TSG-RAN Working Group 3 (Meeting#6) **TSGR3#6(99) 869**
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Agenda Item: Synch Ad Hoc - other

Source: Motorola

Title: Iu Data Frames

Document for: Decision

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1 Introduction

The purpose of this contribution is to discuss the benefit of having a sequence count associated with Iu user plane data frames. The assertion is that this information will result in a simpler time alignment process in the SRNC and can lead to a reduction in delay.

2 Discussion

For illustration purposes, let's assume that inside the SRNC the time alignment process for user-plane data sent from the CN utilises a timing window similar to what Node B does for the Iub. Figure 1 shows four regions for the arrival time of the data frame relative to the reference point (or time zero). The curve shows a hypothetical distribution of arrival times for data frames.

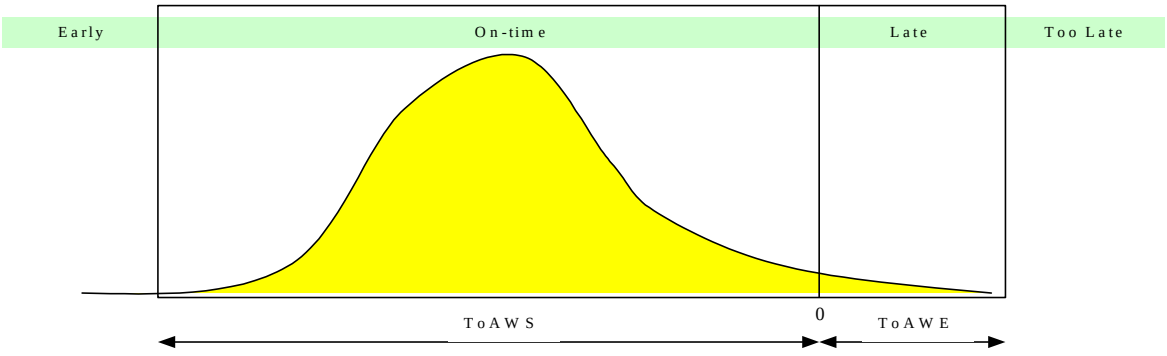

Figure 1

The assumption is that the SRNC will send an Iub data frame to the Node B at time t = ToAWE. A further assumption is that the Iu time alignment procedure (in order to minimise delay as much as possible) would try to move the curve towards the right up to the point where few (if any) data frames arrive after t=ToAWE. Figure 2 shows a sequence of time windows for a sequence of incoming Iu data frames. The interesting question is what relative width of the curves versus TTI. If there is significant probability that frames will arrive in the region between "too late" for frame N and "early" for frame N+1, the timing adjustment procedure is likely to "become confused." The assumption is that for the algorithm to perform properly it must accurately categorise the arrival time of each frame. With proper categorisation, the SRNC can determine in what direction to request the CN to adjust sending of downlink Iu data frames.

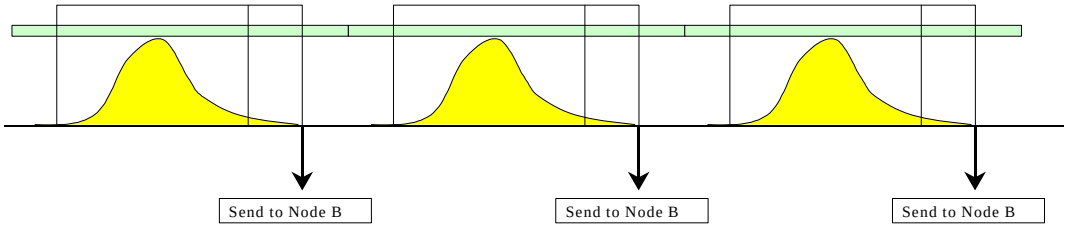

Figure 2

It may be the case that the width of the ToA distribution is small compared to TTI, and therefore the probability of frames arriving in the area of ambiguity is negligible. However, the scenario just described is based on the precondition that the curve is relatively centered in the timing window. The question is how does the procedure perform at start up. Until a sufficient number of frames have been received there is no way to have any certainty about the relationship between the window and the curve. The affect is that the window must be dimensioned significantly wider than the curve width dictates for the steady state situation. Another potential problem is if the phase of the incoming data frames could suddenly shift in time. If so, they might end up aligning with the ambiguous frame transition area.

The above mentioned problems can be solved if the downlink Iu data frames contain a sequence counter. Once the relationship between this sequence number and the CFN was established, the SRNC could accurately assess the arrival time for a frame. This should improve the performance of the time alignment process between the CN and SRNC.

The time alignment scenario described above was based on the premise that the SRNC would buffer downlink data frames and relay them to Node B based on a periodic timer. Let's call this the "non-zero buffer scenario." One thing that can be noticed from Figure 2 is that this process would result some additional delay when compared to an alternative "zero buffer scenario." In this case, the SRNC forwards the information to Node B immediately upon receiving it from the CN and after performing the required processing. Whether or not the reduction in delay is significant depends on the width of the curve.

Having sequence numbers in the incoming Iu frames would greatly simplify the job of the SRNC under the "zero buffer scenario." With sequence numbers, the SRNC simply translates the sequence count to a CFN. Without sequence numbers, the SRNC must setup a time window for each CFN. The value of the CFN in a data frame sent to Node B is implied from time of arrival of the associated Iu data frame. The relationship between the CFN windows and the incoming Iu stream must be maintained. The assertion is that this "phase locking" process is more difficult and error prone than the simple translation of sequence counts to CFN values.

3 Conclusion

The SRNC's internal procedures for time alignment over Iu and scheduling of data frames sent over Iub are not a matter for standardisation. However, it is asserted that providing sequence numbers in the downlink Iu data stream will allow for easier implementation and potentially better performance of these procedures. Therefore, it is recommended that sequence numbers are a part of the structure of the Iu data frame.