (Case II); which configures the UE with the new U-RNTI and indicates the uplink receive PDCP sequence number for each radio bearer configured to support lossless SRNS relocation. The UE compares the uplink receive PDCP sequence number with the UE uplink send PDCP sequence number. If this confirms PDCP SDUs successfully transferred before the start of relocation i.e. already received by the source RNC then these are discarded by the UE.

If the UE has successfully configured itself, it shall send a UTRAN MOBILITY INFORMATION CONFIRM (Case I and Case II). These messages contain the START values and the downlink receive PDCP sequence number for each radio bearer configured to support lossless SRNS relocation. UTRAN compares the downlink receive PDCP sequence number with the downlink send PDCP sequence number For the affected radio bearers, the RLC entity is re-established [2] with the current configuration and in the UE RLC all the data buffers are flushed.

In case of failure; the UE shall send a UTRAN MOBILITY INFORMATION FAILURE (Case I) or CELL/URA UPDATE FAILURE (Case II) message.

Upon reception of the UTRAN MOBILITY INFORMATION CONFIRM/FAILURE (Case I and Case II) or CELL/URA UPDATE COMPLETE/FAILURE (Case II) message, UTRAN shall start the PDCP entity and the relocation procedure ends.

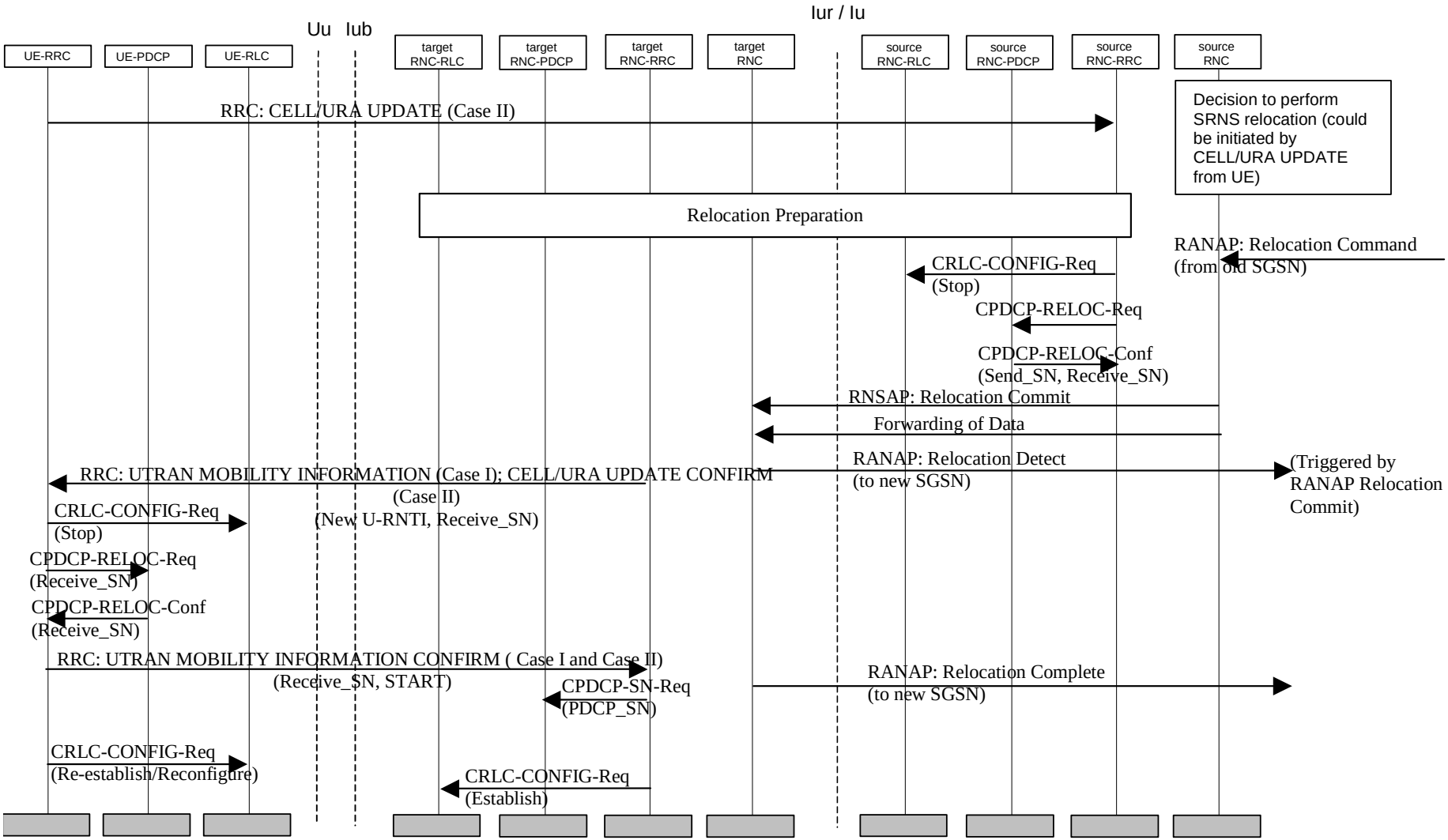


Figure 34: Combined Cell/URA Update and SRNS relocation (lossless radio bearers)

6.4.8.2 Combined Hard Handover and SRNS relocation (lossless radio bearers)

Based on measurement results and knowledge of the UTRAN topology, the source SRNC decides to initiate a combined hard handover and SRNS relocation. The UE is still under control of the SRNC but is moving to a location controlled by the target RNC.

