TSG-RAN Working Group 1 meeting #21   *TSGR1#21(01)0489*
Busan, Korea, 21 – 25 April 2001

Agenda Item: 11
Source: **Samsung Electronics and Nokia**
Title: **User plane signalling for gating**
Document for: Discussion

Introduction

The signalling support for Gated DPCCH Transmission WI has been discussed in WG3 and it has been agreed that RNSAP/NBAP signalling is used for initiation and termination of gating [1]. At the previous RAN3#20 meeting, there was a discussion on delay of NBAP signalling and it was claimed that gating has some benefit on delay aspect compared to CELL_FACH switching. There was however some concern that in some situation, the signaling delay for gating can be similar to signaling delay for CELL_FACH switching (to and from CELL_DCH). It can be noted that the enhancement on gating in signaling delay aspect increases the benefit of gating operation.

At the previous RAN3 meetings, the Radio Interface Parameter Update procedure has been proposed as a procedure for updating radio interface parameters which are applicable to all RL's for a concerning UE. Currently, the parameters that can be updated by the Radio Interface Parameter Update procedure are "TPC power offset" and "DPC mode".

In principle, the Radio Interface Parameter Update procedure [2] applies to the parameters, which have several common characteristics:

  - They all concern dedicated RL's;
  - The signalling could occur relatively frequent;
  - The radio interface parameter changes should be applied to all RL's of the radio connection;
  - No large problems should occur if a node-B fails to apply the new parameters once in a while;
  - In addition, they all might benefit from a synchronized activation between UE and UTRAN.

Gating initiation/termination concerns dedicated RL's, occurs relatively frequent and applies to all RL's of the radio connections. The problem can be minimized when a node-B fails to apply the new parameters by using some optional error recovery procedure. Moreover, the gating initiation/termination should be activated synchronically. Therefore, gating initiation/termination can be done using the Radio Interface Parameter Update procedure in stead of using Synchronized Radio Link Reconfiguration procedure.

In this contribution, a gating initiation/termination signaling using Radio Interface Parameter Update procedure is introduced. Detail procedure is described in next section and a text proposal for TR25.938 is also given as a reference.

Signaling procedure for gating

Since Gating initiation/termination satisfies the principle for the Radio Interface Parameter Update procedure, gating initiation/termination can be done using the Radio Interface Parameter Update

procedure in stead of using Synchronized Radio Link Reconfiguration procedure.

The gating parameters can be set when a Radio Link is set up, the Radio Interface Parameter Update procedure only need to indicate the initiation and termination of gating operation.

Since the Radio Interface Parameter Update procedure support synchronized operation using CFN, gating initiation and termination can synchronized with UE. The main benefit of using the Radio Interface Parameter Update procedure is minimizing the signaling delay for the gating initiation and termination.

The following is the summarized procedures for gating operation:

(1) When a Radio Link is set up, gating related information will be exchanged between SRNC and DRNC using RNSAP messages, and RNC and Node B using NBAP messages.
   - Gating parameters are set by SRNC and are sent to Node Bs, which save the parameters.
   - DRNC sends the gating supporting information to SRNC.

(2) While gating is not activated, SRNC may use unsynchronized reconfiguration procedure to change the gating parameters.
   - New Gating parameters are sent from SRNC to DRNC and Node Bs.
   - DRNC and Node Bs update the gating parameters as signaled.

(3) When SRNC determines gating initiation/termination, SRNC sends a Radio Interface Parameter Update control frame containing gating indicator and CFN to all Node B's.
   - Node B initiates/terminates gating at CFN using the gating parameters as saved.
   - Gating indicator contains the information such as gating initiation (0) or gating termination (1)

(4) While gating is activated, SRNC may use synchronized reconfiguration procedure to change the gating parameters. RRC message should be also sent to UE in order to change the gating parameter at the same time.
   - New Gating parameters are sent from SRNC to DRNC and Node Bs.
   - SRNC sends RRC message to UE to change the gating parameter with the same CFN.
   - Node Bs and UE apply the signaled new gating parameters at the same CFN.

(5) While gating is activated, a new RL that supports gating is added, the gating is continued with the new RL
   - RL SETUP REQUEST message contains gating parameters with gating indicator indicating that gating is activated.

Conclusion

In this contribution, user plane signaling is introduced to be used for initiation and termination of gating instead of using control plane signaling (NBAP/RNSAP). The main benefit of using user plane signaling is short signaling delay. For the error on user plane signaling message, attached CRC can be used and some optional error recovery procedure can be considered as for further study.

Corresponding text proposal for TR25.938 is attached below.

