TSG-RAN Working Group 3 meeting #6   **TSG R3 #6 (99) 875**
Sophia Antipolis, France, Aug 23-27, 1999

Agenda Item: *Sync Ad Hoc 4.8*

Source: **Ericsson**

Title: **Definition of TOA, ToAWS and ToAWE in 25.401 (.427 & .435)**

Document for: **Decision**

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1.   Introduction

When data frames are received on a transport channel, they are supervised if they are received in the receiving window or not.

Data frames received outside the window initiate responses which are called Timing adjustment Control frames. UL Sync Control frames are always sent as a response to DL Sync Control frames. These can be used to adjust the used offset values (for that service in that cell).

The receiving window is defined at the receiver end at transport bearer Set-up, Reconfiguration and/or Addition. The values that define the receiving window (TOAWS and TOAWE) are relative the Latest time of arrival (LTOA) at the receiver end. LTOA is the latest time-instant where Node B can process the received frame.

TOAWS and TOAWE may be changed during the lifetime of a transport bearer.

2.   Discussion

The text in 25.401, chapter 9.6.5 (V1.2.1) needs to be updated.

Modifications in the following documents are also needed:
·   25.427 (DCH data streams)
·   25.435 (CCH data streams)
(text should be "TOAWE" instead of "optimal time", resolution is proposed to be 125 μs).

Documents that also are involved with these parameters are:
·   *25.433 (NBAP, ch. 9.1.10)*
·   *25.423 (RNSAP Setup, Reconfig and Addition)*
These document changes are not included in this proposal. These documents should be updated by their respective editors accordingly (also mentioned in R3-99 663).

2.   Proposal

Changes are proposed in documents 25.401, 25.427 and 25.435.

3.1   25.401 (chapter 9.6.5)

Updates and clarifications are to be added in 25.401 (chapter 9.6.5), in line with the Tdoc R3-99 663 from Nokia. Substitute the present text in 25.401, chapter 9.6.5 with the following text and figure:

A receiving window is configured in Node B at Transport bearer Setup, Addition and Reconfiguration for DL frames (TOAWS and TOAWE). The purpose is to make it possible to supervise whether data frames are received in the window or not. When frames are received outside that window, a response is sent to RNC called Timing Adjustment Control frame. This response contains Time of Arrival information (TOA). See figure below.

The window could be defined to have a margin before LTOA (TOAWE >0). This is to indicate to RNC that data frames are a bit late but they are still processed by Node B. In this case, data frames are received after TOAWE but before LTOA.

Offset values, used for sending data frames from RNC over Iub, could therefore be refined by using this window definition and supervising method.

DL Sync Control frames will always give TOA as response, even if the DL Sync Control frame is received within the window. The purpose of Sync Control frames is to measure when frames are received for a certain transport bearer.
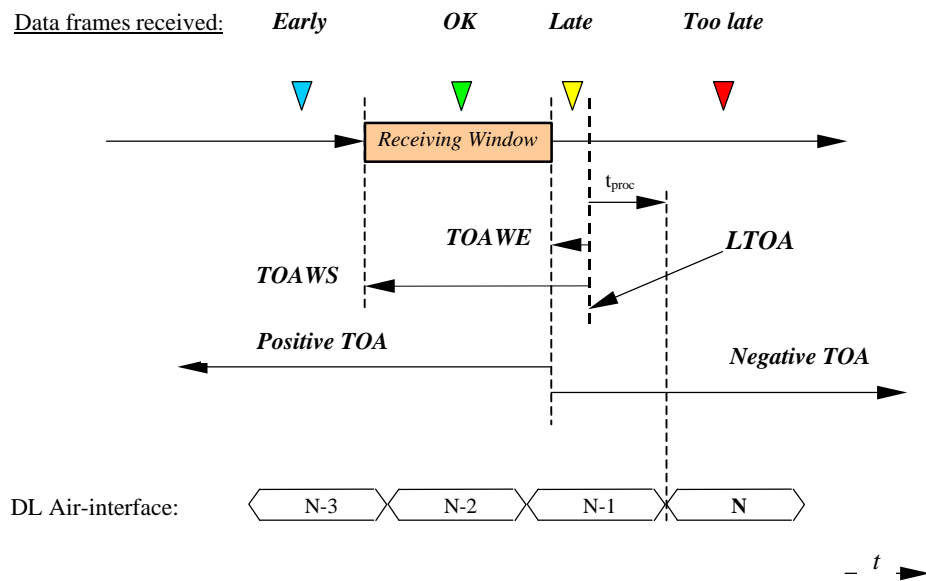
TOA	Time Of Arrival	TOAWE	TOA Window Endpoint
LTOA	Latest TOA	t_{proc}	Processing time before
TOAWS	TOA Window Startpoint		air-interface

Figure 1: Illustration of TOAWS, TOAWE, LTOA and TOA

The window size and position can be chosen with respect to expected data frame delay variation and different macro-diversity leg delays.