A RANAP Relocation Command is received by the source RNC from the CN, indicating the RABs to be released, the Target RNC to Source RNC Transparent Container and the RABs that are subject to data forwarding. Lossless SRNS relocation is always, and only, configured for RABs that are subject to data forwarding. The PDCP layer shall support PDCP sequence numbering when lossless SRNS relocation is supported [7].

The Target RNC to Source RNC Transparent Container includes the RRC message (e.g. PHYSICAL CHANNEL RECONFIGURATION) for hard handover. Upon reception of the RANAP Relocation Command, the source RNC triggers the execution of the relocation of SRNS by sending the RRC message to the UE. This message includes the new U-RNTI and the uplink receive PDCP sequence number for each radio bearer configured to support lossless SRNS relocation. The UE compares the uplink receive PDCP sequence number with the uplink send PDCP sequence number. If this confirms PDCP SDUs successfully transferred before the start of relocation i.e. already received by the source RNC then these are discarded by the UE.

For the affected radio bearers, the RLC entity is stopped and the PDCP sequence numbers are retrieved by RRC. The PDCP send and receive sequence numbers are then transferred during the forwarding of SRNS contexts via the CN phase from source to target RNC for RABs that support lossless SRNS relocation. The target RNC becomes the serving RNC when the RANAP Relocation Detect message is sent.

If the UE has successfully configured itself, it shall send, in this case a PHYSICAL CHANNEL RECONFIGURATION COMPLETE message, to the target RNC. This message contains the START values and the downlink receive PDCP sequence number for each radio bearer configured to support lossless SRNS relocation. UTRAN compares the downlink receive PDCP sequence number with the downlink send PDCP sequence number. For the affected radio bearers, the RLC entity is re-established [2] with the current configuration and in the UE RLC all the data buffers are flushed.

Upon reception of the PHYSICAL CHANNEL RECONFIGURATION COMPLETE message, UTRAN shall start the PDCP entity and the relocation procedure ends.

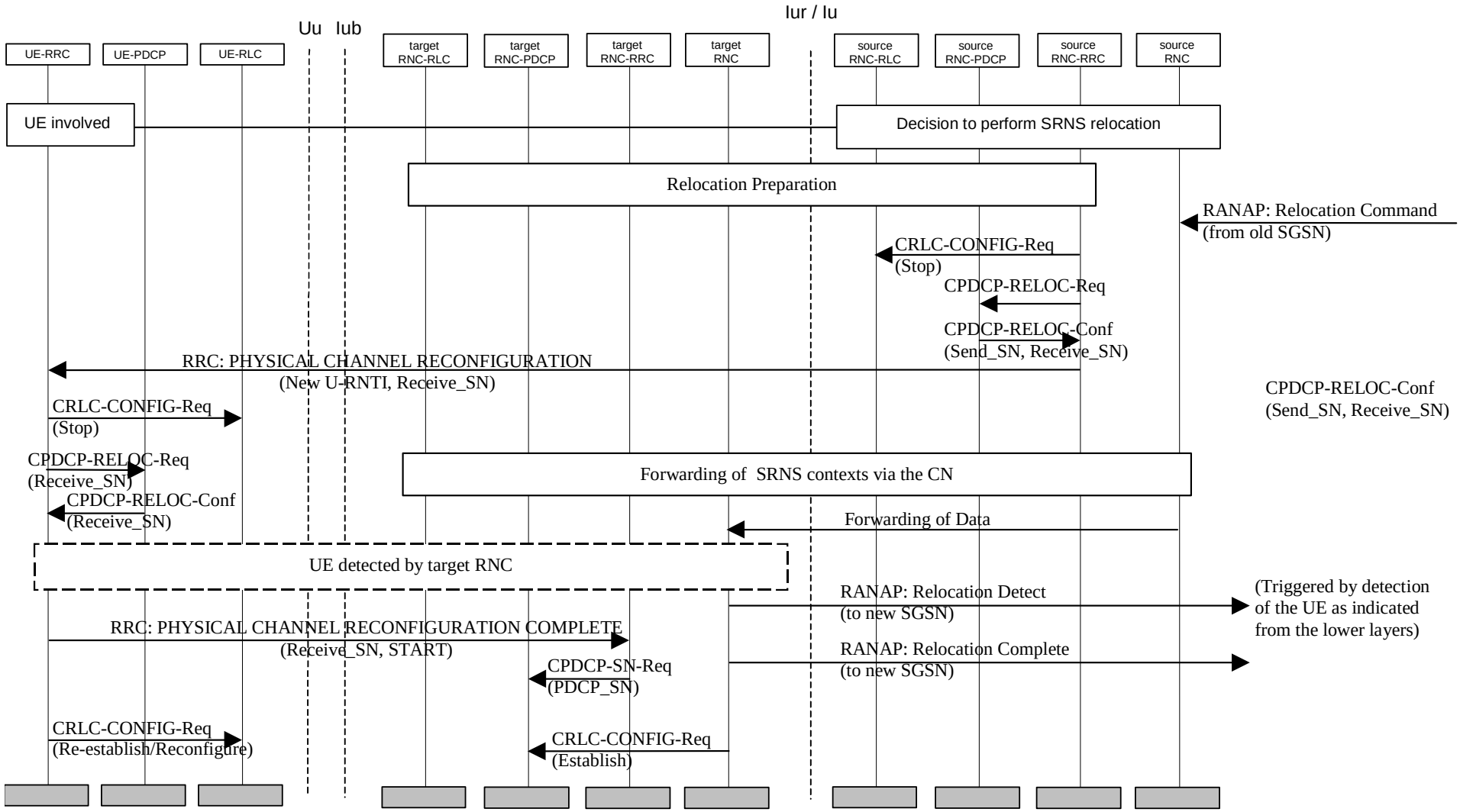


Figure 35: Combined Hard Handover and SRNS relocation (lossless radio bearers)

