TSG-RAN Working Group 2 (Radio layer 2 and Radio layer 3) ***TSGR2#6(99)888***
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Title: Transition from DCH/DCH to RACH/FACH substate

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1 INTRODUCTION

In this contribution the transition from DCH/DCH to RACH/FACH substate is clarified.

2 TRANSITION FROM DCH/DCH TO RACH/FACH SUBSTATE

The UTRAN can initiate the transition from DCH/DCH to RACH/FACH substate with the following messages:

1. RADIO ACCESS BEARER RELEASE
2. TRANSPORT CHANNEL RECONFIGURATION
3. PHYSICAL CHANNEL RECONFIGURATION

When transferring from DCH/DCH to RACH/FACH substate, the UE needs to select which cell it will first use in common channel state. Secondly, the UE needs to receive information on the PRACH and SCCPCH of this cell. Thirdly, the UE may need to be assigned new RNTIs.

One general method to handle to transition procedures is presented in figure 1, where RAB release is used as an example. The UE receives a RADIO ACCESS BEARER RELEASE message from the UTRAN. It then selects the cell, which it will use in common channel state and then monitors the BCH of that cell to receive information on the RACH and FACH channels in that cell. After having received this information, the UE sends a RADIO ACCESS BEARER RELEASE COMPLETE message to the UTRAN. The UTRAN then registers the presence of the UE in the cell and proceeds to allocate a new RNTI(s) to the UE if necessary with the RNTI reallocation procedure.

The principle applies in transport channel reconfiguration and physical channel reconfiguration, when they initiate a transition from DCH/DCH to RACH/FACH substate.

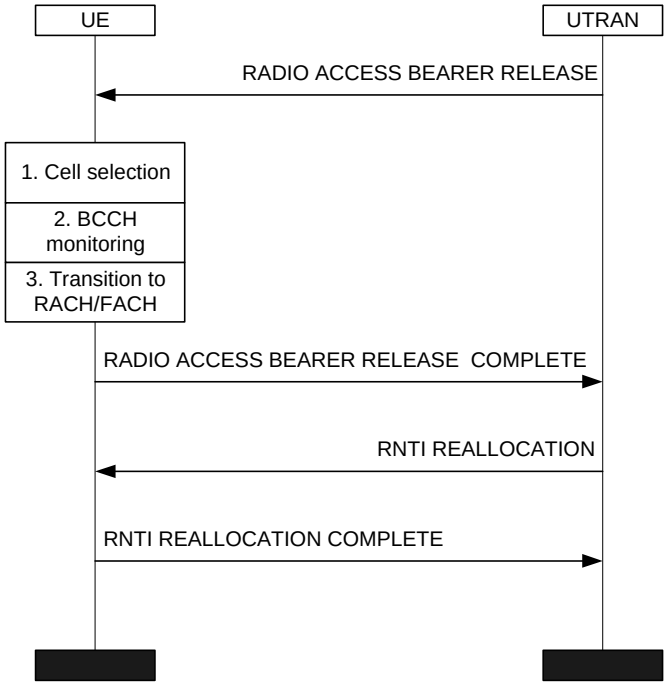

Figure 1: Transition from DCH/DCH to RACH/FACH substate: general procedure

There are possibilities to streamline the general procedure presented in figure 1. Based on previously received measurement reports from the UE, the UTRAN will in many cases be able to predict with a high probability the cell (or set of cells), which the UE would select upon transition to RACH/FACH. Therefore, to make the state transition faster, the UTRAN could suggest a preferred cell with accompanying RACH information and even to allocate RNTIs in any of the messages used to initiate transition to RACH/FACH substate.

In order to provide this possibility, the following optional information elements should be included in the messages (1-3):

- An indication of one or more cells, which the UE should select when changing to RACH/FACH state
- the RACH/FACH configuration of the proposed cells
- c-RNTI(s) for the proposed cell(s)

The UE shall confirm the reception and usage of the above mentioned information by transmitting a complete message (corresponding to the message initiating the transition) in the RACH of the cell, which it has chosen from the list of proposed cells.

3 CHANGE REQUEST TO TS 25.331

3.1 CR to 25.331 Section 8.3.1.2

We propose the following modification to chapter 8.3.2 in TS 25.331 [1]

8.3.1.2 Radio Access Bearer Release

This procedure releases a radio access bearer. The RLC entity for the radio access bearer is released. The procedure may also release a DCH, which affects the TFCS. It may include release of physical channel(s) and change of the used transport channel types / RRC state.
The Radio Access Bearer Release procedure is initiated by the RRC layer on the NW side. A RADIO ACCESS BEARER RELEASE message is sent from the RRC layer in the network to its peer entity in the UE. This message includes possible new L1, MAC and RLC parameters for remaining radio access bearers and indentification of the radio access bearer to be released.
[Note: In synchronised case a specific activation time would be needed for the change of L1 and L2 configuration to avoid data loss.]
The RRC on the UE side configures L1 and MAC, and releases the RLC entity associated to the released radio access bearer . A similar reconfiguration is also done on the network side.
Finally, RRC on the UE side sends a RADIO ACCESS BEARER RELEASE COMPLETE message to the network.
Currently the following alternative methods have been identified by which Radio Access Bearers may be released:

Radio Access Bearer Release with unsynchronised dedicated physical channel modification
Radio Access Bearer Release with synchronised dedicated physical channel modification
Radio Access Bearer Release without dedicated physical channel modification

~~*[Note: When a radio access bearer carried on a DCH is released, it is FFS, whether the UE should acknowledge the RADIO ACCESS BEARER RELEASE message before making the reconfiguration (on the DCH) or after making the reconfiguration (on the RACH)]*~~

When the reconfiguration involves a change from DCH/DCH to RACH/FACH, the UE should acknowledge the RADIO ACCESS BEARER RELEASE message on the RACH, after it has made the reconfiguration. The transmission of the RADIO ACCESS BEARER RELEASE COMPLETE message will in this case replace the cell update procedure.