References

[1] TR25.938 v2.0.1 "Gated DPCCH Transmission", Rel5 WI
[2] R3-000878, "Radio Interface Parameter Updates", Ericsson

Text proposal for TR 25.938

6 Study Areas

6.1.3 Possible Gating Signalling

6.1.3.1 Radio Link Setup

- When SRNC sets up a radio link, SRNC can send gating parameters to DRNC and they will also be sent to Node B in the RADIO_LINK_SETUP_REQUEST messages and then DRNC and Node B will save the gating parameters.
- When SRNC sets up a radio link, DRNC can send gating support indicator as a part of neighboring cell information in the Radio Link Setup Response message and SRNC will save the information.
- If one of the cells that will have radio link does not support gating operation, SRNC shall terminate and not initiate gating operation.
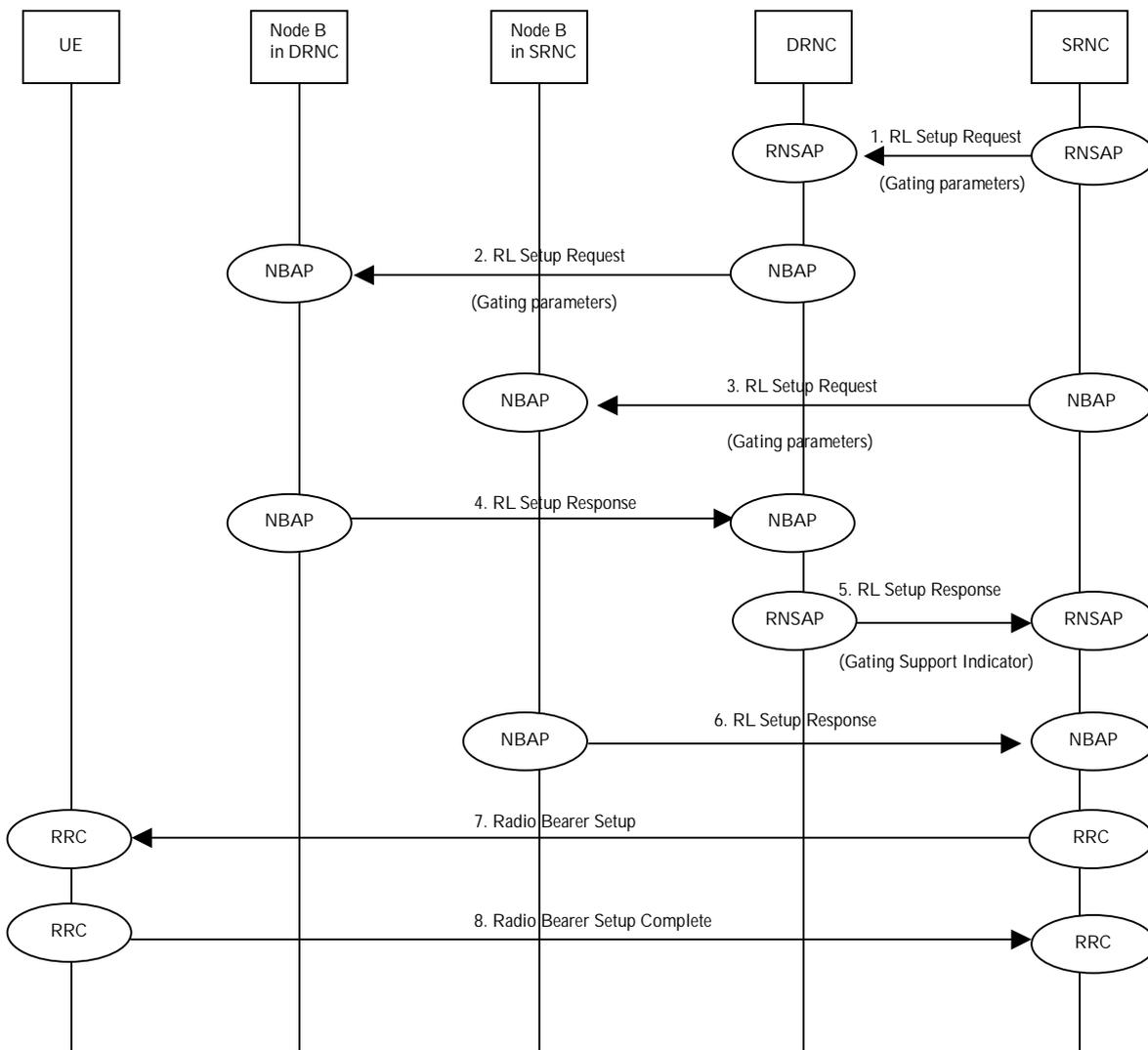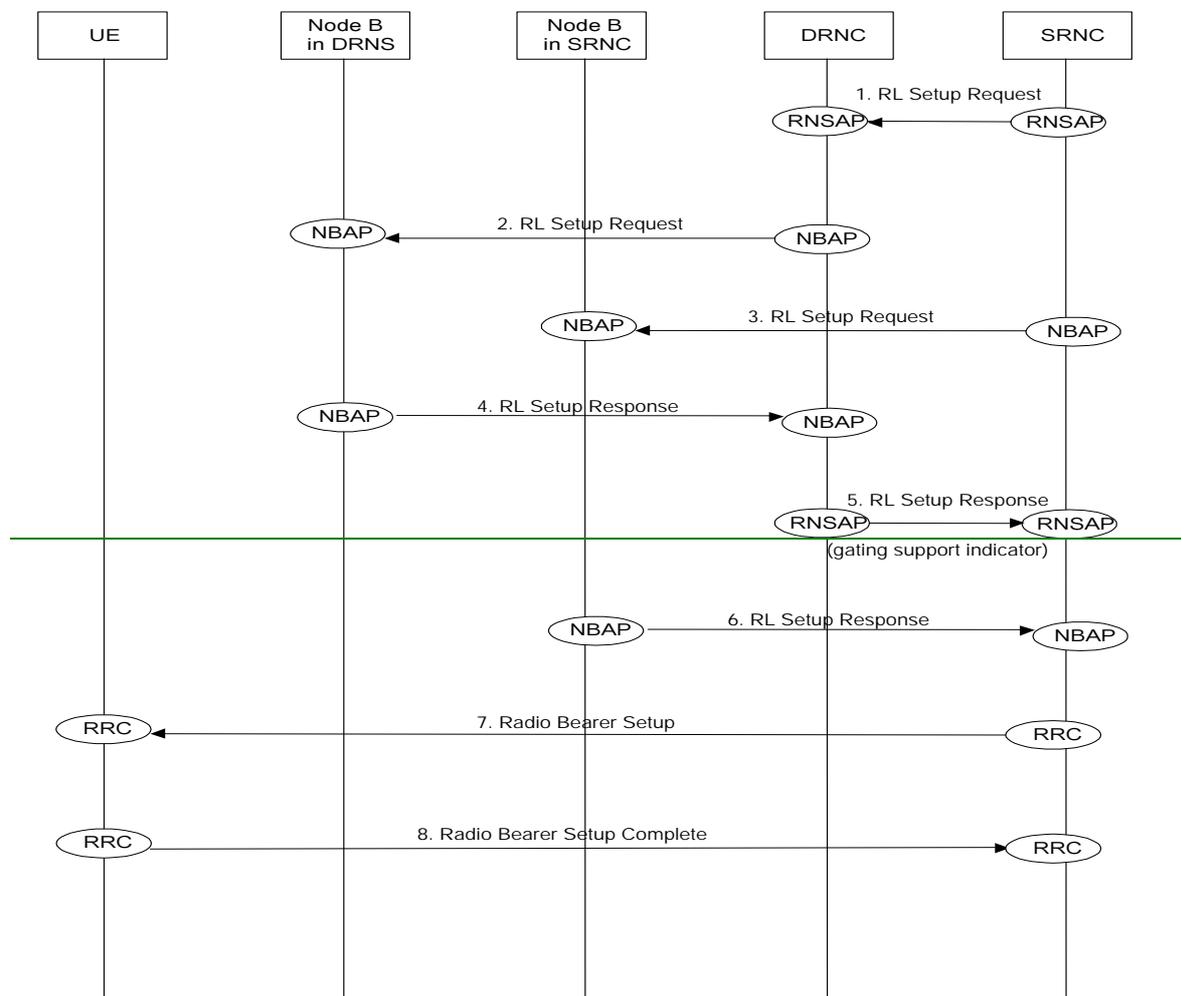
1. When SRNC sets up a Radio Link via the DRNC, SRNC sends **Radio Link Setup Request** message to DRNC with gating parameters.
   Parameters: *gating parameters*
2. DRNC requests its Node B to setup a Radio Link sending **Radio Link Setup Request** message with the gating parameters which are included in the **RNSAP Radio Link Setup Request** message. The gating parameters will be used when gating is initiated.
   Parameters: *gating parameters.*
3. SRNC requests its Node B to setup a Radio Link sending **Radio Link Setup Request** message. with the gating parameters. The gating parameters will be used when gating is initiated.
   Parameters: *gating parameters.*
4. Node B saves the gating parameters, allocates resources and notifies DRNC that the Radio Link is setup sending **Radio Link Setup Response** message.
5. DRNC notifies SRNC that the Radio Link is setup. DRNC can send the information whether neighboring cells including the active cell support gating or not using IE gating support indicator.
   Parameters: *gating support indicator.*
6. Node B allocates resources and notifies SRNC that the Radio Link is setup sending **Radio Link Setup Response** message.