6.4.8.3 Combined Cell/URA Update and SRNS relocation (seamless radio bearers)

The procedure is initiated by the source RNC deciding to perform a SRNS relocation. Case I represents the situation when the UE is not involved and this is shown in Figure 36. Case II represents the situation when the UE is involved and a Combined Cell/URA update and SRNS relocation is performed, also shown in Figure 36.

A RANAP Relocation Command is received by the source RNC from the CN, indicating the RABs to be released. The source RNC continues the downlink data transmission on radio bearers supporting seamless SRNS relocation until the target RNC becomes the serving RNC. The target RNC becomes the serving RNC when the RANAP Relocation Detect message is sent.

The target RNC sends a UTRAN MOBILITY INFORMATION (Case I) or a CELL/URA UPDATE CONFIRM (Case II); which configures the UE with the new U-RNTI.

If the UE has successfully configured itself, it shall send a UTRAN MOBILITY INFORMATION CONFIRM (Case I and Case II). These messages contain the START values (to be used in integrity protection and in ciphering on radio bearers using UM and AM RLC). For the affected radio bearers, the RLC entity is re-established [2] with the current configuration.

Upon reception of the UTRAN MOBILITY INFORMATION CONFIRM (Case I and Case II) message in the UTRAN the relocation procedure ends.

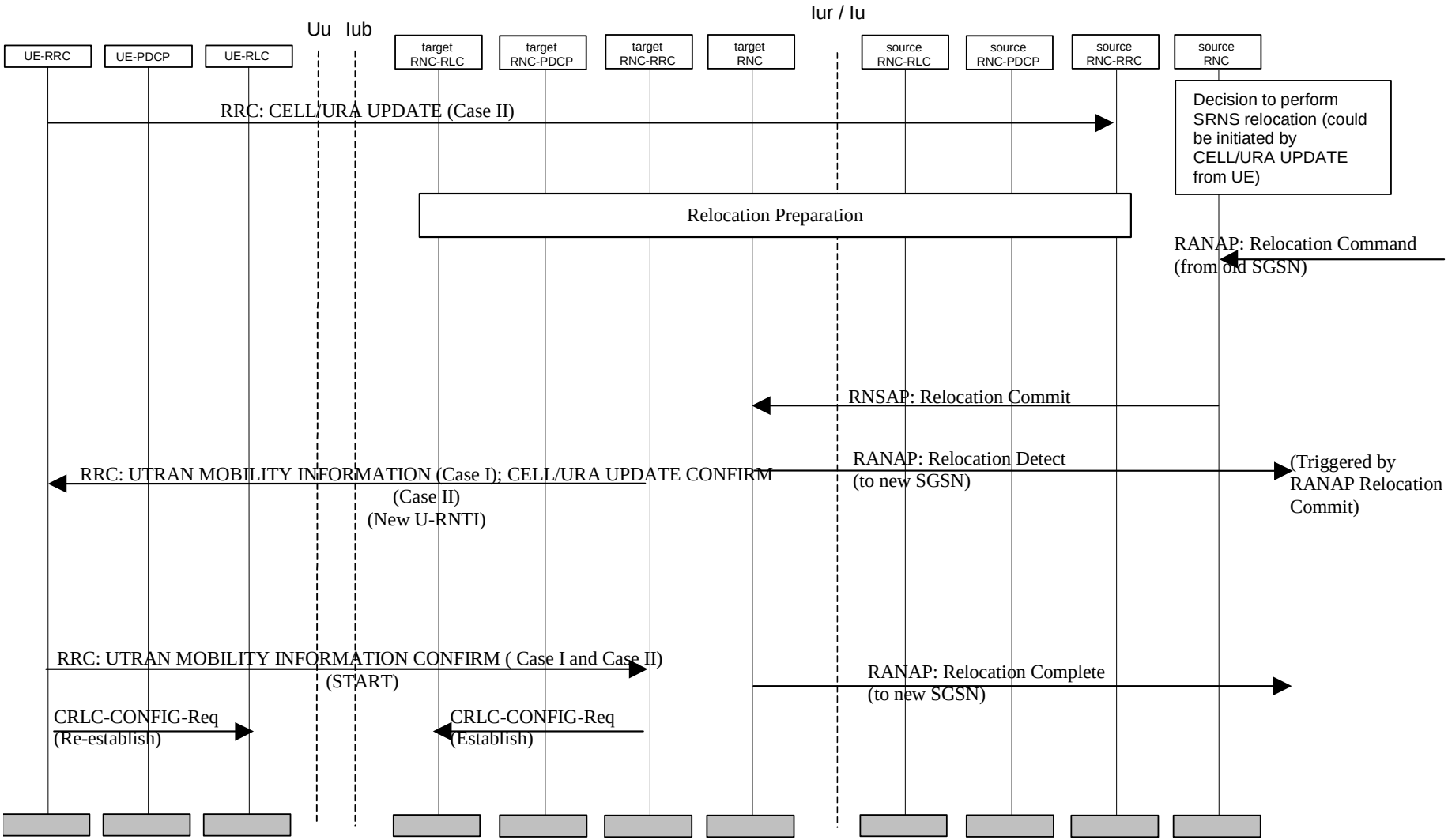


Figure 36: Combined Cell/URA Update and SRNS relocation (seamless radio bearers)

6.4.8.4 Combined Hard Handover and SRNS relocation (seamless radio bearers)

Based on measurement results and knowledge of the UTRAN topology, the source SRNC decides to initiate a combined hard handover and SRNS relocation. The UE is still under control of the SRNC but is moving to a location controlled by the target RNC.