Definitions of receiving window parameters:

Time of Arrival Window Startpoint (TOAWS)

TOAWS is the window startpoint. DL data frames are expected to be received after this window startpoint. TOAWS is defined with a positive value relative Latest Time of Arrival (LTOA). A data frame arriving before TOAWS gives a Timing Adjustment Control frame response.

The TOAWS is a super-frame length parameter.
The resolution is 1 ms, the range is: {0 .. super-frame length −1 ms}

Time of Arrival Window Endpoint (TOAWE)

TOAWE is the window endpoint. DL data frames are expected to be received before this window endpoint. TOAWE is defined with a positive value relative Latest Time of Arrival (LTOA). A data frame arriving after TOAWS gives a Timing Adjustment Control frame response.

The TOAWE is a super-frame length parameter.
The resolution is 1 ms, the range is: {0 .. super-frame lenght −1 ms}

Latest Time of Arrival (LTOA)

LTOA is the latest time instant a Node B can receive a data frame and still be able to process it. Data frames received after LTOA can not be processed (discarded). LTOA is defined internally in Node B to be a processing time before the data frame is sent in air-interface. The processing time (Tproc) could be vendor and service dependent.

LTOA is the reference for TOAWS and TOAWE.

Time of Arrival (TOA)

TOA is the time difference between the TOAWE and when a data frame is received. A positive TOA means that data frames are received before TOAWE, a negative TOA means that data frames are received after TOAWE. Data frames that are received after TOAWE but before LTOA (TOA+TOAWE>=0) are processed by Node B.
When RNC measures data frame reception times to determine window position or to supervise data frame reception times, TOA could be added with TOAWE to make the measurements window position independent.

TOA has a resolution of 125 μs.
TOA is positive when data frames are received before TOAWE.
The range is: {0 .. +super-frame lenght/2 −125 μs}.
TOA is negative when data frames are received after TOAWE.
The range is: {−125 μs .. −super-frame lenght/2}.

3.2 25.427 (DCH data streams)

Part of section 7.2 is proposed to be changed to (underlined part):
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:
:
Timing Adjustment: is used on the UL to notify SRNC that the data is received too late or too early.

Table below shows the structure of the payload when control frame is used for the timing adjustment. This control information is sent in UL only

NAME	Timing Adjustment
Parameters	Time of Arrival (TOA): time difference between the arrival of the DL frame with respect to TOAWE (based on the CFN value in the frame)
	CFN

The range of the Timing Adjustment report parameter (TOA) is plus minus half a super-frame length. The resolution of the timing adjustment report parameter is 125 . s.
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:
:

3.3 25.435 (CCH data streams)

Section 5.2.1 is proposed to be changed to (underlined part):)
Timing adjustment control frames are sent by the Node B to notify to the CRNC that the DL data is received too late or too early, accordingly to the timing adjustment procedure.
Table below shows the structure of the payload when control frame is used for the timing adjustment. This control information is sent in UL only on the transport connection used to convey the FACH/PCH transport channel and the DSCH transport channel.

NAME	Timing Adjustment
Parameters	Time of Arrival (TOA): time difference between the arrival of the DL frame with respect to TOAWE (based on the CN value in the frame)
	SFN

The range of the Timing Adjustment report parameter (TOA) is plus minus half a super-frame length. The resolution of the timing adjustment report parameter is 125 . s.

4. References

[1]   25.401   Section 9.6.5 in V1.2.1
[2]   25.427   Section 7.2, part Timing Adjustment
[3]   25.435   Section 5.2.1

[4]   25.433   NBAP
[5]   25.423   RNSAP
[6]   R3-99 663   ToAWS, ToAWE and TOA mentioned (Nokia)