
Agenda item:

Source: Nokia

Title: Definition of the UE processing capability in TR25.926

Document for: Discussion

Summary:

The definition of UE processing capability parameter in TR25.926 is not clear enough. In order to remove the ambiguity, two possible modifications are considered in this document.

1. INTRODUCTION

In Technical Report, TR25.926, v.1.0.0, the UE radio access capability parameters and their possible values are described in the Table 1. The UE processing capability has been defined as:

- Maximum sum of number of sustainedly processable bits of all transport blocks received in TTIs that end at the same time, normalized with the respective TTI lengths in number of radio frames

Unfortunately, this definition is ambiguous and it is possible for the network to schedule the transport channels such that there are more bits on average to be processed than what the UE can handle. To solve the problem two possible solutions for the problem are presented in this document.

2. DEFINITION OF THE UE PROCESSING CAPABILITY

One problem with the current definition is that it basically allows for to consider any time instant when TTI of some (or many) transport channel end. So even if you calculate the processing capability according to the number of bits received at the end of the longest TTI, this same resulting value can be applied to some other time instants. An example case is shown in the Figure 1.

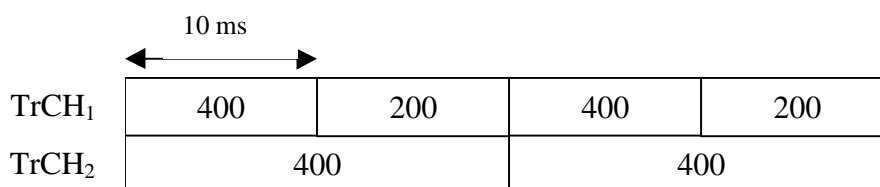


Figure 1. Example of the processing capability calculation. Figures inside the boxes indicate the number of bits in the TTIs.

In this example, if you calculate the processing capability based on the received bits at the end of the longest TTI you get 400 bits/10 ms. This same 400 bits could be allocated to the TTI of the TrCH₁ in the preceding (and succeeding) TTIs of that channel. This would lead to too many bits (in this example the processing requirement would be actually 500 bits/10 ms) to be processed by the UE resulting in accumulation of bits needing further buffering.

One possible solution to the problem is to adopt the original definition from the early versions of the TR25.926, i.e. all the bits received from all the transport channels at the end of longest TTI will be processed within next 10 ms. The advantage of this definition is that the maximum delay is always known and delay budget calculation are easy to do from L1 point of view. The drawback is that possibly relaxed delay requirements of the transport channels can not be used to reduce the processing power requirement of those channels.

Another possible solution is to augment the existing processing capability definition in the following manner:

- The capability is calculated based on the received bits at the end of the longest TTI
- The number of bits received in the subsequent TTIs of the transport channels having TTI shorter than the longest TTI, is limited so that all the bits can be processed during the duration of the longest TTI

The idea is depicted in the Figure 2. By calculating the processing capability at the end of the TTI of TrCH₂, we get again 400 bits/10 ms as in the previous example. Thus, the processing capability during the duration of the longest TTI is in this case 800 bits. In order not to exceed that capability we must ensure that the number of bits received in the next TTI of the TrCH₁ is not more than 200. With that further restriction we can ensure that the processing capability of the UE will not be exceeded and the maximum delay for any of the transport channels is equal to the longest TTI. Note, however, that for all the other transport channels except the one(s) having the longest TTI the processing delay may or may not be longer than the length of the TTIs of them.

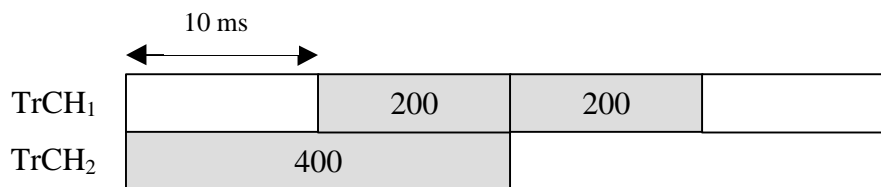


Figure 2. Example of the modified processing capability definition. Figures inside the boxes indicate the number of bits in the TTIs

3. CONCLUSIONS

In order to solve the ambiguity of the current processing capability definition in TR25.926 v1.0.0 two alternatives have been presented. Due to simplicity of the fixed max 10 ms processing delay, it is the solution preferred by Nokia.