The source RNC continues the downlink data transmission on radio bearers supporting seamless SRNS relocation until the target RNC becomes the serving RNC. The target RNC becomes the serving RNC when the RANAP Relocation Detect message is sent.

A RANAP Relocation Command is received by the source RNC from the CN, indicating the RABs to be released. The Target RNC to Source RNC Transparent Container includes the RRC message (e.g. PHYSICAL CHANNEL RECONFIGURATION) for hard handover. Upon reception of the RANAP Relocation Command, the source RNC triggers the execution of the relocation of SRNS by sending RRC message to the UE. This message includes the new U-RNTI.

If the UE has successfully configured itself, it shall send a response message, in this case PHYSICAL CHANNEL RECONFIGURATION COMPLETE message, to the target RNC. This message contains the START values (to be used in integrity protection and in ciphering on radio bearers using UM and AM RLC). For the affected radio bearers, the RLC entity is re-established [2] with the current configuration.

Upon reception of the PHYSICAL CHANNEL RECONFIGURATION COMPLETE message in the UTRAN the relocation procedure ends.

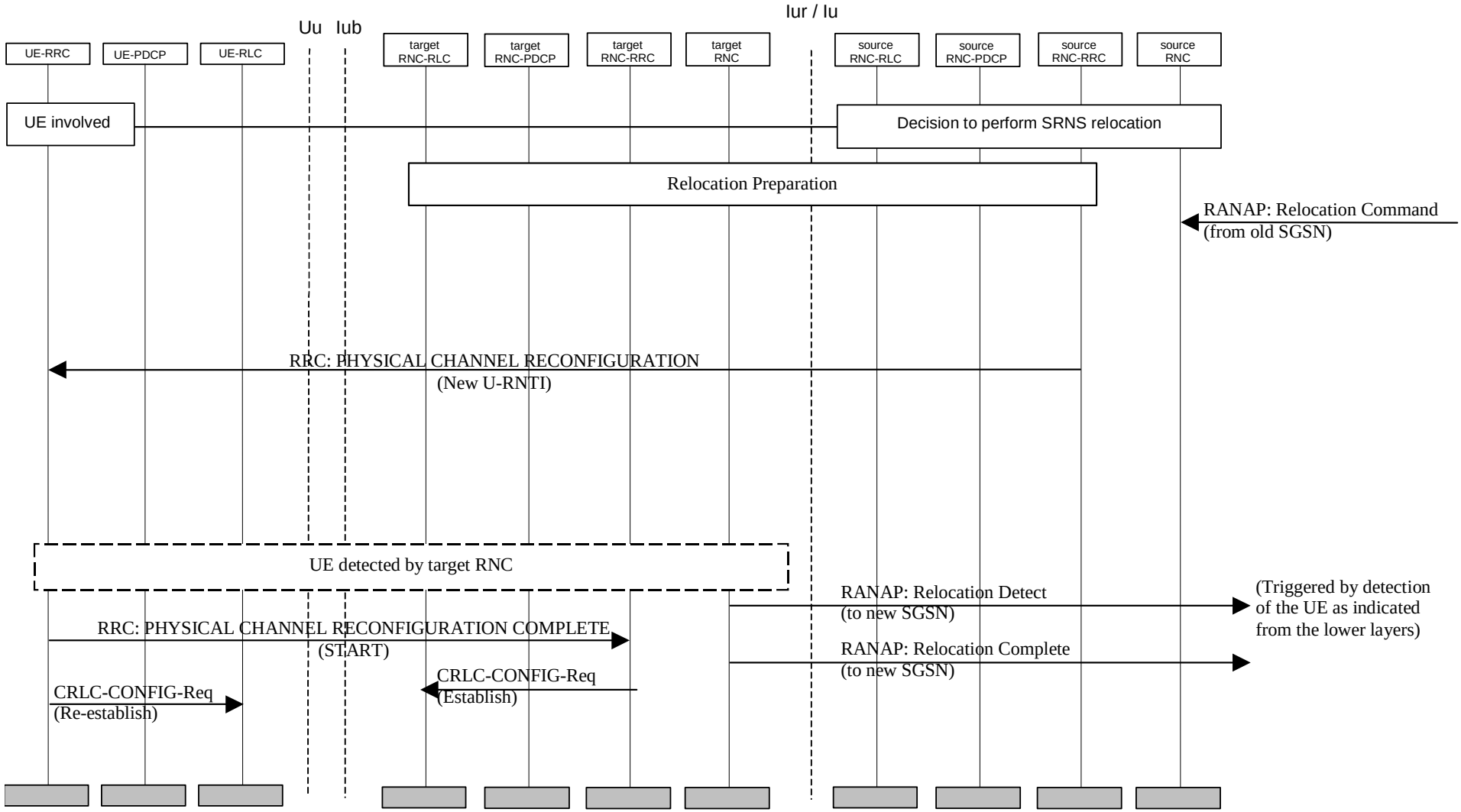


Figure 37: Combined Hard Handover and SRNS relocation (seamless radio bearers)