The UTRAN may optionally include PRACH/SCCPCH parameters and the c-RNTI for one or many cells in the RADIO ACCESS BEARER RELEASE message.

[Note: The details of handling other types of substate transitions is FFS]

[Note: The possibility of releasing multiple radio access bearers within one message is FFS]

3.2 CR to 25.331 Section 8.3.2

We propose the following modification to chapter 8.3.2 in TS 25.331 [1]

8.3.2 Transport Channel Reconfiguration

This procedure configures parameters related to a transport channel such as the TFS. The procedure also assigns a TFCS and may change physical channel parameters to reflect a reconfiguration of a transport channel in use.

A change of the transport format set for a transport channel is triggered in the RRC layer in the network. A TRANSPORT CHANNEL RECONFIGURATION message is then sent from the RRC layer in the network to its peer entity. This message contains the new transport format set, a new transport format combination set and may include physical channel parameters. *[Note1: In a synchronised procedure a specific activation time is needed for the change of L1 and L2 configuration to avoid data loss.]* When this message is received in the UE a reconfiguration of L1 and MAC is done. A similar reconfiguration is also done on the network side. Finally, a TRANSPORT CHANNEL RECONFIGURATION COMPLETE message is returned to the network.

Currently identified options by which transport channels may be reconfigured:

a) Synchronised transport format set reconfiguration
b) Unsynchronised transport format set reconfiguration
c) Pre-configuration of TFS/TFCS for a transport channel not yet in use

~~*[Note: When the reconfiguration involves a change of transport channel it is for further study on what channel the UE should acknowledge the TRANSPORT CHANNEL RECONFIGURATION message, ie. whether it should acknowledge before making the reconfiguration (eg. on the DCH) or after making the reconfiguration (eg. on the RACH)]*~~

When the reconfiguration involves a change from DCH/DCH to RACH/FACH, the UE should acknowledge the TRANSPORT CHANNEL RECONFIGURATION message on the RACH, after it has made the reconfiguration. The transmission of the TRANSPORT CHANNEL RECONFIGURATION COMPLETE message will in this case replace the cell update procedure.

The UTRAN may optionally include PRACH/SCCPCH parameters and the c-RNTI for one or many cells in the TRANSPORT CHANNEL RECONFIGURATION message.

[Note: The details of handling other types of substate transitions is FFS]

3.3 CR to 25.331 Section 8.3.4

We propose the following modification to chapter 8.3.4 in TS 25.331 [1]

8.3.4 Physical Channel Reconfiguration

This procedure may assign, replace or release a set of physical channels used by a UE. As a result of this, it may also change the used transport channel type (and RRC state). For example, when the first physical channel is assigned the UE enters the DCH/DCH state. When the last physical channel is released the UE leaves the DCH/DCH state and enters a state (and transport

channel type) indicated by the network. A special case of using this procedure is to change the DL channelization code of a dedicated physical channel. *[Note: The procedure does not change the active set, in the downlink the same number of physical channels are added or replaced for each radio link.]*

Currently identified motivations for using this procedure (methods by which physical channels may be reconfigured):

~~a)~~Assignment of dedicated physical channel (switch from common channels to dedicated physical channel)
~~b)~~Synchronised replacement (modification) of dedicated physical channel (eg. for D/L code tree re-organisation)
~~c)~~Release dedicated physical channel (switch from dedicated physical channel to common channels).
~~d)~~This procedure can also be used to add further FAUSCH channels (e.g. for use in other cells of the URA, to which a UE might move in the future when the UE already has an RRC connection.)

When the reconfiguration involves a change from DCH/DCH to RACH/FACH, the UE should acknowledge the PHYSICAL CHANNEL RECONFIGURATION message on the RACH, after it has made the reconfiguration. The transmission of the PHYSICAL CHANNEL RECONFIGURATION COMPLETE message will in this case replace the cell update procedure.

The UTRAN may optionally include PRACH/SCCPCH parameters and the c-RNTI for one or many cells in the PHYSICAL CHANNEL RECONFIGURATION message for one or many cells.

We propose to rename the c-RNTI information element into c-RNTI info and include the possibility to include a reference to a specific cell, if the PDU includes RNTIs for many cells. The renaming should be done in all PDUs, which currently include the c-RNTI information element.

3.4 CR to 25.331 Section 10.2.3.2

We propose the following modification to chapter 8.3.2 in TS 25.331 [1]

10.2.3.2 C-RNTI info

~~The controlling RNC RNTI identifies an UE having a RRC connection within an controlling RNC.~~

Information Element/Group name	Presence	Range	IE type and reference	Semantics description
c-RNTI				The controlling RNC RNTI identifies an UE having a RRC connection within an controlling RNC.
DL scrambling code	C if many c-RNTIs			Identifies the cell in which the c-RNTI applies.

4 REFERENCES

[1] TS 25.331, v 1.2.0 1999-07, "Description of the RRC protocol", source: TSG RAN WG2.