7. SRNC sends UE **Radio Bearer Setup** message.
8. UE notifies SRNC that radio bearer is setup sending **Radio Bearer Setup Complete** message.

6.1.3.2 Gating Initiation and termination

- When SRNC determines gating initiation/termination, SRNC may sends NBAP/RNSAP message **Radio Link Reconfiguration Prepare** the parameter, gating indicator and SRNC may include the gating parameters (gating rate and gating direction).
- SRNC sends RRC message **Radio Bearer Reconfiguration** or **Transport Channel Reconfiguration** or **Physical Channel Reconfiguration** to initiate/terminate gating operation with the gating parameters.
- During gating operation, SRNC and UE may restrict TFCIs in order to keep lower data rate.
- Gating initiation and termination can be synchronized since Synchronized Radio Link Reconfiguration procedure and Radio Bearer Reconfiguration procedure have activation time which can be synchronized.
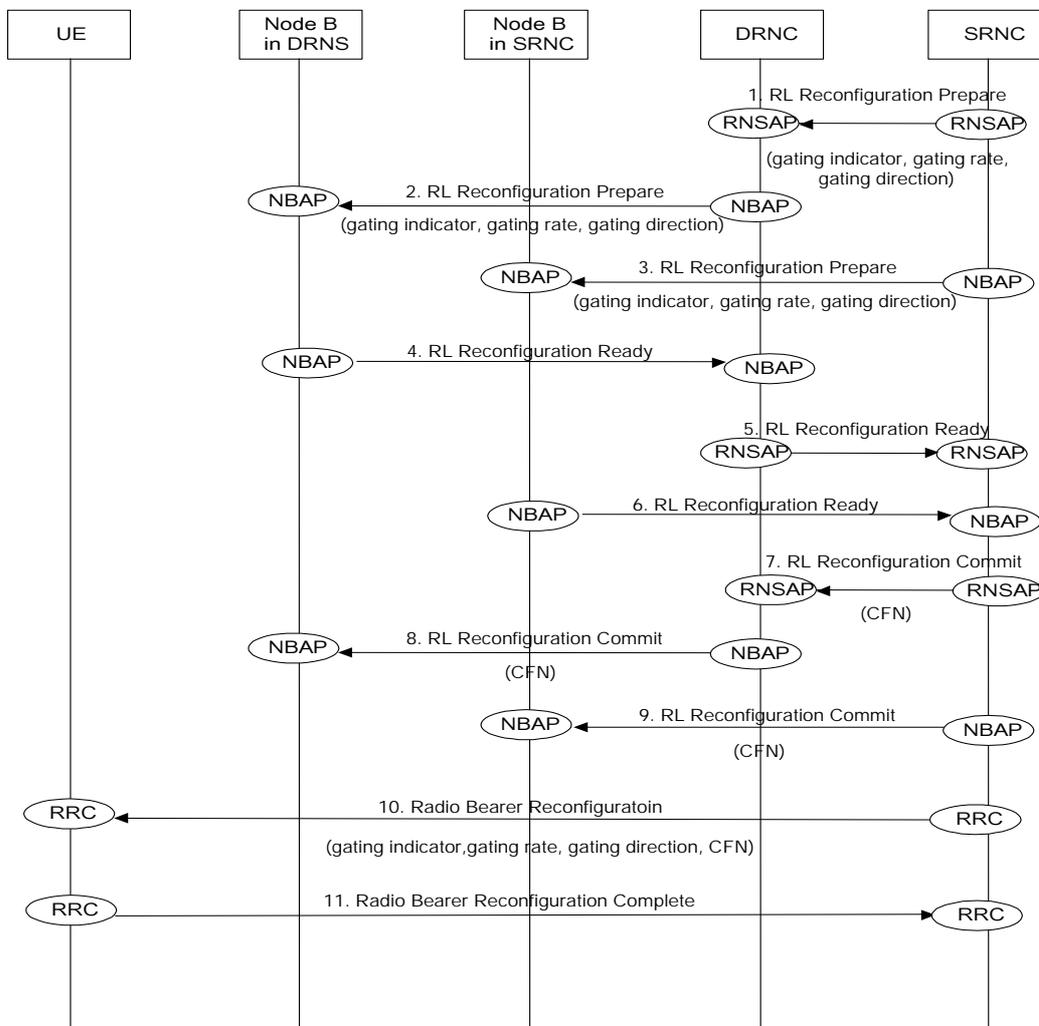
1. SRNC initiates/terminates gating operation sending **Radio Link Reconfiguration Prepare** message to DRNC with gating parameters.
   Parameters: *gating indicator, gating rate, gating direction, gating cycle*
2. DRNC requests its Node B to initiate/terminate gating operation sending **Radio Link Reconfiguration Prepare**