6.4.9 RRC Connection re-establishment

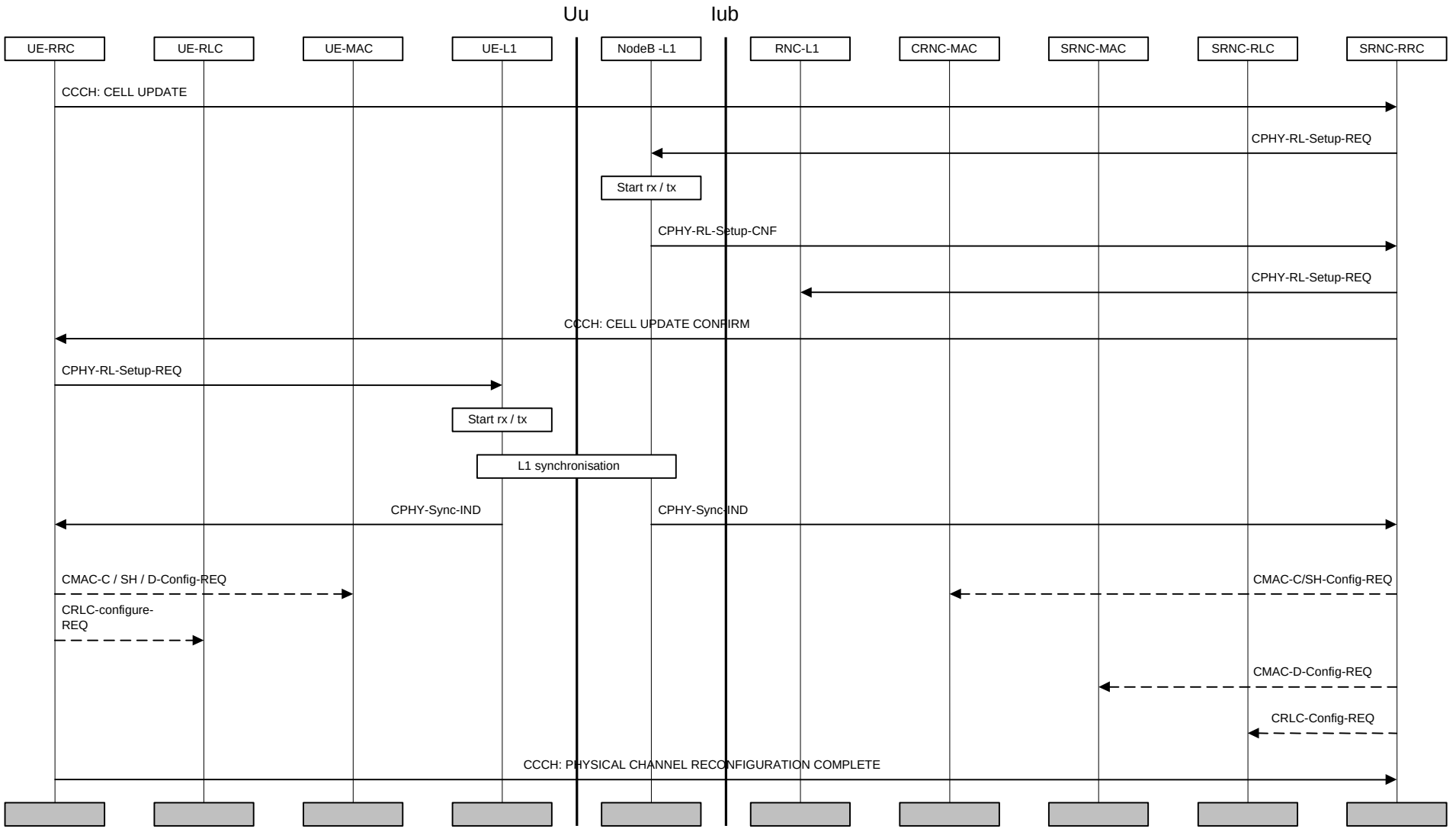


Figure 38: RRC connection re-establishment

Figure 38 shows an example of the procedure, when a UE loses radio connection due to e.g. radio link failure. After having selected a new cell, the UE RRC sends the NW RRC a CELL UPDATE message. The CELL UPDATE message contains information to the network that it was sent due to a radio link failure. The NW RRC configures the NW and acknowledges the connection re-establishment to the UE RRC with a CELL UPDATE CONFIRM message. The UE RRC configures the UE L1 to activate the new radio link(s). After the UE has synchronised to at least one radio link, the MAC and RLC layers can be configured (if necessary).

When the procedure is completed on the UE side, an PHYSICAL CHANNEL RECONFIGURATION COMPLETE message is sent.

