

Agenda item: 9.6
Title: E-DCH scheduling options: way forward
Source: Vodafone Group, Motorola, T-Mobile, Nokia, Telecom Italia
Document for: Discussion and Decision

1. Introduction

FDD Enhanced Uplink WI was approved at RAN #23 [1] with 18 supporting companies as a follow up of the SI created at RAN #17. The deadlines for the WI were agreed to be December 2004 for Stage-2, March 2005 for RAN WG1, RAN WG2, RAN WG3 and June 2005 for RAN WG4.

Despite the significant amount of contribution on the topic and the significant amount of time spent in the WG meetings and in AdHoc Conference call, the Stage-3 for RAN 2/3 cannot be considered complete right now.

The importance of the functionality and the need not to delay the Rel-6 release require a very close tracking by the RAN Plenary on the WI, potentially indicating to the different WGs early recommendations in order to reduce as much as the possible risks of delays in the Stage-3 completion.

2. Overview of the current status

In the last February RAN WG2 spent 3 out 5 days on EUL. In spite of the long time spent the progress can not be considered as satisfactory. RAN WG2 is not facing any blocking situation (e.g. due to objections by some companies on some technical proposal), but the decision process is slowed down due to complications that emerged in the specification process of the scheduling functionality.

From our point of view, the main issue is that in order to take faster decision in the recent past, a number of working assumptions have been taken, without the needed in depth analysis, thus resulting in many options in the Stage-2 and now the "interworking" of these options is seen as very complicated. This is especially true since there is the general desire to have consistent mechanisms that work across the different "configuration" options without penalizing the efficiency. This is the most challenging task the EUL is facing from our perspective.

Many contributions have been submitted to the working groups and the feeling is that the general attitude is constructive. So it should be easier to accept a pragmatic approach for the way forward.

In fact, at the end of last RAN WG2 meeting there was a general feeling that a clean-up process of the Stage-2 would be beneficial, possibly involving the removal of a number of options. In particular the scheduling operation seems the most critical, where different companies have different opinions on the best option. Currently the following options exist in the specifications:

- a) Scheduling mode (RG-based and non-RG based)
- b) Scheduling type (Dedicated or Group)
- c) Per process/Per UE scheduling

These options lead to a large number of combinations/branches in the scheduling operation, making the number of possible interworking scenarios considerably high (especially if we consider for example that different cells might have

different configurations). Consequently it is fairly obvious that it becomes very difficult to handle all the different scenarios.

NOTE: *it is worth clarifying that the options above are just provided as a list of the options that may impact the scheduling, depending on the configuration. We are not proposing to remove all of them.*

3. Delay impacts analysis

In this section we tried to capture the main points that actually open in the different WGs and how much these are “blocking” for the other groups.

3.1 RAN WG1

RAN WG1 is not the most impacted working group by the different Scheduling Mode (RG and Non-RG based mode) created in the scheduling, though there are some substantial impacts as the layer 1 has to be designed to support the different modes of operation. Hence there are complications in the design of the control channels and the timing between these channels.

3.2 RAN WG2

RAN WG2 is the most impacted working group by the different scheduling options. In particular in the current Stage-2 proposed to be agreed at this RAN Plenary [2] depending on the Scheduling Mode the UE behavior is different for all the basic operations to derive the Scheduling Grants (SG):

- Grants from the Serving RLS
- Grants from the non-Serving RLS
- Reception of Grants from both the Serving and Non-serving RLS

These different behaviors have been included since there was no agreement on a common behavior across the two Scheduling modes. It is worth mentioning that how the serving grant is derived is somewhat crucial from a performance point of view and any different understanding of the specification may lead to a significant deterioration of the overall system efficiency.

Moreover the per-UE/per process scheduling results in different cases for the applications of the Scheduling grants. It would be beneficial to verify if the full flexibility on the applicability of this option is definitely needed, or some restrictions/simplifications can be done.

The different scheduling types (dedicated/group) seems to be the only option that has not a significant impact on the specifications since group identities or dedicated identities are not distinguished by the UE. It is up to the UTRAN to allocate the same identity to a group of UEs, if desired.

In conclusion it seems fair to assume that the long discussions on how to harmonize the UE behavior across the different scheduling options have drained a significant amount of time. There has not been any demonstrated performance differences between the scheduling modes [3]. It is also evident that the result is far to be a clear, simple and stable agreement.

3.3 RAN WG3

Similarly to RAN1, RAN3 is not the most impacted working group by the utilization of different a) “branches” created in the scheduling, though there would be some functional description impacts within RNSAP and NBAP.

Currently it is stated that non-serving cells may participate in the scheduling process (by distributing RGs) so, if it is agreed that Serving RLs do not participate in scheduling using Relative Grants, minor procedural text should be added to “tidy up” NBAP and RNSAP.

Within RNSAP and NBAP where it is indicated that a new/additional/reconfigured RL is the Serving E-DCH RL i.e. where *Serving E-DCH RL* IE is present in the RL Setup Response & Radio Link Reconfiguration messages, it should

be stated that the NodeB would not respond with the *E-AGCH And E-RGCH/E-HICH FDD Scrambling Code* IE within the response message.

3.4 RAN WG4

In general for Scheduling Mode there would need to be some UE performance test to ensure that RG-based scheduling is being followed properly by the UE. If both options were standardised, for the non-RG based scheduling the autonomous ramping functionality would additionally have to be tested to make sure it is working properly.

The options in Scheduling Type have no impact on the UE, because the signalling is the same from the UE perspective.

The options in per-process/per-UE scheduling would mean that both UE performance in limiting both “individual” processes and all processes would need to be tested.

4. Possible way forward

In order to simplify the feature and allow to complete the stage 3 specifications rapidly, we need to remove some options in the E-DCH scheduling functionality. The existence of options is only justified if there is a major performance difference between them. Discussions have shown a very large support for such a simplification process. Pragmatically one option that can be removed is one of the two scheduling modes (RG based or non-RG based), while the scheduling type (dedicated or common) can be significantly simplified if one of the scheduling modes is removed.

It was also shown that the interest on some others options might be fairly limited, so an “in-depth” simplification going beyond the scheduling mode could be done.

5. Conclusion and decision

In this paper we have raised concerns about the current status of the work on the scheduling for E-DCH and how the multiple options currently assumed impact the specification complexity. The analysis has been done for each RAN WGs, clearly showing that there is unjustified complexity in the scheduling functionality.

The specification of E-DCH is seen by the vast majority of the 3GPP members as a key element to improve the UL performances and there is a clear and urgent market demand for such functionality: based on this it is of utmost importance to ensure a timely completion of the WI.

The number of allowed options of a functionality, is by experience, a common cause of delays in the completion of specifications, we strongly recommend RAN Plenary to consider the simplification of the functionality by means of reducing the E-DCH scheduling options allowed.

RAN Plenary shall take the decision to task the working groups to remove one scheduling mode and potentially to consider other simplifications of the scheduling functionality.

6. Reference

- [1] RP-040081 FDD Enhanced Uplink WI
- [2] R2-050715 25.309 v 6.2.0
- [3] R2-050621 Comparative performance of dedicated versus autonomous mode