

**Agenda Item:** 14.1, 14.2

**Source:** NTT DoCoMo

**Title:** Proposed Introduction of DL Timing Adjustment command in lur/lub user plane protocols

**Document for:** Discussion

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## **1.Introduction**

In UMTS 25.427 (lur/lub User plane protocol for DCH data streams) and UMTS 25.435 (lub interface user plane protocols for common transport channel data streams), control information for timing adjustment is defined. The current control information is sent only in UL, stimulated by the reception of a data frame outside the appropriate receiving window. This contribution discusses and proposes the introduction of DL timing adjustment control information that also triggers the (UL) timing adjustment control information.

## **2.Discussion**

### **2.1 Necessity of timing adjustment with no data transmission**

In the current baseline documents, it is defined that Timing Adjustment control information sent by the lur/lub control frame to notify SRNC/CRNC that the DL data is received too late or to early. In other words, the Timing Adjustment control information is stimulated only by the reception of DL data frame.

However, it is desirable that the timing adjustment procedure can be done even if there is no data to send to Node B, e.g. just after the RL setup and before the actual data transmission is started between the SRNC/CRNC and Node B. The major purpose of the timing adjustment is the minimisation of the buffer in Node Bs. The more the uncertainty of the actual delay in the part of UTRAN, the more buffer size is required. If SRNC/CRNC knows the actual delay before the start of data transmission, such an uncertainty of the delay can be minimised. Especially for services with relatively large amount of data transmission and lower requirement on lu/lur transmission delay (i.e., packet), such a timing adjustment procedure contributes a lot to the reduction of buffer size in Node B.

### **2.2 Solution**

To fulfil the above requirements, the following two methods can be considered.

- A. Downlink data frame with no/empty payload is used.
- B. A new control information "DL Timing Adjustment" for control frame is defined.

Comparing the two, solution B is proposed based on the following analysis.

- Downlink data frame is handled in Node B basically once in the interleaving period whereas the timing adjustment should be handled whenever the request is received, independent of the interleaving period.
- For the DL timing adjustment, the only parameter which needs to be sent is CFN/Cell FN. Rather than making TFI and Payload field optional, a new control frame designed for the purpose should be defined.

### **2.3 Summary of the discussion**

From the above discussion, the following is proposed.

- Timing adjustment procedure with no data transmission should be defined between SRNC/CRNC and Node B for the user plane protocols for both DCH and common transport channel data streams.
- For the support of timing adjustment procedure with no data transmission, a new control frame "DL Timing Adjustment" for the control frame should be defined.

### 3.Proposal

Following the summary of the above discussion, specific changes on UMTS 25.427 (Iur/Iub User plane protocol for DCH data streams) and UMTS 25.435 (Iub interface user plane protocols for common transport channel data streams) are proposed below.

#### 3.1 Proposed changes on UMTS 25.427

- A. Proposed new control information to be included under Section 7.2

**DL Timing Adjustment:** is used on the DL to execute timing adjustment with no data transmission. Receiving DL Timing Adjustment, the Node B responds with UL Timing Adjustment control information.

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

NAME	DL Timing Adjustment
Parameters	CFN

- B. Proposed name change of "Timing Adjustment"

Introducing "DL Timing Adjustment," the "Timing Adjustment" control information should be renamed as "UL Timing Adjustment." The text under Section 7.2 should be modified accordingly.

- C. Modification on the explanatory text of UL Timing Adjustment

The explanatory text of (UL) Timing Adjustment should be modified as follows, impacted by the introduction of DL Timing Adjustment.

**"UL Timing Adjustment:** is used on the UL to notify SRNC that the data or DL Timing Adjustment is received too late or too early."

- D. Copying of downlink control frame

The first paragraph under Section 7.2 says,

"On the downlink, the same control frame is copied and sent transparently to all the Node Bs from the SRNC."

However, this applies only to the control frame containing "UL Outer Loop Power Control." Neither the proposed DL Timing Adjustment nor DL Synchronisation should be copied and distributed to all the Node Bs. Therefore, the following is proposed.

