

Agenda Item: 9
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Introduction

This paper proposes changes for the chapter “5.1 Cell Connected State” of 25.303, to include the UE RRC states of the UTRA TDD mode.

Note: The following presents the basics of the TDD specific description of the “Cell Connected State” only, for easier reading. If a conclusion can be reached the final version of chapter 5.5.1 will be a merger of the current version of that chapter, as in 25.303 version 3.0.1, and this TDD-adapted version.

Chapter 5.5.1, changed

5.5.1 Cell Connected State

In this state, the position of the UE is known on cell level. The RRC Connection mobility is handled by handover procedures including soft handover (FDD only), hard handover and cell updates. Both uplink and downlink data transfer is possible.

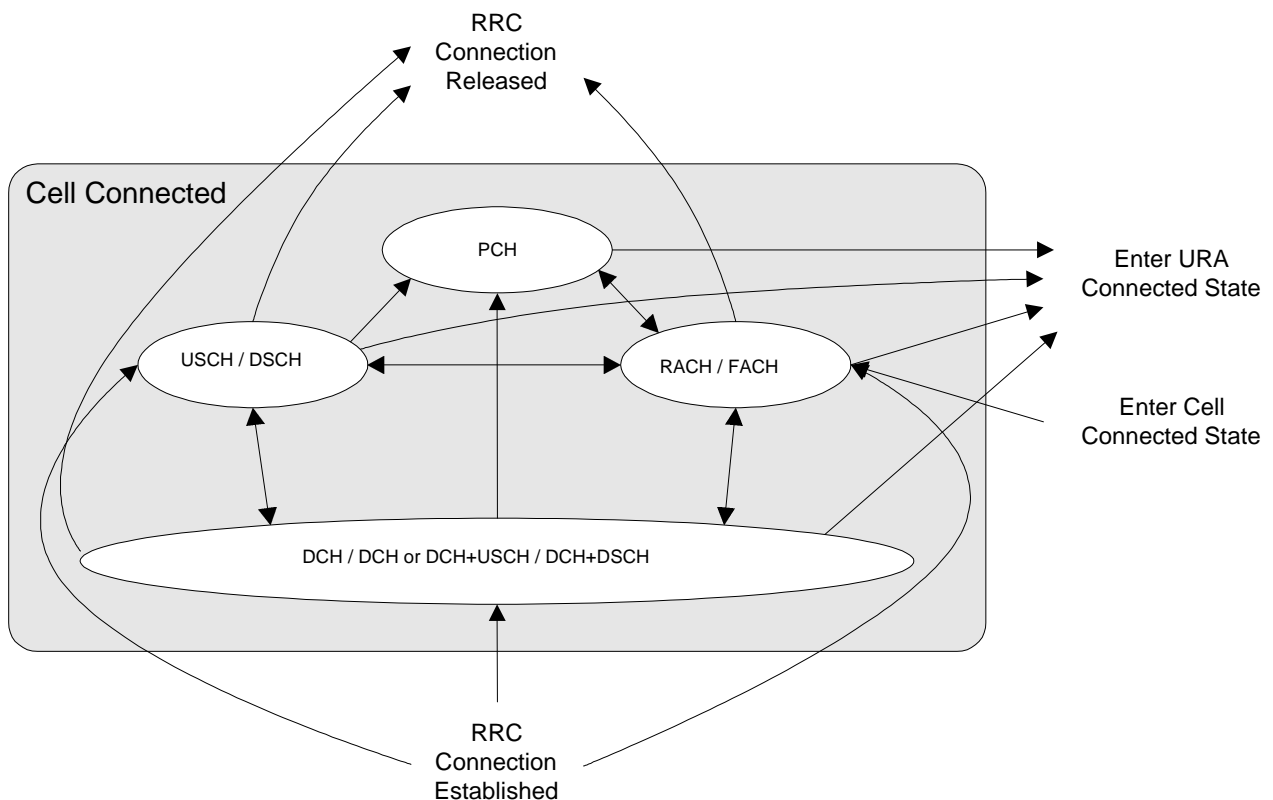


Figure 1: Substates within Cell Connected State

5.5.1.1 DCH /DCH or DCH + USCH / DCH + DSCH substates

These substates are characterized by the allocation of a dedicated transport channel to the UE. The DCH-states are entered from the Connecting State through the setup of an RRC connection, or by establishing a dedicated channel (DCH) from the RACH / FACH, or USCH / DSCH substates.