6.4.11 Inter-RAT Handover: UTRAN to GSM/BSS, CS domain services

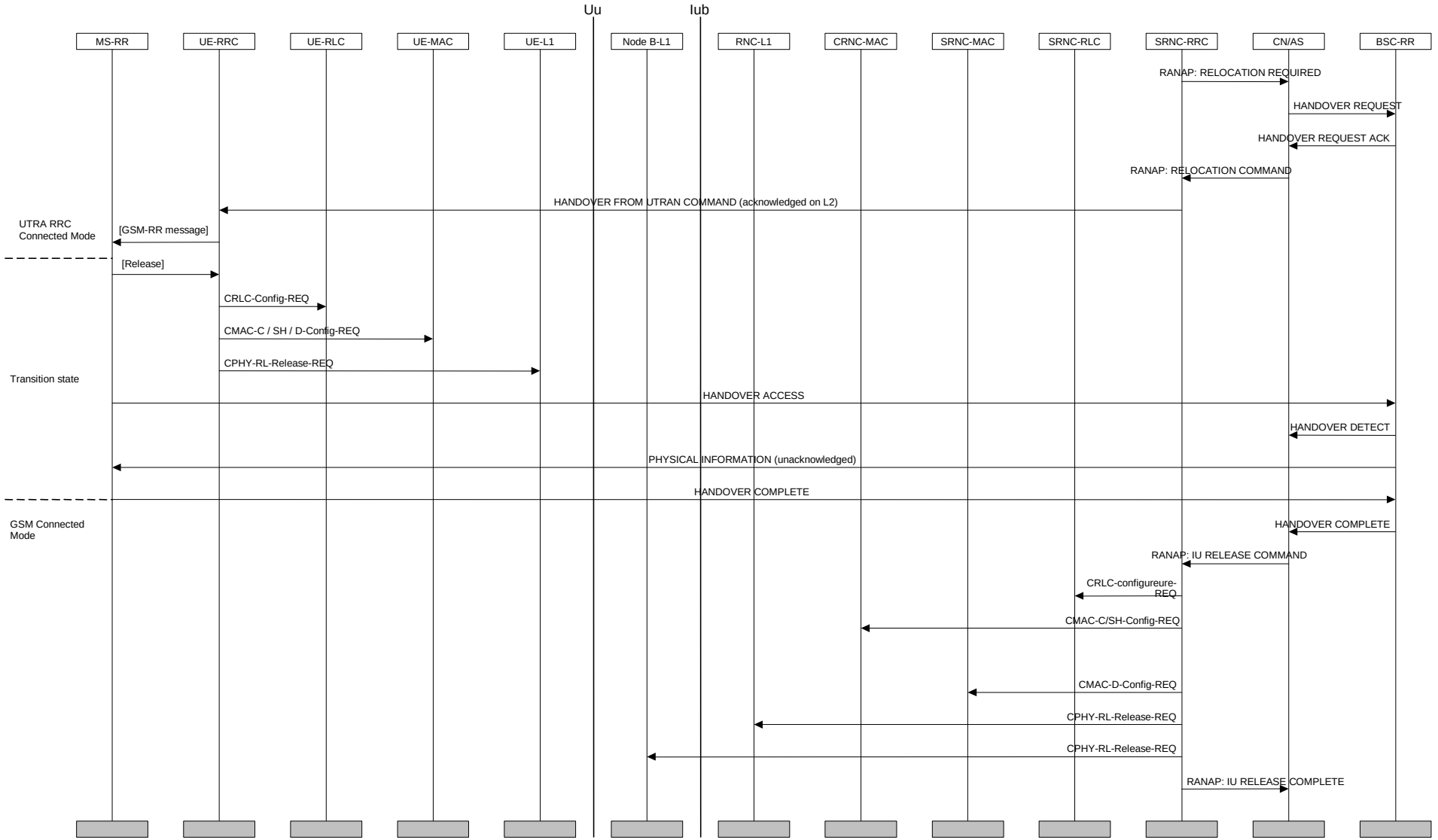


Figure 40: UTRAN to GSM inter-RAT handover

NOTE: The scope of this description is restricted to a UE having a connection only to CS domain services, i.e. no simultaneous PS signalling connection.

For CS domain services UTRAN to GSM inter-RAT Handover procedure is based on measurement reports from the UE but initiated from the UTRAN. HANDOVER FROM UTRAN COMMAND is sent using acknowledged data transfer on the DCCH. The UE transition from UTRAN Connected Mode starts when an HANDOVER FROM UTRAN COMMAND is received. The transition to GSM Connected mode is finished when HANDOVER COMPLETE message is sent from the UE.

UTRAN sends a RELOCATION REQUIRED to CN/AS. This message contains information needed for the GSM system to be able to perform a handover (e.g. serving cell, target cell). Some parts of this information (e.g. MS classmark) have been obtained at setup of the RRC Connection and are stored in CN.

The CN/AS sends a HANDOVER REQUEST message to BSC-RR allocating the necessary resources to be able to receive the GSM MS and acknowledge this by sending HANDOVER REQUEST ACKNOWLEDGE to CN/AS. The HANDOVER REQUEST ACKNOWLEDGE contains an GSM-RR message all radio-related information that the UE needs for the handover.

CN/AS sends a RELOCATION COMMAND (type UTRAN-to-BSS HARD HANDOVER) to the UTRAN to start the execution of the handover. This message contains an GSM-RR message with all the information needed for the UE to be able to switch to the GSM cell and perform a handover to GSM.

Upon reception of the HANDOVER FROM UTRAN COMMAND message in the UE, the UE-RRC entity forwards the GSM-RR message to the MS-RR entity. To release the UTRA resources the MS-RR entity requests the UE-RRC entity to locally release the RRC connection. The UE-RRC entity can then locally release the resources on the RLC, MAC and physical layers of the UE.

After having switched to the assigned GSM channel received in the HANDOVER FROM UTRAN COMMAND, the GSM MS sends HANDOVER ACCESS in successive layer 1 frames, just as it typically would have done for a conventional GSM handover initiation.

