TSG-RAN Working Group 2 (Radio layer 2 and Radio layer 3) ***TSGR2#3(99) 213***
Yokohama 13th to 16th April 1999

Agenda Item: 7.11

Source: Alcatel

Title: Change request to S2.03 to include a new procedure for 'Dynamic Resource Allocation Control of Uplink DCH'

Document for: Decision

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1 Introduction

The concept of 'fast arbitration of radio resources allocation for uplink DCH' has been agreed in RAN/WG2#2, based on a proposal from Alcatel (Tdoc RAN/WG2 122/99). This document presents a proposal for the description of the procedure, to be included in S2.03 document. Some changes are also proposed for the section 6, related to the overview of procedures for RAB control.

It is proposed to include proposed changes to section 6 and a new section 7.2.5 in S2.03.

6 Radio Access Bearer Control – Overview of Procedures

6.1 Configurable parameters

The following layer 1, MAC and RLC parameters should be able to configure by RRC. The list is not complete.

- Radio access bearer parameters, e.g.
  - RLC parameters per RLC link (radio access bearer), which may include e.g. PDU size and timeout values. Used by RLC.
  - Multiplexing priority per DCCH/DTCH. Used by MAC in case of MAC multiplexing of logical channels.
- Transport channel parameters, e.g.
  - Scheduling priority per transport channel. Used by MAC in case of layer 1multiplexing of transport channels.
  - Transport format set (TFS) per transport channel. Used by MAC and L1.
  - Transport format combination set (TFCS) per UE. Used by MAC and L1.
  - Allowed subset of TFCS per UE. Used by MAC.
  - <u>Allowed subset of TFS per DCH. Used by MAC.</u>
  - <u>Transmission probability on uplink DCH. Used by MAC.</u>
- Physical channel parameters, which may include e.g. carrier frequency and codes. Used by L1.

6.2 Typical configuration cases

The table below gives a proposal which main combination cases of parameter configuration that shall be supported, in terms of which parameters that shall be able to configure simultaneously (by one procedure). Note that the "Transport channel type switching" is not a parameter as such, it only indicates that switching of transport channel type may take place for that combination case.

Parameter		Layer	A	B	C	D	E	F
Radio access bearer parameters	RLC parameters	RLC	X					
	Logical channel multiplexing priority	MAC	X					
Transport channel parameters	Transport channel scheduling priority	MAC	X					
	TFS	L1+MAC	X	X				
	Subset of TFS	MAC						X
	TFCS	L1+MAC	X	X				
	Subset of TFCS	MAC					X	
	Transport channel type switching	MAC	X	X	X			
	Transmission probability	MAC						X
Physical channel parameters		L1	X	X	X	X		X

Table 1. Typical configuration cases. An "X" indicates that the parameter can (but need not) be configured.

Case A is typically when a radio access bearer is established or released, or when the QoS of an existing radio access bearer or the signalling link need to be changed (the necessity of change of QoS is FFS).

Case B is when the traffic volume of a radio access bearer has changed so the TFS used on the DCH need to be changed, which may in turn affect any assigned set of physical channels. Another example is to make the UE use a new transport channel and at the same time supplying the TFS for that channel.

Case C is when the traffic volume of one radio access bearer has changed so that the used transport channel type is changed from e.g. RACH/FACH to DCH/DCH, which includes the assignment or release of a set of physical channels.

Case D is e.g. the change of used DL channelization code, when a DCH is currently used. No transport channel type switching take place.

Case E is a temporary restriction and/or a release of restriction for usage of the TFCS by the UE (total uplink rate).

Case F is used to dynamically control the allocation of resources on uplink DCH in the CRNC, using broadcast information such as transmission probability and minimum spreading factor.

6.3 RRC Elementary Procedures

6.3.1 Category 1: Radio Access Bearer Configuration

The first category of procedures includes Case A and are characterized by:

- Are executed upon request by higher layers and the parameter configuration is based on QoS
- Affects L1, MAC and RLC.

There are three RRC procedures included in this category:

- **Radio Access Bearer Establishment.** This procedure establishes a new radio access bearer. The

establishment includes, based on QoS, assignment of RLC parameters, multiplexing priority for the DTCH, scheduling priority for DCH, TFS for DCH and update of TFCS. It may also include assignment of a physical channel(s) and change of the used transport channel types / RRC state.

