3GPP TSG-RAN Working Group 3 meeting # 4
1 – 4 June, 1999
Warwick, UK

***TSGR3#4(99)496***

**Title:** **Implications of Shared Channel Concept in TDD on the Iub**

**Source:** **Siemens, Italtel**

**Agenda Item:** **13.2 (UTRAN Iub Interface: General Aspects and Principles – Procedure specification)**

**Document for:** **Approval**

---

**1. Introduction**

In 25.321 [1] the MAC architecture in support of the TDD downlink shared channels (DSCH) and uplink shared channels (USCH) is described. The adoption of both an uplink and downlink shared channel in TDD has implications for the Iub interface particularly the logical model of the NodeB.

This document describes the required changes to the logical model and proposes corresponding changes to the document 25.430 [2].

**2. Background**

The revised UTRAN side MAC architecture is shown in Figure 1 below.

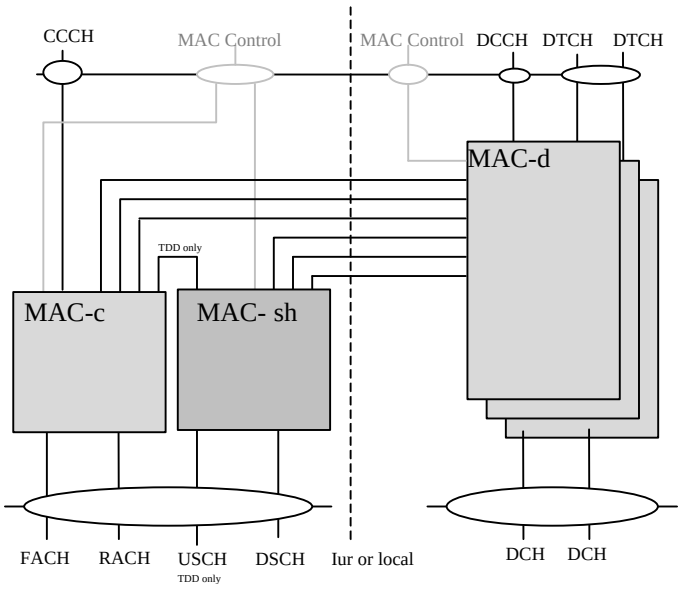


Figure 1: UTRAN side MAC architecture

A proposed method of operation for the TDD DSCH and USCH channels is summarized as follows:-

i) Access to the DSCH and USCH by multiple UEs is controlled by the MAC-sh entity. A MAC-d exists for each UE on the UTRAN side.

ii) The MAC-sh allocates resource units to individual UE using a scheduling function, resource units may be allocated for a period of time. The scheduling function may use queue information from the RLC to determine capacity requirements. The number and the location of the resource units that are available to the DSCH and USCH are defined by RRC.

iii) The signalling of resource allocations for the DSCH and USCH are made on the FACH. The signalling of UE requirements may be made over the RACH.

iv) In TDD, resource units are characterized by frequency, code and slots. Resource units for shared channels are grouped for allocation purposes. The groups are referred to *in this document* as 'sub-channels', where a sub-channel represents a particular group of resources. Sub-channel(s) are allocated to a UE by the MAC scheduler, with allocations limited to sub-channel identification thereby reducing signalling overhead. The set of resources represented by a sub-channel may be signalled in advance, the set will change over time.

v) The MAC-sh will not signal the shared channel to UE mapping in-band on the DSCH or USCH, this will be inferred from the individual resource allocation as signalled on the FACH.

**3. Discussion**

The use of TDD shared channels (USCH and DSCH) places the following requirements on the logical model of the NodeB:

- the existence of both DSCH and USCH must be reflected in the logical model of the NodeB
- typically only a single DSCH and USCH is required per cell as the multiplexing/demultiplexing of UE data to sub-channel, is handled by the MAC-sh entity.
- the shared channel 'sub-channel' structure may be changed slowly over time
- the shared sub-channel mapping of individual MAC data will vary rapidly with time under the control of the MAC-sh