- The sentence referred above should be deleted.
- The following sentence should be added in the explanatory text for UL Outer loop power control.  
"The control frame containing this control information should be copied and sent to all the Node Bs from the SRNC."

#### 3.2 Proposed changes on UMTS 25.435

- A. Proposed new control information to be included under Section 5.2

DL Timing Adjustment control frame is used by the CRNC on the DL to execute timing adjustment with no data transmission. Receiving DL Timing Adjustment, the Node B responds with UL Timing Adjustment control information.

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

NAME	DL Timing Adjustment
Parameters	CFN

- B. Proposed name change of "Timing Adjustment"

Introducing "DL Timing Adjustment," the "Timing Adjustment" control information should be renamed as "UL Timing Adjustment." The text under Section 5.2 should be modified accordingly.

C. Modification on the explanatory text of UL Timing Adjustment

The explanatory text of (UL) Timing Adjustment should be modified as follows, impacted by the introduction of DL Timing Adjustment.

“UL Timing Adjustment control frames are sent by the Node B to notify the CRNC that the data or DL Timing Adjustment is received too late or too early, accordingly to the timing adjustment procedure.”

D. Modifications to Section 6.3 (DL Timing Adjustment procedures)

Section 6.3 should be modified as follows.

6.3 ~~DL~~ Timing Adjustment

6.3.1 FACH/PCH Channels

Timing Adjustment procedure is used to indicate for the CRNC the incorrect arrival time of downlink data or DL Timing Adjustment control information to node B.

Timing adjustment procedure is initiated by the node B if a DL data frame or the DL control frame containing DL timing adjustment arrives outside of the defined arrival window.

If the DL frame has arrived before the ToAWS or after the ToAWE nodeB includes the ToA and the target Cell SFN as message parameters for UL TIMING ADJUSTMENT Control Frame.

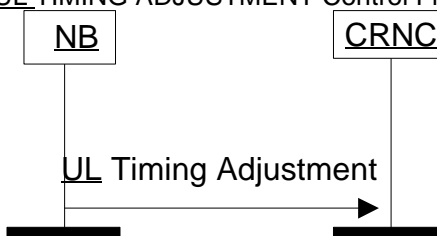


Figure 1. FACH/PCH Timing Adjustment procedure activated by DL data frame reception.

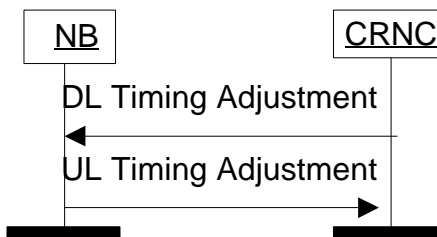


Figure 7. FACH/PCH Timing Adjustment procedure activated by DL Timing Adjustment reception.

6.3.2 DSCH Channels

Timing Adjustment procedure is used to indicate the incorrect arrival time of downlink data or DL Timing Adjustment control information for the CRNC.

Timing adjustment procedure is initiated by the node B if a DL data frame or the DL control frame containing DL timing adjustment arrives outside of the defined arrival window.

If the DL frame has arrived before the ToAWS or after the ToAWE nodeB includes the ToA and the target Cell SFN as parameters to the UL TIMING ADJUSTMENT Control Frame

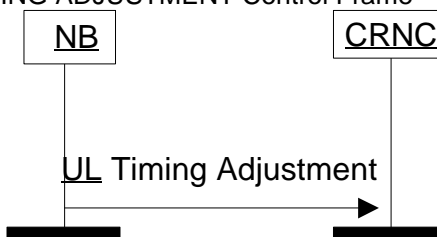
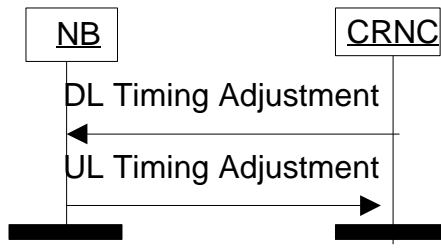


Figure 28. DSCH Timing Adjustment procedure activated by DL data frame reception.



**Figure 9. DSCH Timing Adjustment procedure activated by DL Timing Adjustment reception.**