When the BSC-RR has received the HANDOVER ACCESS it indicates this to the CN/AS by sending a HANDOVER DETECT message. The BSC-RR sends a PHYSICAL INFORMATION message to the GSM MS in unacknowledged mode that contains various fields of physical layer -related information allowing a proper transmission by the MS.

After layer 1 and 2 connections are successfully established, the GSM MS returns the HANDOVER COMPLETE message.

CN/AS is then able to release the UTRAN resources that were used for the UE in UTRAN Connected Mode. The CN/AS send a IU RELEASE COMMAND to UTRAN, after which UTRAN can release all NW resources from RLC, MAC and the physical layer. When the release operation is complete, a IU RELEASE COMPLETE message is sent to CN / AS.

6.5 CN originated paging request in connected mode

6.5.1 UTRAN coordinated paging using DCCH

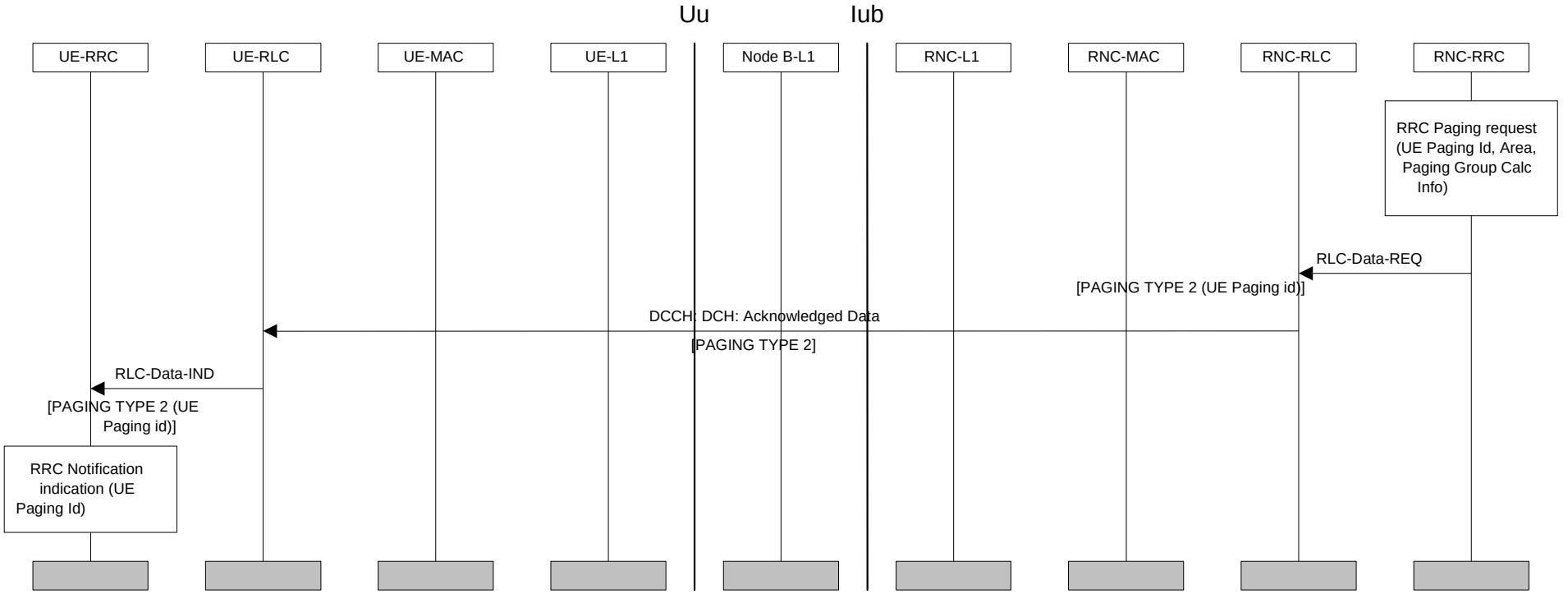


Figure 41: Example sequence of CN initiated paging request using DCCH

The above sequence illustrates a CN originated paging request, when the UE is in connected mode and can be reached on the DCCH. The coordination of the paging request with the existing RRC connection is done in UTRAN.

The entity above RRC on the network side requests paging of a UE over the Nt-SAP. The request contains a UE paging identity, an area where the page request is to be broadcast, information for calculation of the paging group.

Since the UE can be reached on the DCCH, the RRC layer formats a PAGING TYPE 2 message containing the UE paging identity, and the message is transmitted directly to the UE using acknowledged data transfer.