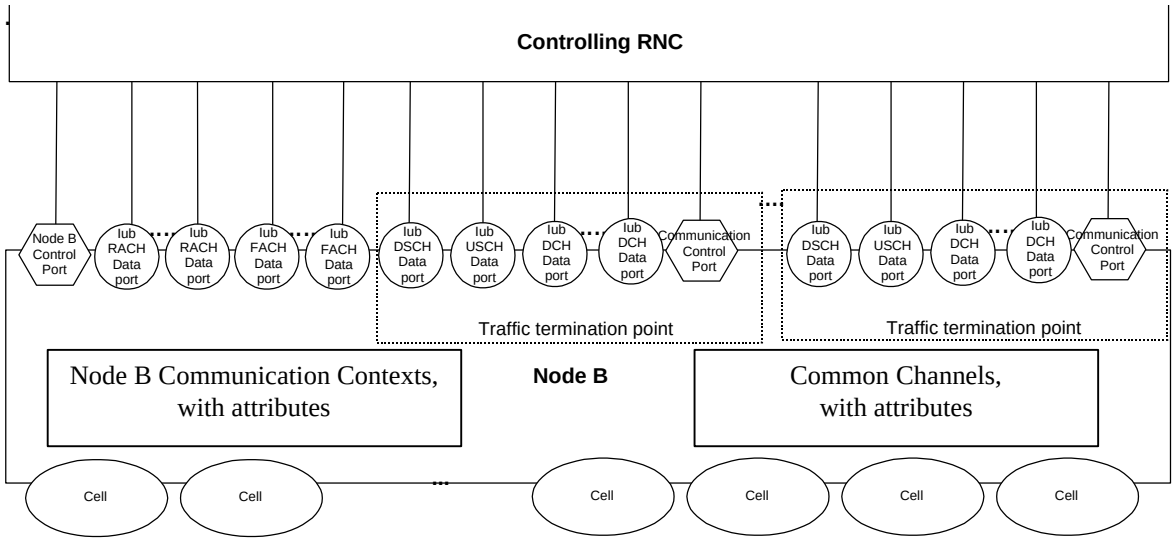


Figure 2: Logical Model of NodeB for TDD

Figure 2 above shows an amended logical model of NodeB for TDD shared channel operation. This illustrates the single USCH and DSCH per cell.

Secondly it is proposed that the definition of cell is reintroduced as illustrated in Figure 3:

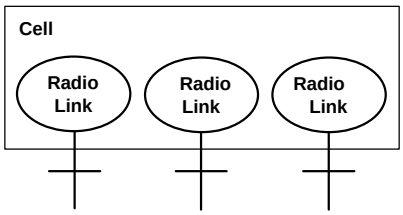


Figure 3: Cell Architecture within Logical Model Node B

The meaning of a radio link is defined for TDD comprises :

- a cell identifier
- a Radio Frequency Carrier identifier
- a set of TDD resources units
- frame repetition information

where:

- a TDD resource unit comprises a user code and time slot
- the frame repetition information would give the pattern at which the resource set repeats on a frame basis.

The corresponding meaning of a radio link for FDD would be:

- a cell identifier
- a Radio Frequency Carrier identifier
- a Physical Channel Identifier (spreading code).

The above description allows each TDD USCH/DSCH sub-channel to be described as a radio link. (Similarly each TDD DCH resource allocation may also be described as a radio link). The sub-channel structure would be signalled to the NodeB using the existing NBAP messages relating to radio links, with only necessary TDD related parameter changes. This signalling would occur via the communication control port. This allows the RRC to define and modify the definition of the sub-channels.

The mapping of DSCH message to sub-channel radio link will vary rapidly over time under the control of the MAC-sh. This allocation would be signalled in-band with the data to the NodeB.

The use of sub-channels in this way provides for mechanisms similar to the Transport Format Combination Set and reflects similar processes for the RRC.

**4. Proposal**

In [2] Section 6 'Node B logical Model over Iub' should be amended as follows:

1. Section 6.1 'Overview', the text and/or title of the existing figure 'Logical Model of Node B' should be amended to state that this is for FDD only
2. Section 6.1. 'Overview', the figure 2 'Logical Model of Node B for TDD' from this document should be included
3. Section 6.2.1 'Radio Network Logical Resources', the definition of cell for TDD and FDD - as described in section 3 of this document should be included
4. Section 6.2.2.7 'Iub DSCH Data Port', the text of the existing description should be amended to show that this is for FDD only. A description identifying the existence of a single DSCH port per cell for TDD should included.
5. Section 6.2.2.8 'Iub USCH Data Port', a new sub-section should be added identifying the existence of a single USCH port per cell for TDD should included.
6. Section 6.2.4 'Common Channels', the text should be amended to show the existence of USCH for TDD.

**References**


1. 25.321 (v2.0.0 1999-04) 3GPP Technical Specification Group (TSG) RAN; Working Group 2 (WG2); MAC protocol specification
2. 25.430 (proposed v0.1.1 1999-05) 3GPP Technical Specification Group (TSG) RAN; UTRAN Iub Interface: General Aspects and Principles.