Common model for data traffic channel performance

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Source: Ericsson LM, Huawei Technologies Co. Ltd., HiSilicon Technologies Co., Ltd., Neul Limited, Orange, Telecom Italia S.p.A., Nokia Networks

Background

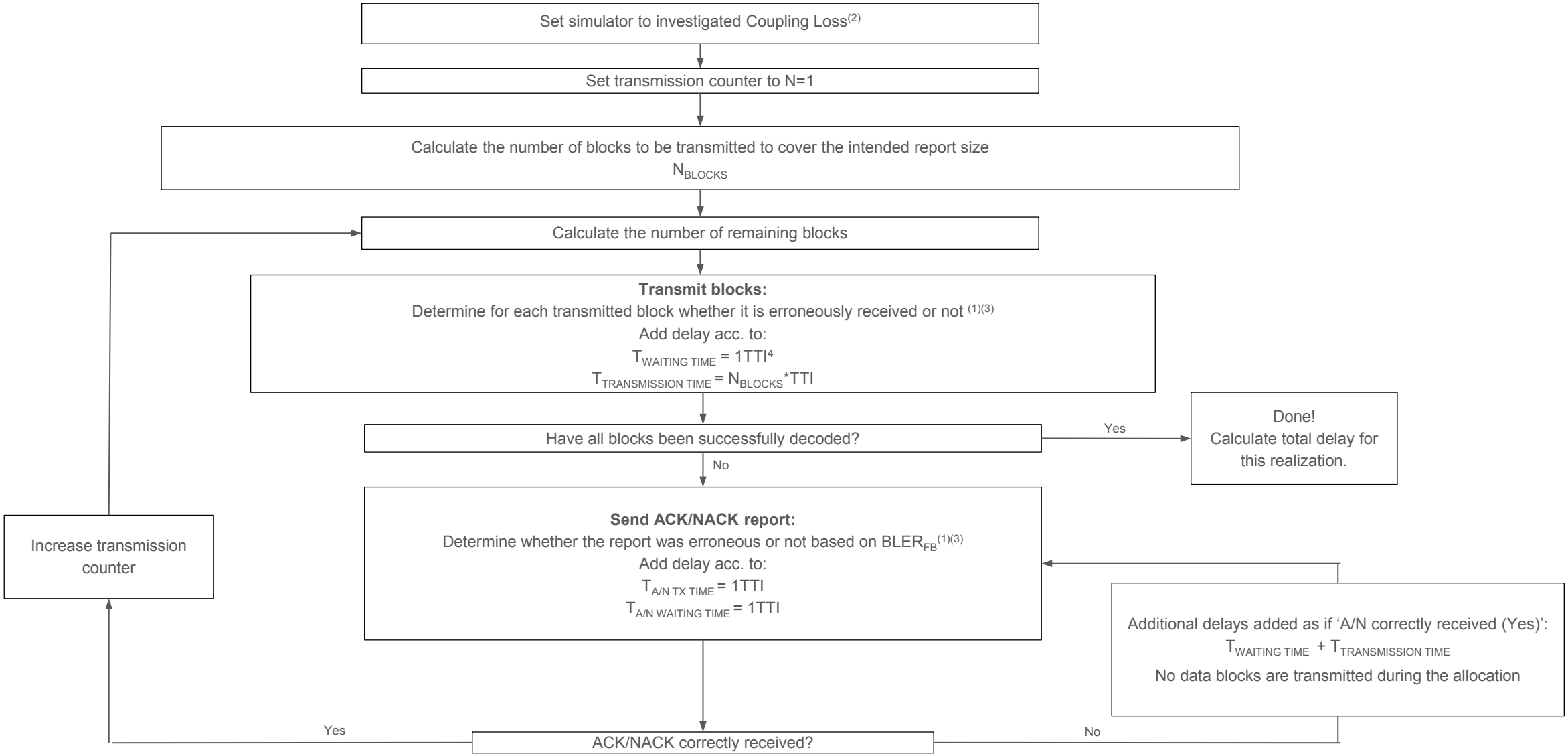
- Extensive discussions have been taken place on how to model the data packet traffic channel in WG1 for the CIoT study.
- Several aspects have been mentioned in the discussion, such as modeling of message error instead of candidate specific block error, using HARQ in the modeling or not, including time coherency dependencies in the channel propagation, etc.
- The following slides captures a way forward taken as a working assumption at CIoT telco#11, to be formally agreed at GERAN#66.
- The methodology would apply to all candidates proposals in the study, irrespective for example of the use of HARQ.
- The model will be used in:
  - Latency evaluations
  - Throughput calculation at different coverage targets, and,
  - Battery lifetime calculations.

Proposed way forward

- Approach 1: Shall be used by candidate solutions that make use of an initial message BLER of ≤10%
  - MCL is derived directly from the required receiver SNR to achieve the 10% initial message BLER, and the throughput is also derived for this case
  - Exception report latency is derived for 90% and 99% confidence of successful delivery, where the 99% case is approximated as one retransmission (unless the initial message BLER is already <=1%)
  - Battery life is derived by considering the average number of retransmissions, which is approximated as the initial message BLER, i.e. in this case the residual BLER after the first retransmission is approximated as 0 %
- Approach 2: Shall be used by candidate solutions that make use of an initial message BLER of > 10%
  - Link-level modelling is used, based on the following slides
  - This is used to derive the MCL, the latency at 90% and 99% confidence of successful delivery, and the average number of retransmissions used for the battery lifetime estimation

Model for approach 2

- The model is explained as a block diagram.
- The intention is use a link level simulator as a basis to follow the block diagram, and by this correctly follow channel propagation, without using a simplified model.
- The model applies mainly to the data traffic channel performance, but is dependent on the control channel in the opposite direction. This implies that the data traffic channel is limited in coupling loss to where the control channel achieves 10 % average block error rate (according to the agreed MCL methodology).
- Relevant errors other than for the user payload data is to be modeled. If HARQ is used for example, errors that are relevant for the HARQ operation, such as dependency of header errors in order to do soft combining shall be modeled.
  - E.g. for the EC-GSM DL PDTCH performance, erroneous RLC/MAC header or Stealing Flag (SF) reception implies that no soft combining with previous received blocks is possible. Also for the EC-GSM UL PDTCH performance, all received RLC data blocks need to be confirmed by correct reception of Stealing Flags (SF) and RLC/MAC header.



NOTE1:
- Relevant errors, such as header errors, should be included and described for each candidate technique, when using approach 2.
NOTE2:
- The average BLER on control channel in opposite direction shall be less than, or equal to 10 %
NOTE3:
- Embedded link simulator to be used taking channel coherency between blocks and transmissions into account
NOTE4:
- TTI includes also blind repetitions, if used.

Output for approach 2

- The model is used to:
  1. Derive the 90th and 99th percentile latency of the *data traffic channel* (other parts contributing to the overall exception report latency, such as network synchronization, are not considered in this evaluation) for '*Exception report latency*'.
  2. Derive the 90th percentile throughput. The delay from bullet 1. is used, and the size of the delivered report. The 160 bps throughput requirement applies to the 90th percentile.
  3. Derive the average number of retransmissions (hence the resource utilization), to be used in the battery lifetime estimations