- **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.
- **Bearer Reconfiguration.** This procedure reconfigures parameters for a radio access bearer or the signalling link to reflect a change in QoS. It may include change of RLC parameters, change of multiplexing priority for DTCH/DCCH, change of DCH scheduling priority, change of TFS for DCH, change of TFCS, assignment or release of physical channel(s) and change of used transport channel types. *[Note: The necessity of this procedure is FFS.]*

6.3.2 Category 2: Transport Channel Configuration

The second category of procedures includes Case B and are characterized by:

- Configuration of TFS for a transport channel and reconfiguration of TFCS is done, but sometimes also physical channel parameters.
- Affects L1 and MAC.
- Switching of used transport channel(s) may take place.

There is one RRC procedure included in this category:

- **Transport Channel Reconfiguration.** This procedure reconfigures 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. *[Note: It is expected that the configuration of TFS/TFCS needs to be done more seldom than the assignment of physical channel. A "pre-configuration" of TFS/TFCS of a transport channel not in use can be done by this procedure, to be used after transport channel type switching when the physical channel is assigned.]*

6.3.3 Category 3: Physical Channel Configuration

The third category of procedures includes the cases C and D and are characterized by:

- May assign or release a physical channel for the UE (which may result in transport channel type switching)
- May make a combined release and assignment (replacement) of a physical channel in use (which does not result in transport channel type switching / change of RRC state).
- Affects mainly L1, and only the transport channel type switching part of MAC.
- The transport format sets (TFS and TFCS) are not assigned by this type of procedure. However, the UE can be directed to a transport channel, which TFS is already assigned to the UE.

There is one RRC procedure included in this category:

- **Physical Channel Reconfiguration.** This procedure may assign, replace or release a set of physical channels used by an UE. As a result of this, it may also change the used transport channel type (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.]*

6.3.4 Category 4: Transport Format Combination Restriction

The fourth category of procedures includes Case E and are characterized by:

- Does only control MAC by means of the transport format combinations that may be used within the set without affecting L1.

There is one RRC procedure included in this category:

- **Transport format combination control.** The network uses this procedure towards an UE, to control the used transport format combinations in the uplink within the transport format combination set.

6.3.5 Category 5: Uplink Dedicated Channel Control in CRNC

The fifth category of procedures includes Case F and are characterized by:

- Does control UE MAC by means of broadcasting transmission probability and minimum spreading factor that may be used.

There is one RRC procedure included in this category:

- **Dynamic Resource Allocation Control of Uplink DCH :** The network uses this procedure towards all UEs, to control the probability of transmission and the minimum spreading factor used in the uplink.

