3GPP TSG RAN WG2 Meeting #6 **RAN WG2 780/99**
Sophia Antipolis, 16-20 August 1999

Agenda Item: **14**

Source: **InterDigital**

Title: **TDD Support of NRT Data Services with Dedicated Channels**

Document for: **Decision**

Introduction

In TDD low data occupancy on dedicated channels supporting NRT services must be avoided. Since only a small number of physical channels share common air resources in TDD (i.e. within a time slot), other physical channels can not absorb unused spectrum within specific time slots. Therefore it is important to have the ability to allocate dedicated channels only for the specific period required for user data transmission.

Discussion

For NRT data services RLC buffer measurements in the UE and RNC are used to determine physical channel allocations. UE measurements are reported to the S-RNC with the RRC Measurement Report. Based on measurement reports the RNC can establish and release dedicated physical channels (DPCH).

The worst case scenario exists when a cell is saturated by DPCH's that are supporting primarily short bursts of user data. The following example illustrates the expected efficiency of supporting 2000 octet average transmissions (across commonly allocated TDD RU's for two UE's – for simplicity):

1. Assuming high data transfer rate allocations (to reduce serialization delays on the physical channel) on the order of 200kbs, a 2000 octet transmission will require 80ms (8 frames).

2. The duration from RNC reception of either the UE or RNC RLC measurement to RRC DCH establishment or DCH release is expected to be on the order of 100 to 200ms.

Air frames 1 - 30

1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0
UE #1 DCH establishment															UE #1 Transmitting								UE #1 DCH Release						

Air Frames 31-60

1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0
UE #1 DCH Release								UE #2 DCH establishment															UE #2 Transmitting						

Air Frames 61-76

1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6
	UE #2 Release														

In this worst case example only 16 of the 76 air frames are used for the respective RU's assigned to the hypothetical two users. This is approximately a 20% utilization of the assigned RU's.

The cause for this inefficient use of RU's is due to the RRC release signaling procedure having to complete before the RRC establishment procedure can be initiated. This is effectively a serial sequence (establish-transmit-release-establish…). The proposed solution is to allow the RRC signaling procedures to be performed asynchronously and in parallel with respect to the user data transmissions.

Therefore to more efficiently allocate RU's for NRT connections, it is proposed that DCH establishments and releases in TDD mode can be coordinated with the air frame number. With this capability the release of a particular UE's RU's can be coordinated on an air frame boundary with another UE's establishment. It is suggested that this can be accomplished by adding parameters to existing RRC messages, without any change in existing RRC procedures.

It is proposed that the RRC Physical Channel Reconfiguration that already incorporates an "activation time" parameter will now also include a "deactivation time". With this capability the RNC resource controller has the ability to coordinate RU allocations between different UE's on air frame boundaries.

Change Request to the RRC Protocol Specification (TS25.331):

10.1.5.1 PHYSICAL CHANNEL RECONFIGURATION

This message is used by UTRAN to assign, replace or release a set of physical channels used by a UE.
RLC-SAP: t.b.d.
Logical channel: DCCH
Direction: UTRAN → UE

Information element category	Information elements	REFERENCE	TYPE	NOTE	
	Message Type		M		
UE Information elements	Activation Time		O		
	Deactivation Time		O		
	C-RNTI		O	Only RACH/FACH	
UTRAN mobility Information elements					
	URA update indicator		O	When PCH shall be used, and when present, it instructs the UE to make URA updating	
PhyCH information elements					
	Uplink DPCH power control info		O		
	Frequency info		O		
				Maximum one of these	Uplink radio resources
	Uplink DPCH info		O		
	PRACH info		O		
	Uplink time slot info		O		
				For each radio link	Downlink radio resources
	Primary CCPCH info		O		
	Downlink DPCH info		O		
	Secondary CCPCH info		O	For FACH	
	Secondary CCPCH info		O	For PCH	
	Downlink timeslot info		O	Note 1	
	SSDT indicator		O	Necessity is FFS	
	Gated Transmission Control info		O	FFS	
	Default DPCH Offset Value		O		

Note 1: It is assumed that the DL timeslot configuration is the same for all radio links, whether or not macro-diversity is supported for TDD.