

Source: Sharp
Title: TA group handling
Agenda Item: 7.1.2.3
Document for: Discussion and Decision

1 Introduction

In RAN2#76bis, RAN2 agreed that RRC signalling is used to (re-)associate SCell with a TA group. However there are some remaining issues regarding how to realize the association between SCell and TA group.

In this contribution, we would like to discuss the way to handle TA group in a multi-TA scenario.

2 Discussion

2.1 TA group ID allocation

In Rel-10 CA there can be only one TA group, and as such the TA group must contain the PCell (pTAG). Thus no explicit mapping is required to associate the PCell to the TA group. On the other hand, in Rel-11, one or more TA groups can be configured with the SCells only (sTAG). Therefore it is necessary to provide some kind of identifier (i.e. TAG-ID) to create an association between the SCell(s) and the sTAG to which the SCell will align the UL timing. However we prefer that the pTAG in a Rel-11 UE not be assigned such an identifier to preserve backward compatibility (e.g. a Rel-11 UE that performs carrier aggregation without the multi-TA configuration, can adhere to the Rel-10 specification). Furthermore, when the UE in Rel-11 is configured with a SCell that is not explicitly assigned a TAG-ID, the UE considers that the SCell belongs to pTAG, and the UE can consider the TAG-ID of pTAG to be assigned a default value of '0' [1][2].

Proposal 1: There is no explicit TAG-ID allocation for pTAG.

Proposal 2: When the UE is configured with a SCell that is not assigned a TAG-ID, the UE considers that the SCell belongs to pTAG.

Meanwhile, a TAG-ID that is allocated to identify UL of the SCell in TA group will not contain the PCell (sTAG). So TAG-ID is not necessary for the SCell without UL configuration (i.e. DL only SCell).

Proposal 3: TA group and UL of SCell in sTAG are mapped by TAG-ID.

2.2 TA group change procedure

We think that the TA group could be changed in the following 2 cases:

- Case.1: SCell where TA group is changed belongs to the existing TA group (including pTAG),
- Case.2: SCell where TA group is changed belongs to the new TA group.

Both cases can be seen for example in the deployment scenario5 [3], if the eNB does not know a position of the frequency selective repeater. Fig.1 shows the example of TA group change in the deployment scenario5. The UE at the point A can perform CA with one TA group (pTAG), but the UE at the point B needs to perform CA with different TA group which not contain PCell (sTAG).

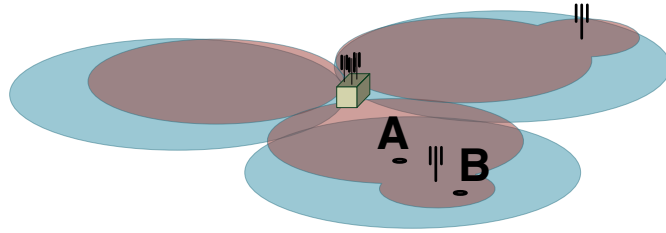


Fig.1: Example of TA group change in the deployment scenario5 [3]

Case.1 will occur when the UE at the point B moves to the point A in Fig.1. The UE may continue UL transmission without stopping because the UE can apply TA timer and TA value of the existing TA group for the SCell where TA group is changed. So it is not necessary to change the state of SCell where TA group is changed because there is no problem to continue UL transmission on the concerning SCell. On the other hand, Case.2 will occur when the UE at the point A moves to the point B in Fig.1. The eNB will need to allocate all sTAG related configurations during TA group change procedure. In this case, UL transmission will be stopped on the SCell where TA group is changed because TA timer of the new TA group is not running. Therefore it is also not necessary to change the state of SCell where TA group is changed. RA procedure is necessary to require a new TA value and to start a new TA timer for the usage of UL SCell in the new TA group.

There are two possible approaches for the TA group that is changed by RRC. The first approach is that the eNB will release and subsequently add the concerning SCell as well as the SI update for the SCell. The second approach is that the eNB will just modify the concerning SCell configuration by the reconfiguration.

We think that both approaches can work for TA group change. However if the first approach is applied, the concerning SCell is in deactivated state after SCell addition as a default state, so the eNB has to send an activation command to use the concerning SCell again. Whereas the second approach does not change the SCell state and there is no problem to remain the state of the concerning SCell during TA group change. Another drawback is that the message size of the first approach could be bigger than the second one because SCell addition message contains SCell common configurations which may not be changed.

From the reasons above, we prefer the second approach to change TAG-ID of the SCell in sTAG.

Proposal 4: For the SCell in sTAG, TAG-ID can be modified by the SCell modification without the SCell state change (i.e. not use SCell release and addition).

2.3 Maximum number of TA group

Current TA command on MAC Control Element has 2 reserved bits, as shown in Fig.2 [4]. So, it is possible to indicate up to 4 TA groups by 2 reserved bits in TA command. To reduce specification impact, i.e. not to add new LCID, we prefer to re-define the reserved bits to indicate TA group where the received TA command applies.

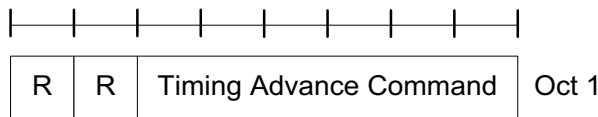


Fig.2: TA command MAC Control Element [4]

However, in Rel-11, there are up to 2 UL CCs in the ongoing inter-band CA WIs [5]. So it may be enough to use only 1 reserved bit. But an unnecessary restriction will prevent forward compatibility for further release, and result in additional specification changes should it be required to support more than 2 TA group in the future.

Proposal 5: Two reserved bits in TA command MAC Control Element should be re-defined to indicate TA group where reserved TA command applies.

In addition, it is natural to reuse TAG-ID configured by RRC to indicate TA group where the reserved TA command applies. It means that the RRC signalling can configure up to 4 TAG-IDs.

Proposal 6: Up to 4 TAG-IDs are configurable by the RRC signalling, even if Rel-11 UE does not support up to 4 TA groups.

2.4 TA group configuration

Because TA group configuration is UE-specific, TAG-ID is only associated with the UL of SCell dedicated configuration. Therefore it is suitable to set TAG-ID in the UL configuration of *PhysicalConfigDedicatedSCell*.

Proposal 7: TAG-ID configuration should be included in the UL configuration of *PhysicalConfigDedicatedSCell*.

3 Conclusions

The following is a summary of our proposals about open issues of TA group handling:

Proposal 1: There is no explicit TAG-ID allocation for pTAG.

Proposal 2: When the UE is configured with a SCell that is not assigned TAG-ID, the UE considers that the SCell belongs to pTAG.

Proposal 3: TA group and UL of SCell in sTAG are mapped by TAG-ID.

Proposal 4: For the SCell in sTAG, TAG-ID can be modified by the SCell modification without the SCell state change (i.e. not use SCell release and addition).

Proposal 5: Two reserved bits in TA command MAC Control Element should be re-defined to indicate TA group where reserved TA command applies.

Proposal 6: Up to 4 TAG-IDs are configurable by RRC signalling, even if Rel-11 UE does not support up to 4 TA groups.

Proposal 7: TAG-ID configuration should be included in UL configuration of *PhysicalConfigDedicatedSCell*.

4 References

- [1] R2-115747, *MAC Downlink Signalling for Multiple TA*, Nokia Siemens Networks, Nokia Corporation
- [2] R2-115812, *Signalling for TA group configuration*, Potevio
- [3] TS36.300 v10.6.0
- [4] TS36.321 v10.4.0
- [5] R4-115774, *TP to inter-band CA TR*, TSG RAN WG4