7.2.5 Dynamic Resource Allocation Control of Uplink DCH

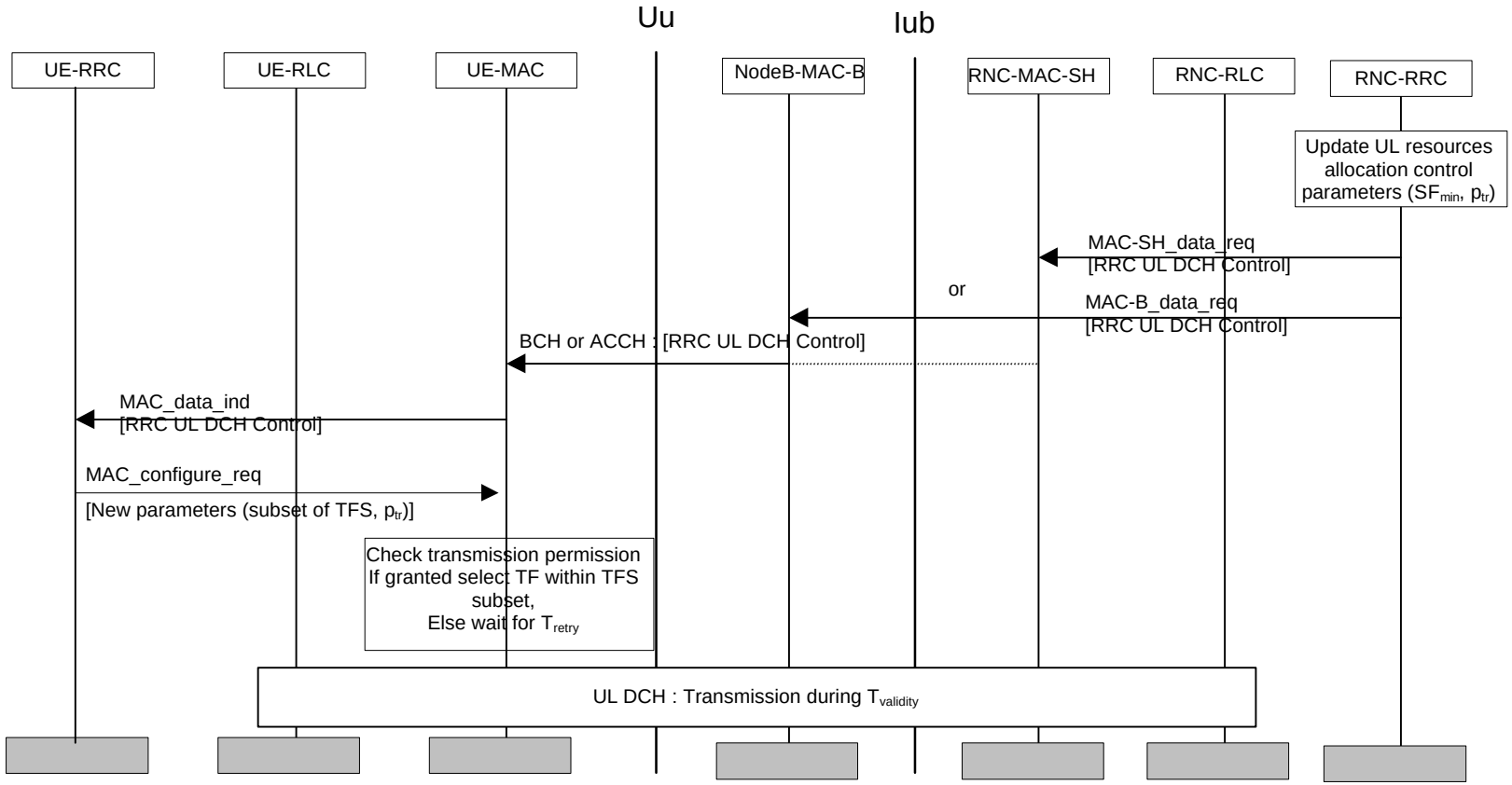

Figure 1: Dynamic Uplink Resource Allocation Control of DCH

Figure 1 illustrates an example of a Dynamic Uplink Resource Allocation Control procedure for DCH. The CRNC updates transmission parameters at each frame, according to network load. The following parameters are transmitted :

- Transmission probability p_{tr}, which indicates the probability for a UE to be allowed to transmit on its DCH during the next period $T_{validity}$
- Minimum spreading factor SF_{min}, which indicates the maximum bit rate allowed to be used by the UE on its DCH during the next allowed period $T_{validity}$

Besides these parameters, the UE has been transmitted once (through BCCH or at RAB establishment) the following parameters :

- Transmission time validity, $T_{validity}$, which indicates the time duration for which an access for transmission is granted. $T_{validity}$ shall be a multiple of the Transmission Time Interval of each involved DCH.
- 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 Uplink DCH Control message from the CRNC to all UE. This message is sent either on the BCH or on the ACCH transport channel or on both, depending on the network configuration. If there is no ACCH in the cell, the message is sent on the BCCH, otherwise it is sent on the ACCH. A parameter on the BCCH will indicate on which transport channel the information is broadcast. This message contains a set of parameters defined above per UE class. It is sent every frame.

The procedure applies to all uplink DCH being established with a 'Dynamic Control' parameter in the RAB establishment procedure. The UE has to listen to this message prior to any transmission on DCH and continues with a reconfiguration of MAC. The MAC is assigned a new probability of transmission on this DCH and a new subset of the TFS allocated to the DCH, which is derived by RRC from the SF_{min} parameter. The detailed UE MAC procedure is described in S2.21. The L1 is indirectly adapting to the new minimum spreading factor (SF_{min}), through the L1 uplink dynamic rate matching procedure, according to the TBS sent by MAC at each Transmission Time Interval. The UE MAC procedure shall be mandatory for all UEs supporting high bit rate NRT services.

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 (i.e. lowest ratio p_{tr}/SF_{min}).