These substates are further divided depending on the type of information that is allowed to be transmitted on the dedicated channel(s) and the uplink and downlink shared channel. The substates are shown in Figure 2.

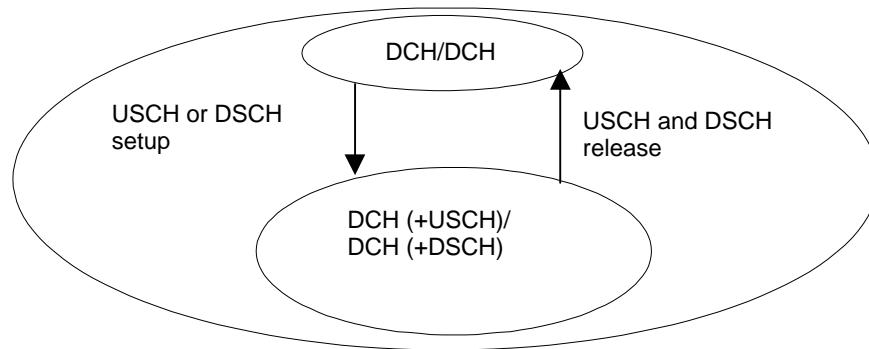


Figure 2: Substates in DCH / DCH or DCH+USCH / DCH+DSCH substates

5.5.1.1.1 DCH/DCH substate

In this substate UTRAN has allocated Dedicated transmission resources for the UE and it may transmit data without a prior request up to the peak capacity that is currently granted to that UE.

5.5.1.1.2 DCH (+USCH) / DCH (+DSCH) substate

In this substate UTRAN has allocated Dedicated transmission resources for the UE and it may transmit data without a prior request up to the peak capacity that is currently granted to that UE.

In addition, UTRAN has admitted the UE to use USCH and/or DSCH for NRT bearers, i.e. UTRAN has configured USCH and DSCH Transport Format Sets in the UE. Therefore the UE **listens to the FACH** to receive allocation messages from the UTRAN which indicate to the UE the physical PUSCH and/or PDSCH resources to use for USCH/DSCH, for a limited time.

This fact that the UE listens to the FACH for USCH/DSCH allocation messages, is the basic difference between the DCH/DCH substate and the DCH(+USCH) / DCH(+DSCH) substate, even if currently no physical PUSCH/PDSCH channels are available to that UE.

Another characteristics of that substate is that the UE can send USCH capacity requests to the UTRAN, asking for PUSCH resources, either within the USCH, or via the RACH.

Depending on the current availability of PUSCH/PDSCH resources, this state is decomposed into the following four sub-substates:

- DCH (+RACH) / DCH (+FACH): The UE uses DCH/DCH for bidirectional data transmission, listens to the FACH for USCH/DSCH allocation messages, and may use the RACH for USCH capacity requests.
- DCH + USCH / DCH (+FACH): The UE uses DCH+USCH for uplink, DCH for downlink data transmission, listens to the FACH for USCH/DSCH allocation messages, and may use the USCH for further USCH capacity requests.
- DCH (+RACH) / DCH + DSCH (+FACH): The UE uses DCH for uplink, DCH + DSCH for downlink data transmission, listens to the FACH for USCH/DSCH allocation messages, and may use the RACH for USCH capacity requests.
- DCH + USCH / DCH + DSCH (+FACH): The UE uses DCH+USCH for uplink, DCH+DSCH for downlink data transmission, listens to the FACH for USCH/DSCH allocation messages, and may use the USCH for further USCH capacity requests.

