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Agenda Item:
Source: NEC and Telecom Modus
Title: Procedures for slow transmit power control
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1. Introduction

In TSG-RAN WG1, a downlink transmit power control method has been discussed, which is called “Slow Transmit Power Control (slow TPC)”. This method was introduced for downlink packet transmission in the ARIB specification as an option for both UE and network, and was also included in the 3GPP 25.200 series. In order to control and manage this power control method, Layer 3 signaling is required. In TSG-RAN WG2, the necessary enhancements to relevant RRC protocol messages has been discussed. This contribution explains the concept of slow TPC and proposes relevant information elements in NBAP procedures.

2. Slow TPC

This method may be used instead of inner loop power control when downlink packet data are transmitted via DCH and when a little data including ACK messages are expected for uplink. A typical application is web browsing, which has a relatively high average data rate on the downlink, while on the UL only acknowledgments and URL requests are sent.

When slow TPC is used, the UE transmits the DPCCH discontinuously. At regular time instants spaced T_{RINT}, the UE transmits a "Power Control Ratio" (PCR) on the DPCCH for the duration of one frame. The PCR replaces the normal content of the DPCCH frame. T_{RINT} specifies the maximum time distance between the transmission of two power control ratios. Additional PCRs are sent each time when the UE uses its UL DPDCHs. If uplink data is scheduled for transmission, at a PCR time instant, then the DPDCH is activated in addition to the DPCCH. When uplink transmission is resumed, the UE transmits dummy slots composed of only DPCCH prior to a radio frame composed of DPCCH and DPDCH. The number of the dummy slots is N_{DS}. By using this method, the UE can reduce its power consumption significantly at the expense of a slight decrease in DL capacity.

3. NBAP Procedures for Slow TPC

The transition between normal fast TPC and slow TPC is controlled by the SRNC using existing NBAP communication. Since slow TPC is not used during soft handover, RNC may activate slow TPC when UE has only one Radio Link, and shall stop slow TPC before Radio Link Addition.

4. Proposal of Information Element for slow TPC

To utilize this method, we propose to introduce a new IE “**Slow TPC Information”** in RADIO LINK RECONFIGURATION PREPARE message.

(1) Proposed text for Radio Link Reconfiguration (Synchronized)
We propose to include a text in 8.2.2 Radio Link Reconfiguration (Synchronized) as follows:

The RADIO LINK RECONFIGURATION PREPARE message contains:
- UL Radio Resources (UL Channelisation code type)

- DL Radio Resources (DL Channelisation code per RL) (if changed)
- Transport Format Combination Set

In case of DCH addition, this message also contains
- DCH Information (new DCH ID to add, Transmission Rate, Transport Format Set)
- Priority of DCH (How is it used?)

When setting up co-ordinated DCH's, if the receiver is not able to setup one of the DCH's, the setup of the other DCH's requested with the same DCH Combination Indicator value shall be rejected.

In case of DCH reconfiguration, this message also contains
- DCH Information (existing DCH ID to modify, Transmission Rate, Transport Format Set)
- Priority of modified DCH (How is it used?)

In case of DCH deletion, this message also contains
- DCH Information (DCH ID to delete)

In case of deleting one or more co-ordinated DCH's, the deletion of all DCH's established together with the same value for the DCH Combination Ind, shall be requested with one message. If deletion of only a subset of the co-ordinated DCH's is requested, the complete deletion shall be rejected.

In case of DSCH addition, this message also contains
- DSCH Information (DSCH Identifier to add, RL identifier, Transport Format Set)

In case of DSCH modification, this message also contains
- DSCH Information (DSCH Identifier to modify, Transport Format Set)

In case of DSCH deletion, this message also contains
- DSCH Information (DSCH Identifier to delete)

In case of activation or stop of slow TPC, this message also contains,
- Slow TPC information

The RADIO LINK RECONFIGURATION PREPARE message may consist of a combination of DCH addition, deletion, and reconfiguration.

(2) Proposed message contents for RADIO LINK RECONFIGURATION PREPARE

We propose to include the following information element in the RADIO LINK RECONFIGURATION PREPARE message.

Information element	REFERENCE	TYPE	NOTE
Slow TPC information		O	
Activation Indicator		M	Indicates if Slow TPC should be on or off
T_{RINT}		O	Maximum interval between the transmission of two consecutive Power Control Ratios.
N_{DS}		O	Number of dummy slots