message.
Parameters: *gating indicator, gating rate, gating direction, gating cycle*
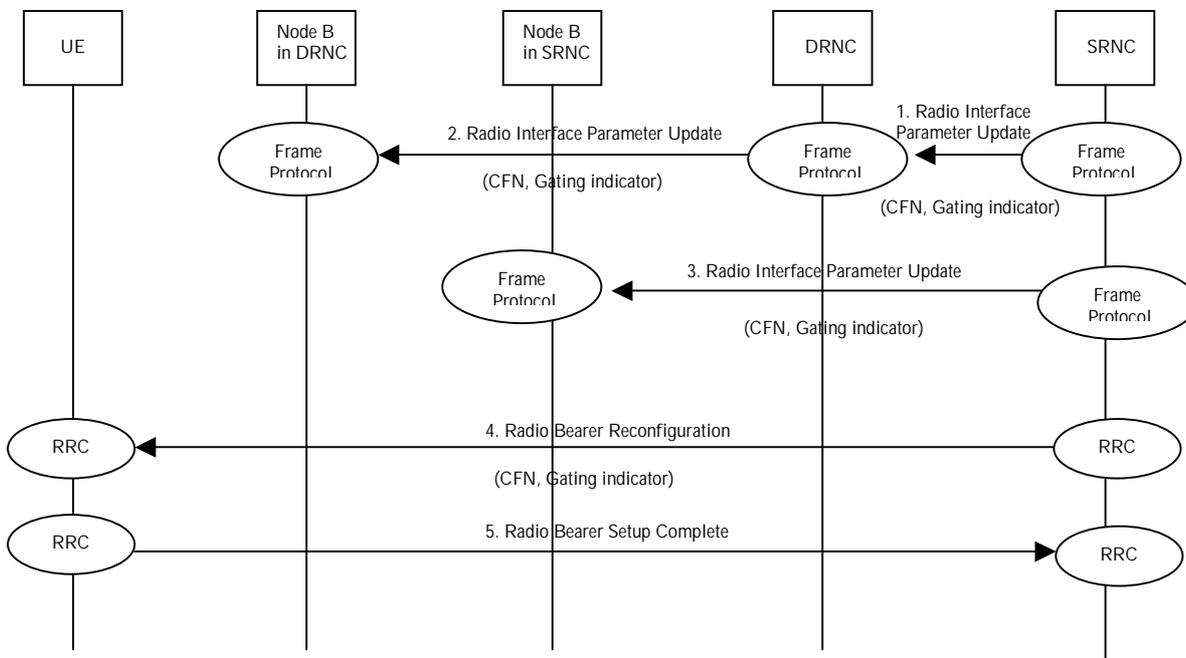
3. SRNC requests its Node B to initiate/terminate gating operation sending **Radio Link Reconfiguration Prepare** message.
Parameters: *gating indicator, gating rate, gating direction, gating cycle*.

4. Node B prepares gating operation and notifies DRNC that the gating operation is ready sending **Radio Link Reconfiguration Ready** message.

5. DRNC notifies SRNC that the gating operation is ready sending **Radio Link Reconfiguration Ready** message.

6. Node B prepares gating operation and notifies SRNC that the gating operation is ready sending **Radio Link Reconfiguration Ready** message.

7. RNSAP message **Radio Link Reconfiguration Commit** is sent from SRNC to DRNC for initiating/terminating gating operation at CFN.

8. NBAP message **Radio Link Reconfiguration Commit** is sent from DRNC to Node B for initiating/terminating gating operation at CFN.

9. NBAP message **Radio Link Reconfiguration Commit** is sent from SRNC to Node B for initiating/terminating gating operation at CFN.

10. SRNC sends UE **Radio Bearer Reconfiguration** message with gating parameters.
Parameters: *gating indicator, gating rate, gating direction, gating cycle*.

11. UE notifies SRNC that gating operation is ready sending **Radio Bearer Reconfiguration Complete** message and UE initiates/terminates gating operation with gating parameters at CFN that is signaled.

## 6.1.3.3 Alternative Gating Initiation and termination

- When SRNC determines gating initiation/termination, SRNC sends Radio Interface Parameter Update control Frame to Node Bs with CFN and Gating indicator in order to initate/terminate gating.
- SRNC sends RRC message **Radio Bearer Reconfiguration** or **Transport Channel Reconfiguration** or **Physical Channel Reconfiguration** to initiate/terminate gating operation with the gating parameters.
-

1. SRNC initiates/terminates gating operation sending **Radio Interface Parameter Update** Control Frame to DRNC with CFN and gating indicator.
   Parameters: *gating indicator*
2. DRNC forwards the Control Frame to Node B.
3. SRNC initiates/terminates gating operation sending **Radio Interface Parameter Update** Control Frame to its Node B with CFN and gating indicator.
   Parameters: *gating indicator*
4. SRNC sends UE Radio Bearer Reconfiguration message with gating parameters to initiate/terminate gating.
   Parameters: *CFN, gating indicator, gating rate, gating direction, gating cycle.*
5. UE notifies SRNC that gating operation is ready sending Radio Bearer Reconfiguration Complete message and UE initiates/terminates gating operation with gating parameters at CFN that is signaled.