5.5.1.1.13 Radio Resource Allocation tasks (DCH/DCH and DCH+USCH / DCH+DSCH)

For the DCH, several physical channel allocation strategies may be applied. The allocations can be either permanent (needing a DCH release message) or based on time or amount-of-data.

Resource allocation can be done separately for each packet burst with fast signalling on the DCH. Transition out of the Control only state is either triggered by user capacity allocation or by timeout (no data transaction requests received within a specified time period).

On the DCH, the DSCH and the USCH the UE and the network indicate in each radio frame the current data rate (in uplink and downlink respectively) using the transport format combination indicator (TFCI). However in TDD DCH and DSCH or USCH are mapped on different CCTrCh's, their TFCI are therefore totally independent. DCH transmission is not modified by the simultaneous existence of DSCH/USCH. For USCH/DSCH the TFCI is transmitted in each frame in-band on one or more codes of the allocated PUSCH/PDSCH. If the configured set of combinations (i.e. transport format set for one transport channel) on one of the transport channels are found to be insufficient to retain the QoS requirements for a transport channel, the network initiates a reconfiguration of the transport format set (TFS) for that transport channel. This reconfiguration can be done during or in between data transmission. Further, the network can reconfigure the physical channel allowing an increase or decrease of the peak data rate.

For the uplink data transmission, the UE reports the observed traffic volume to the network in order for the network to re-evaluate the current allocation of resources. This report contains e.g. the amount of data to be transmitted or the buffer status in the UE.

5.5.1.2 RACH / FACH substate

The position of the UE is known by UTRAN on cell level. In the RACH / FACH substate the UE performs the following actions:

- listens to an FACH
- listens to the BCH transport channel of the serving cell for the decoding of system information messages
- initiates a cell update procedure on cell change
- transmits uplink control signals and small data packets on the RACH.

5.5.1.3 USCH / DSCH substate

This substate is very much equivalent to the DCH+USCH / DCH+DSCH substate, however without availability of the DCH/DCH pair. So there is no more possibility to use fast closed loop power control which requires at least one DPCH/DPCH pair. Therefore either open loop power control, or slow closed loop power control is applied.

In this substate, UTRAN has admitted the UE to use USCH and/or DSCH for NRT bearers, i.e. UTRAN has configured USCH and DSCH Transport Format Sets in the UE. The UE listens to the FACH to receive allocation messages from the UTRAN which indicate to the UE the physical PUSCH and/or PDSCH resources to use for USCH/DSCH, for a limited time.

In addition, the UE can send USCH capacity requests to the UTRAN, either within the USCH, or at the RACH.

Depending on the current availability of PUSCH/PDSCH resources, this state is decomposed into the following four sub-states:

- (RACH) / (FACH): The UE listens to the FACH for USCH/DSCH allocation messages, and may use the RACH for USCH capacity requests.
- USCH / (FACH): The UE uses USCH for uplink data transmission, listens to the FACH for USCH/DSCH allocation messages, and may use the USCH for further USCH capacity requests.
- (RACH) / DSCH (+FACH): The UE uses DSCH for downlink data reception, listens to the FACH for USCH/DSCH allocation messages, and may use the RACH for USCH capacity requests.
- USCH / DSCH (+FACH): The UE uses USCH for uplink, DSCH for downlink data transmission, listens to the FACH for USCH/DSCH allocation messages, and may use the USCH for further USCH capacity requests.

5.5.1.4 PCH substate

The position of the UE is known by UTRAN on cell level. In this substate the UE performs the following actions:

- listens to the PCH transport channel for the decoding of paging and notification messages sent by the network
- listens to the BCH transport channel of the serving cell for the decoding of system information messages
- initiates a cell update procedure on cell change.

The DCCH logical channel cannot be used in this substate. If the network wants to initiate any activity, it needs to make a paging request on the PCCH logical channel in the known cell to initiate any downlink activity.