6.6 UTRAN originated paging request and paging response

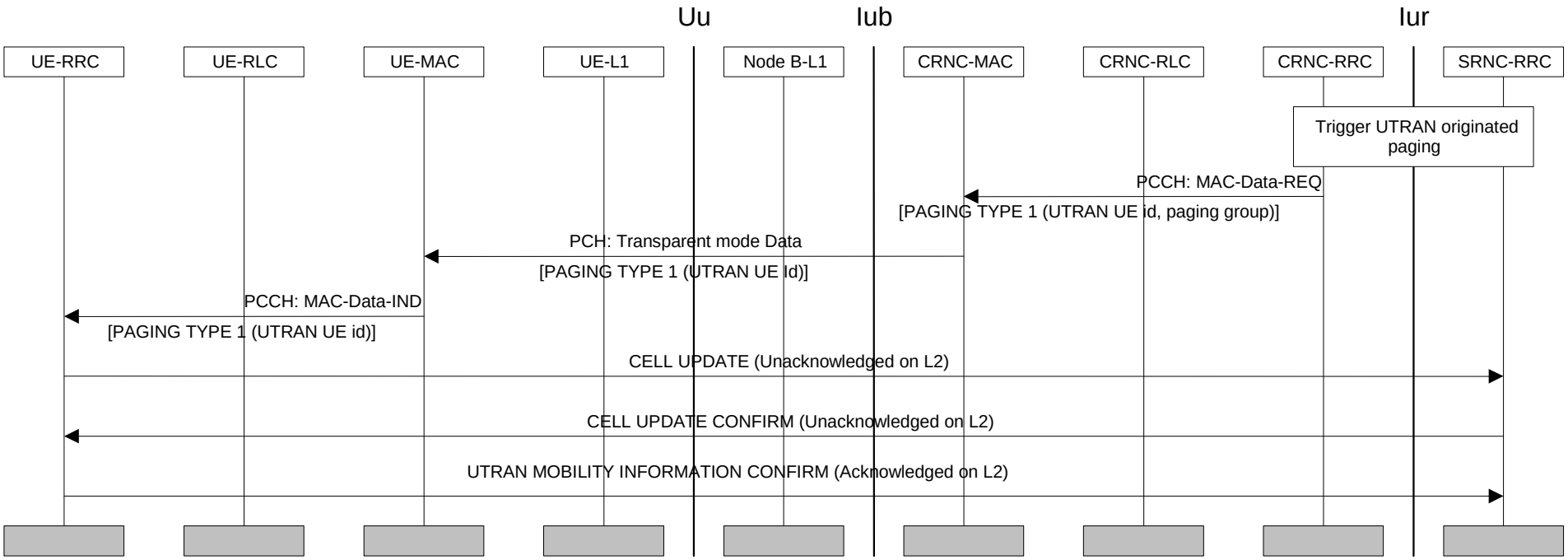


Figure 42: Example sequence for UTRAN initiated paging request with paging response

The RRC layer in the network uses this sequence to trigger a switch to CELL_FACH state, when the UE can only be reached on the PCH (the CELL_PCH state or the URA_PCH state). A Paging Type 1 message is prepared, containing the UTRAN UE identity (s-RNTI + RNC-ID). The RRC requests the transmission of the message by MAC on the PCCH, indicating the paging group.

In the UE, the RRC layer continuously monitors the paging group on the PCH and compares the UE identities in received paging request messages with its own identities. A match occurs, and in this case the RRC layer changes state to CELL_FACH state.

The UE prepares a Cell Update message, which is sent on CCCH.

When the network receives the Cell Update message, a c-RNTI is allocated and signalled to UE using the Cell Update Confirm message, which is sent on DCCH using unacknowledged mode. The latter message also acknowledges the reception of the Cell Update message. The UE configures MAC to use the new c-RNTI and prepares a UTRAN MOBILITY INFORMATION CONFIRM message. When the network receives the UTRAN MOBILITY INFORMATION CONFIRM message on DCCH it can delete any old c-RNTI and the DCCH/DTCH logical channels can be used also in the downlink using the new c-RNTI.

6.7 Other procedures

6.7.1 UE Capability Information

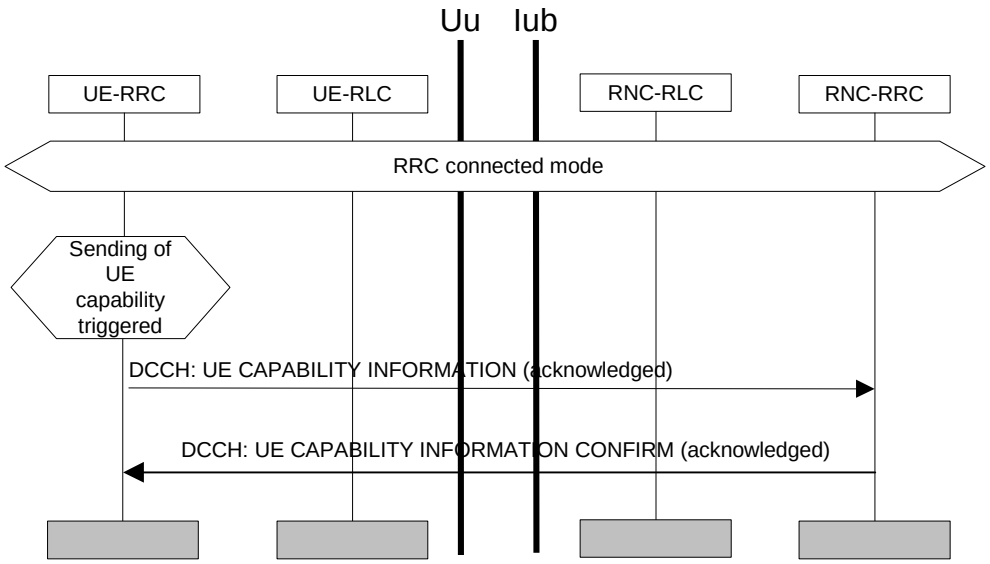


Figure 43: UE Capability Information

The UE transfers its capability information to the network by transmitting the RRC message UE Capability Information using acknowledged mode on the DCCH. UTRAN confirms the reception of the UE capabilities by transmitting an UE CPABILITY INFORMATION CONFIRM message using acknowledged mode on the DCCH. This procedure is performed during the lifetime of the RRC Connection if the UE capability information changes (e.g. due to change in UE power class). UE capability information can also explicitly be requested by UTRAN.