## 6.1.3.4 Gating parameter synchronised reconfiguration

- When SRNC determines change of the gating parameters during gating operation, SRNC may send NBAP/RNSAP message **Radio Link Reconfiguration Prepare** message with the new gating parameters. (gating rate, gating direction and gating cycle).
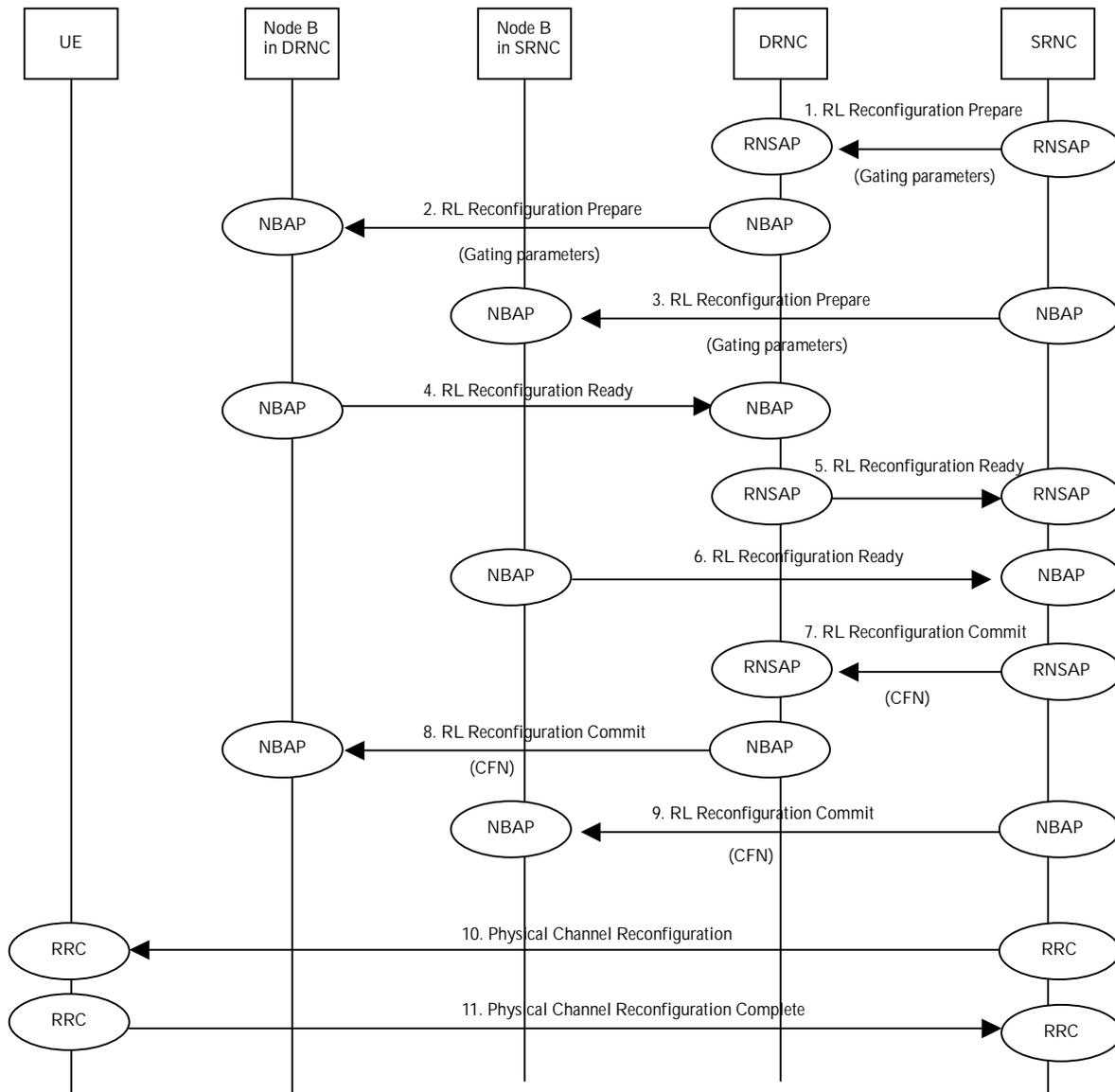
1. SRNC may send **Radio Link Reconfiguration Prepare** message to DRNC with gating parameters to reconfigure the parameters during gating is activated.
   Parameters: *gating rate, gating direction, gating cycle*
2. DRNC sends **Radio Link Reconfiguration Prepare** message with the gating parameters to Node B when it receives the RNSAP message for reconfiguration of gating parameters during gating is activated.
   Parameters: *gating rate, gating direction, gating cycle*
3. SRNC may send **Radio Link Reconfiguration Prepare** message to Node B with gating parameters to reconfigure the parameters during gating is activated.
   Parameters: *gating rate, gating direction, gating cycle*
4. Node B updates the gating parameters as requested and notifies DRNC that the recofiguration is ready sending **Radio Link Reconfiguration Ready** message.
5. DRNC notifies SRNC that the reconfiguration is ready sending **Radio Link Reconfiguration Ready** message.
6. Node B updates the gating parameters as requested and notifies SRNC that the recofiguration is ready sending **Radio Link Reconfiguration Ready** message.
7. RNSAP message **Radio Link Reconfiguration Commit** is sent from SRNC to DRNC for changing the gating parameters at CFN.
8. NBAP message **Radio Link Reconfiguration Commit** is sent from DRNC to Node B for changing the gating parameters at CFN.
9. NBAP message **Radio Link Reconfiguration Commit** is sent from SRNC to Node B for initiating/terminating gating operation at CFN.
10. SRNC sends UE **Physical Channel Reconfiguration** message with gating parameters.
    Parameters: *CFN, gating rate, gating direction, gating cycle.*
11. UE notifies SRNC that the reconfiguration is ready sending **Physical Channel Reconfiguration Complete** message and UE changes the gating parameters at CFN that is signaled.

