TSG-RAN Working Group 1 meeting #15 **R1-00-1163**
Berlin, Germany, 22-25 August, 2000

Source: TSG RAN WG1

To: TSG RAN WG2, TSG RAN WG3, TSG RAN WG4

Title: LS on issues related to UE timing

Contact: Serge Willenegger, sergew@qualcomm.com, +41 24 436 3541.

During its 15th meeting, RAN WG1 discussed various issues related the UE timing following the presentation of Tdoc R1-00-1100 (attached to this liaison as a reference). Based on this discussion RAN-WG1 wishes to get the opinion of the other RAN working groups on UE timing aspects as described below.

1. First significant path

The terminology "first significant path" is used in several RAN documents and in particular in RAN-WG1 specification documents. RAN-WG1 found that this terminology is somewhat ambiguous as the dimension (time, power, other) to which the term "first" applies is not explicit. RAN-WG1 endorsed CR 25.211-075 and CR 25.215-071 (in Tdoc R1-00-1049) which replace the term "first significant path" with the term "first detected path (in time)". RAN-WG1 wishes to confirm that this terminology clarification is in line with the understanding of the other RAN working groups and if so suggests that the same terminology is used across the RAN documents (e.g. TS 25.331, TS 25.133) in order to ensure consistency.

2. Rx-Tx time difference

Similar to the measurement "SFN-SFN time difference", the measurement "Rx-Tx time difference" (defined in TS 25.215) is used for initial DL timing selection and DL time adjustments as well as for positioning. RAN-WG1 believes that the UE should be allowed to base the measurement "Rx-Tx time difference" on different paths depending on whether the measurement result is used for DL timing selection or for positioning. In the DL timing context it is indeed desirable that the reference path is the earliest path which can be used for demodulation while in the positioning context it is desirable that the reference path is the earliest detected, even if the path is not strong enough to be used for demodulation.

However, this requires the definition of two classes for the measurement "Rx-Tx time difference" in a way similar to the classes defined for the measurement "SFN-SFN time difference". Before proceeding with the introduction of "Type 1" and "Type 2" classes for the measurement "Rx-Tx time difference", RAN WG1 wishes to confirm with the other RAN working groups that this differentiation is acceptable and feasible.

3. "Valid" range

RAN-WG1 understands that the RRC may define two thresholds which delimit the valid "Rx-Tx time difference" range for all cells in the active set. When the "Rx-Tx time difference" of a cell crosses either threshold, the UE is expected to report the event to the network which in turn is expected to adjust the DL timing of that cell. Once the time adjustment is effective, the "Rx-Tx time difference" of the cell should be back within the valid range. It is the understanding of RAN-WG1 that RRC may define thresholds up to 256 chips apart from the UE DL reference timing (Tx_timing – To). RAN

WG1 would like to clarify that its assumption has been that the UE is not expected to meet the one slot power control loop delay if the DL cell timing is such that the "Rx-Tx time difference" for any cell in the active set is lower than 876 chips (To – 148) . In addition, if the "Rx-Tx time difference" is higher than 1172 chips (To +148), the probability that Node B can meet the 1 slot power control group delay for a UE it controls decreases.

In addition RAN WG1noticed that the reporting range for the measurement "Rx-Tx time difference" is limited to 876 to 1172 chips. This is a smaller range than the range of possible values for the reporting thresholds (768 to 1280 chips).

RAN-WG1 wishes to confirm that the other RAN working groups have the same understanding.

4. PC combining

Although RAN-WG1 understands that the network is expected to ensure that every cell in the active set is received within the 876…1172 chip Rx-Tx range, it is possible that the network will momentarily not be able to meet the timing requirement due to unexpected conditions (load, measurement report errors, …). In such situations where the timing requirement is not met, RAN-WG1 assumptions on the UE power control behaviour are as follows:

- For the UL power control, the UE is expected to combine the power control commands of all the cells in the active set in the derivation of the power correction to be applied in the UL. This may result in an increased UL power control loop delay in the UE.
- For the DL power control, the UE is expected to base the power control command decision on all the cells in the active set possibly resulting in an increased DL power control loop delay in the UE.

RAN-WG1 wishes to confirm that the other RAN working groups have the same understanding.

5. Timing adjustment

RAN-WG1 and RAN-WG4 documents specify that the terminal UL transmission takes place 1024 chips after the first detected path (in time) is received. In addition it is specified that the UE shall adjust its timing to maintain this time interval. RAN-WG1 found that when the number of cells in the active set is higher than 2, there is a possibility that the UE will constantly be adjusting its timing. The above requirement indeed implies that stability can only be achieved when all the cells in the active set are received between 1024 and 876 chips before the corresponding UL transmission instant. From RAN-WG1 point of view, it seems acceptable if UE is constantly adjusting its timing. However, as this scenario may result in more frequent DL time adjustments (in particular when the active set size is high, e.g. 6 or more), RAN-WG1 wishes to ask the other working groups whether they see any issue resulting from such scenario. RAN WG1 expects further discussion on this issue in its future meetings.