TSGR3#6(99)881

Agenda Item:	4.5 synch ad-hoc
Source:	Nokia
Title:	**Measurement of UL/DL transmission delay and Achievement of Node synchronisaton**
Document for:	Approval

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1. Introduction

This paper shows how a Node synchronism can be achieved, if desired, with the current synchronization proposal and no additional procedures are needed. The paper does not discuss at all about the need of an exact Node Synchronization in UTRAN, that is questionable.

2. Discussion

Some WG3 see the need for a Node B-CRNC Node synchronisation, i.e. CRNC knows the frame timing in the node B with precision on the order of one or few milliseconds). Accordingly to the argumentation of those companies, the Node synchronism is needed in order to allow the RNC to know separately the DL and UL transmission delay in Iub/Iur and thus how to split the allowed UTRAN delay between transmission delay and frame margin (buffering), needed to avoid frame slips at the vocoder.

Documents [R3-99687] and [R3-99688] proposes to use a protocol to be carried on a new ALL0-based *synchronisation plane* in the Iub interface in order to achieve the node synchronism. During the discussion in WG3#5 (synchronisation ad-hoc), it was agreed that the same effect are achieved using the existing FP synchronisation procedure (with possible introduction of new parameters), provided that those are executed over an high priority transport bearer (=with same UL and DL transport delay).

But Node synchronisation can be achieved also with the current synchronisation proposal as follows:

As it was shown during the discussion, the first run (i.e. the SRNC starts it anytime) of the current synchronisation procedure over any of the transport connection between RNC and Node B provides information for a Node synchronism with an error that is half of the difference of the transmission delay between UL and DL. If then, based on such estimate, the SRNC sends a second DL Synchronisation frames at the time point where it expects the frame to arrive at the ToAWE point in Node B, the received ToA gives the needed correction in order to achieve the wanted synchronism. The precision of the Node synchronisation is equal to the precision of the ToA parameters (currently 1 msec).

What proposed above requires that:

1) SRNC knows the OFF, Td, ToAWE and Node B processing delay (in order to relate ToA value to the SFN frame timing). This is already assumed in the current standardisation proposal, except the Node B processing delay that it not exactly defined. The Node B processing delay depends on the Node B implementation, on the current processing load and on the required L1 processing, thus shall be defined by the node B at the setup of a new Iub port, and passed to the SRNC with the RL Setup/Addition Response message.

2) SRNC knows the response time of the Node B for the synchronisation procedure (time between the reception of the DL synchronisation frame and the sending of the UL synchronisation frame). This time shall be defined, for example during the Node B configuration, or fixed by the standard.

Note that the proposed method has the following benefits respect to the use of one high priority link between the CRNC and one Node B

1) It is based on a procedure that needs to be performed in any case for every new transport connection, due to the fact that the use of the high priority link does not provide any information on the transmission delay on the normal priority link.

2) It allows the synchronism between the SRNC and the Node B, while the pre-established high priority connections are proposed to be used only between a CRNC and its Node B. The high priority link method is not applicable when the first RL is setup in a DRNS, and an alternative method need to be anyway provided.

3. Proposals

- It is proposed that the definitions of any mechanism targeted to provide node synchronization (as synchronization procedures over high priority transport connection) is not considered anymore in WG3 because the current synchronisation proposal allows already the achievement of such synchronism (the accuracy is given by the precision of ToA parameters). It is up the vendor specific implementation of the algorithms in the SRNC to define how to use the available user plane procedures.

- It is proposed to include the following text in the description of the synchronisation procedure in [25.427] and [25.435].

  The Node B response time (NB_synch_Tresp) shall be defined in the procedure description.

- It is proposed to include the following text in the description of the Timing alignment procedure in [25.427] and [25.435] (the same parameters are used for the synchronization procedure).

  The used Node B processing time is returned to the SRNC in the RL Setup/Addition/Reconfiguration response messages.

4. References

[25.327]   UMTS 25.427, Iub/Iur user plane protocol for DCH data streams

[25.335]   UMTS 25.435, Iub user plane protocol for Common Transport Channel data streams