## 6.1.3.5 Gating parameter unsynchronised reconfiguration

- When SRNC determines change of the gating parameters when gating is not activated, SRNC may send NBAP/RNSAP message **Radio Link Reconfiguration Request** message with the new gating parameters. (gating rate, gating direction and gating cycle).
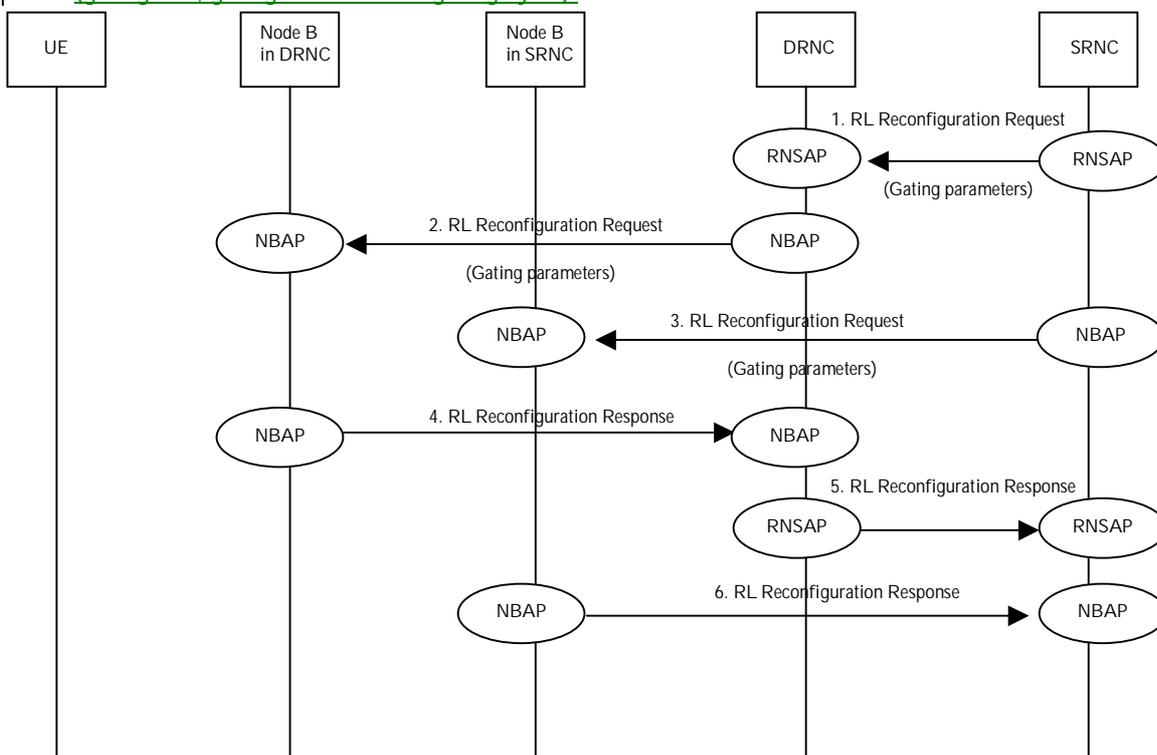
1. SRNC may send **Radio Link Reconfiguration Request** message to DRNC with gating parameters to reconfigure the parameters when gating is not activated.
   Parameters: *gating rate, gating direction, gating cycle*
2. DRNC sends **Radio Link Reconfiguration Request** message with the gating parameters to Node B when it receives the RNSAP message for reconfiguration of gating parameters when gating is not activated.
   Parameters: *gating indicator, gating rate, gating direction, gating cycle*
3. SRNC may send **Radio Link Reconfiguration Request** message to Node B with gating parameters to reconfigure the parameters when gating is not activated.
   Parameters: *gating rate, gating direction, gating cycle*
4. Node B changes and saves the gating parameters as requested and notifies DRNC that the reconfiguration is completed sending **Radio Link Reconfiguration Response** message.
5. DRNC notifies SRNC that the reconfiguration is completed sending **Radio Link Reconfiguration Response** message.
6. Node B changes and saves the gating parameters as requested and notifies SRNC that the reconfiguration is completed sending **Radio Link Reconfiguration Response** message.

