TSG-RAN Working Group 3 ***R3#6(99)985***
Meeting #6
Sophia-Antipolis, France 23 - 27 August 1999

Agenda Item: 6.3 / Sync Ad-hoc 4.5
Source: NTT DoCoMo
Title: Rationale for AAL0 on high priority VC for Node Offset Measurement (NOM)
Document for: Discussion

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1. Abstract

At the WG3 #5 meeting in Helsinki, R3-99687 [1] and R3-99688 [2] were proposed. These two contributions discuss and propose the need for highly prioritised VC with AAL0 in Iub IF.

However, the last meeting could not reach to the conclusion; whether highly prioritised VC is needed or not, and whether AAL0 or AAL2 is applied as transport bearer for synchronisation establishment.

This contribution once again proposes the necessity of the following points:

- Why highly prioritised transport bearer is required in Iub IF for performing Node Offset Measurement (NOM) procedure
- Why AAL0 is better than other AAL (i.e. AAL2, AAL5)

2. Discussion

2.1 Why highly prioritised transport bearer is required in Iub IF for NOM procedure?

Before discussion is gone into detail, a new term "Node Offset Measurement (NOM)" procedure shall be defined in contrast with "*synchronisation procedure of transport channel*".

According to the description in TS25.427 [3] and 25.435 [4], the *synchronisation procedure* is interpreted as a procedure that is dedicated to one certain transport channel (i.e. DCH, RACH/FACH, and DSCH). This procedure is intended to make ***one transport channel*** synchronised. Performing the procedure, the SRNC can set the initial CFN for a certain transport channel before sending any TBS toward the NodeB.

On the other hand, NOM procedure is intended to create synchronism between ***two certain nodes.*** If two nodes are synchronised, these two nodes acknowledge the time difference from each other.
As proposed in R3-99872 [5] and R3-99873 [6], NOM procedure after node start/restart or routine NOM procedure may help omit the synchronisation procedure for each added transport channel. This will shorten time of whole Radio Link Setup/Addition/Reconfiguration procedure.
As having been already proven in [1], the more prioritised transport bearer NOM procedure is performed on, the more accurate the synchronism between two nodes would be achieved since the delay variation decreases.

Now the most important issue is "why accurate synchronisation between two nodes help reducing the delay?" This story was also discussed in [1], but seemed not understood correctly.
This contribution explains the necessity of accurate synchronism by replacing the technical story with a more generic one. The following story explains:

> Supposed that a man named Mr. A lives in Home X and he goes to Office Y everyday. He has two clock, namely Clock X and Clock Y, at Home X and at the Office Y respectively as in Figure 1. In addition, Mr. A knows that it takes him **1-hour at maximum** from his Home X to Office Y. It is also important that Mr. A does not have a wristwatch.

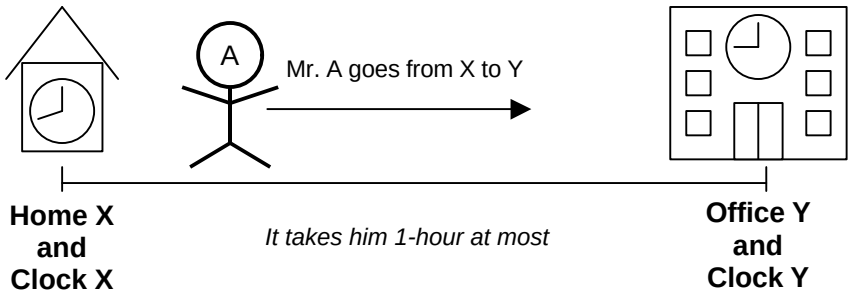

Figure 1

In this situation, if the Clock X and Clock Y are completely adjusted (synchronised), the story is simple. If Mr. A wants to arrive at the Office Y by 9:00AM, then Mr. A has to leave Home X at 8:00 AM at latest. Mr. A is convinced that he can arrive before 9:00 AM since Mr. A knows that it does not take him more than 1-hour. This is a matter of course.

Then, let us consider a case when Clock X and Clock Y are not accurately adjusted (inaccuracy in synchronism). Supposed that Clock Y has an inaccuracy variation of 30minutes compared with Clock X (Clock Y is either fast or slow by up to 30minutes).
In this situation, Mr. A has to leave Home X at 7:30 AM at latest in order to convince himself that he can arrive by 9:00AM. Mr. A has to take into consideration that the Clock Y is 30 minutes faster than Clock X in the worse case. He has to leave Home X 30 minutes earlier due to inaccuracy of these two Clocks.

One would insist that, from the next day, Mr. A could leave a little bit later from the experience. Supposed that Mr. A had arrived at Office Y at 8:45AM in Clock Y. One would says that if he left his home at 7:45AM next day, then he would be able to arrive at Office Y at 9:00AM sharp. But this cannot be done. Mr. A has to leave his home at 7:30AM again next day.
This is due to the nature that Mr. A could not be able to figure out the reason why he could arrive 15 minutes earlier. It could be because Clock Y was only 15minutes fast, not 30minutes. But it could also be because the travelling time was 15 minutes shorter due to less traffic. It must be noted that Mr. A does not have a wristwatch. He is unable to measure the travelling time by himself.

From this story, it can be proven that as the inaccuracy of the two Clocks increases, Mr. A has to leave the Home X earlier in order to compensate the inaccuracy of Clocks, unless he can be late sometime.

The generic story can also be applied to the Iub synchronisation story. It is easy to expect the result by replacing Home X with SRNC, Office Y with NodeB, and Mr. A with a transport block set. In conclusion, accurate synchronisation across Iub IF will help reducing the total delay of transport block set over Iub IF.

2.2 Why AAL0 is more appropriate than AAL2?

As described in [1], delay variation would create inaccuracy in synchronism between the nodes.
As known, AAL2 has a function to multiplex more than one short-cell onto one ATM cell. This function will create delay variation since ATM cell cannot leave the node until the ATM cell is filled with short-cells.

3. Proposal

It is proposed that Node Offset Measurement Procedure shall be performed on as highly prioritised VC as possible for accurate synchronism of nodes. Accurate synchronism will help reduce the total delay of transport block set over Iub IF.

In conjunction with R3-99A19, It is also proposed to create a new baseline document “TS25.4XX Iub Interface Signalling Transport & Signalling for Node Offset Measurement” for highly prioritised VC with AAL0 solution. It shall be noticed that this solution is only applicable to ATM solution and this baseline document would not exclude the solution for the future transport layer solution.

4. Reference

[1] R3-99687 “Synchronisation between RNC and NodeB” from NTT DoCoMo
[2] R3-99688 “Proposed Iub node synchronisation procedure” from NTT DoCoMo
[3] UMTS 25.427: Iur/Iub User plane protocol for DCH data streams, V0.3.1
[4] UMTS 25.435 Iub User Plane Protocol for COMMON TRANSPORT CHANNEL Data Streams, V0.3.1
[5] R3-99872 “A potential merged sync solution including two approaches” from Ericsson
[6] R3-99873 “Node offset measurements using Synchronisation Control frames” from Ericsson