

Agenda Item: 7.1.2
Source: CMCC
Title: RRC reconfiguration failure in dual connectivity
Document for: Discussion and Decision

1 Introduction

Dual Connectivity (DC) has been discussed extensively [1], while there are still many issues that needs to be addressed in details. One of these issues is on the RRC reconfiguration procedure, especially on the handling of RRC reconfiguration failure case.

In this contribution, we try to resolve this issue.

2 Discussion

2.1 Existing mechanism on RRC reconfiguration failure

There is a basic principle on the RRC reconfiguration failure since Rel-8, i.e. no partial success/failure. This means if the UE is unable to comply with part of the configuration, it does not apply any part of the configuration, as extracted [2]

5.3.5.5 Reconfiguration failure

The UE shall:

- 1> if the UE is unable to comply with (part of) the configuration included in the *RRCCConnectionReconfiguration* message;
- 2> continue using the configuration used prior to the reception of *RRCCConnectionReconfiguration* message;
- 2> if security has not been activated:
 - 3> perform the actions upon leaving RRC_CONNECTED as specified in 5.3.12, with release cause other;
- 2> else:
 - 3> initiate the connection re-establishment procedure as specified in 5.3.7, upon which the connection reconfiguration procedure ends;

This UE behaviour is also specified in the RRC re-establishment procedure [2]:

5.3.7.2 Initiation

The UE shall only initiate the procedure when AS security has been activated. The UE initiates the procedure when one of the following conditions is met:

- 1> upon detecting radio link failure, in accordance with 5.3.11; or
- 1> upon handover failure, in accordance with 5.3.5.6; or

- 1> upon mobility from E-UTRA failure, in accordance with 5.4.3.5; or
- 1> upon integrity check failure indication from lower layers; or
- 1> upon an RRC connection reconfiguration failure, in accordance with 5.3.5.5;

In CA, the same principle and UE behaviour are applied regardless the Pcell and Scell (re)configuration. However, the situation may change with regard to the dual connectivity.

2.2 Issue in RRC reconfiguration failure in DC

According to the current agreements on DC, the MeNB manage the UE control plane, i.e. the MeNB takes care the UE with RRC signalling including RRC reconfiguration. The SeNB also participates in the UE RRC configuration by providing the respective RRC configurations/contexts in RRC containers to the MeNB through the X2 interface, as shown in below Figure 1.

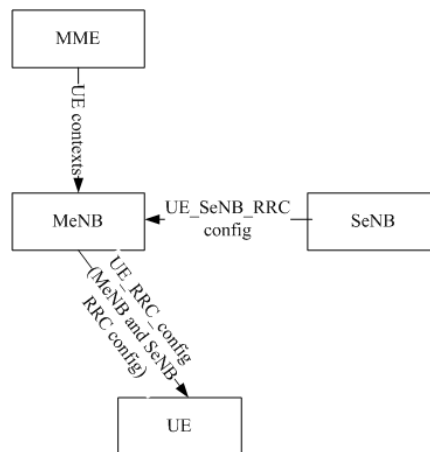


Figure 1: C-Plane in dual connectivity

Due to whatever reason, there might be a RRC reconfiguration failure scenario where the UE is unable to comply with part of the configuration. Assuming the AS security has been activated for the UE in DC, otherwise the UE should perform the actions upon leaving RRC_CONNECTED. Given the AS security has been activated, we can further elaborate this scenario into three cases:

- **Case 1:** UE is unable to comply the MeNB configuration only (i.e. UE is able to comply the SeNB configuration)
- **Case 2:** UE is unable to comply the SeNB configuration only (i.e. UE is able to comply the MeNB configuration)
- **Case 3:** UE is able to comply neither the MeNB nor the SeNB configuration

So far there is no UE behaviour specified for resolving the above cases while these issues should be addressed in Rel-12 DC.

2.3 Solutions to resolve the RRC reconfiguration failure in DC

Based on the cases described in section 2.2, we further discuss the potential solutions in this section.

According to the current agreements on DC, the MeNB manage the UE control plane, i.e. the MeNB takes care the UE with RRC signalling including RRC reconfiguration.

For case 1, it seems reasonable that the UE should adopt the existing behaviour, i.e. the UE should initiate the RRC re-establishment procedure. This is also straightforward since only the MeNB manages the RRC connection as well as generates and maintains the RRC procedure and message to the UE. So, if the UE is not able to comply the MeNB configuration, the UE has no other choice than initiates the RRC re-establishment. In this case, the MeNB is most likely to be selected as the target for the UE re-establishment.

For case 2, a simple way is to adopt the same behaviour as the existing procedure, i.e. the UE initiates the RRC re-establishment procedure. However, this mechanism is not reasonable since the UE and the MeNB can still work well even if there is no SeNB configuration. Note the MeNB and SeNB manage respective scheduling and radio resource independently. Without the SeNB configuration, the UE and the MeNB can still communicate to each other. Therefore, If the UE must stop its communication with MeNB and initiate the RRC re-establishment just because of the un-successful configuration with SeNB in this case, it may result in a bad user experience due to unnecessary transmission interruption. A more logical alternative is that the UE still maintain its communication with MeNB and reports its uncomplying configuration status of SeNB to the MeNB, then a modification of the concerning configuration may take place.

For case 3, it is clear that the UE should initiate the RRC re-establishment procedure since neither the MeNB nor the SeNB can maintain the RRC connection with the UE.

Therefore, we propose:

Proposal 1: If the UE is unable to comply the MeNB configuration, regardless of the SeNB configuration, the UE should initiate the RRC re-establishment procedure.

Proposal 2: If the UE is able to comply the MeNB configuration and is unable to comply the SeNB configuration, the UE should not initiate the RRC re-establishment procedure.

Proposal 3: If the UE is able to comply the MeNB configuration and is unable to comply the SeNB configuration, the UE should report its uncomplying configuration status of SeNB to the MeNB.

3 Conclusions

Based on the discussion, our proposals are provided as follows:

Proposal 1: If the UE is unable to comply the MeNB configuration, regardless of the SeNB configuration, the UE should initiate the RRC re-establishment procedureB.

Proposal 2: If the UE is able to comply the MeNB configuration and is unable to comply the SeNB configuration, the UE should not initiate the RRC re-establishment procedure.

Proposal 3: If the UE is able to comply the MeNB configuration and is unable to comply the SeNB configuration, the UE should report its uncomplying configuration status of SeNB to the MeNB.

4 References

- [1] RAN2-85 Prague - Chairman notes.14-02-14_17-09-40
- [2] 3GPP TS 36.331. RRC Protocol Specification.