~~6.1.3.3~~6.1.3.6   Soft handover during Gating

- When SRNC determines to setup a new Radio Link in a DRNC during gating operation, SRNC sends NBAP/RNSAP message **Radio Link ~~Addition~~/Setup Request** with the parameter~~s~~, gating rate, gating direction, gating cycle, gating indicator. Gating indicator notifies gating operation is on.
- Node B saves the gating parameters and starts UL reception and DL transmission based on gating parameters.
- If the Node B which will have the new Radio Link does not support the gating operation, SRNC shall terminate gating ~~send gating indicator with off to terminate~~ gating operation.
- SRNC sends RRC message **Active Set Update** to UE with gating indicator that will be off if gating operation should be off.
-
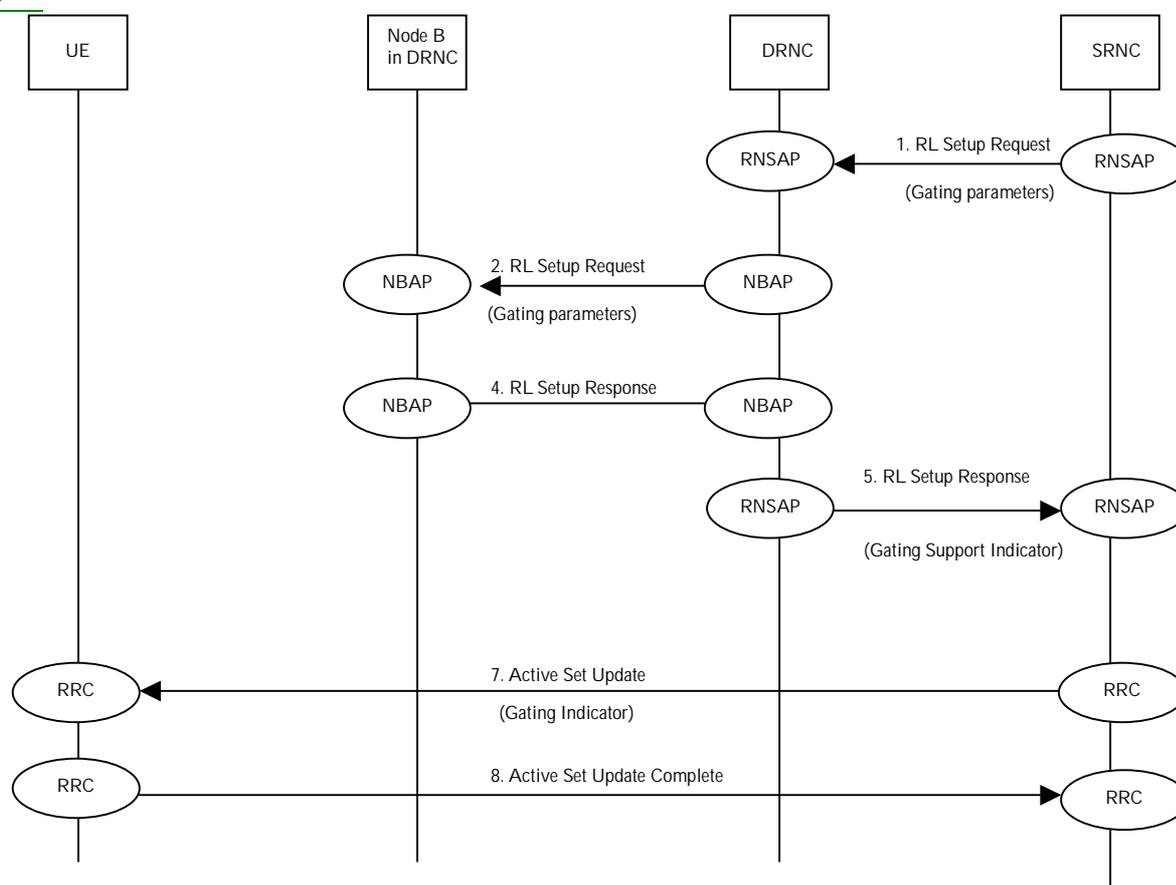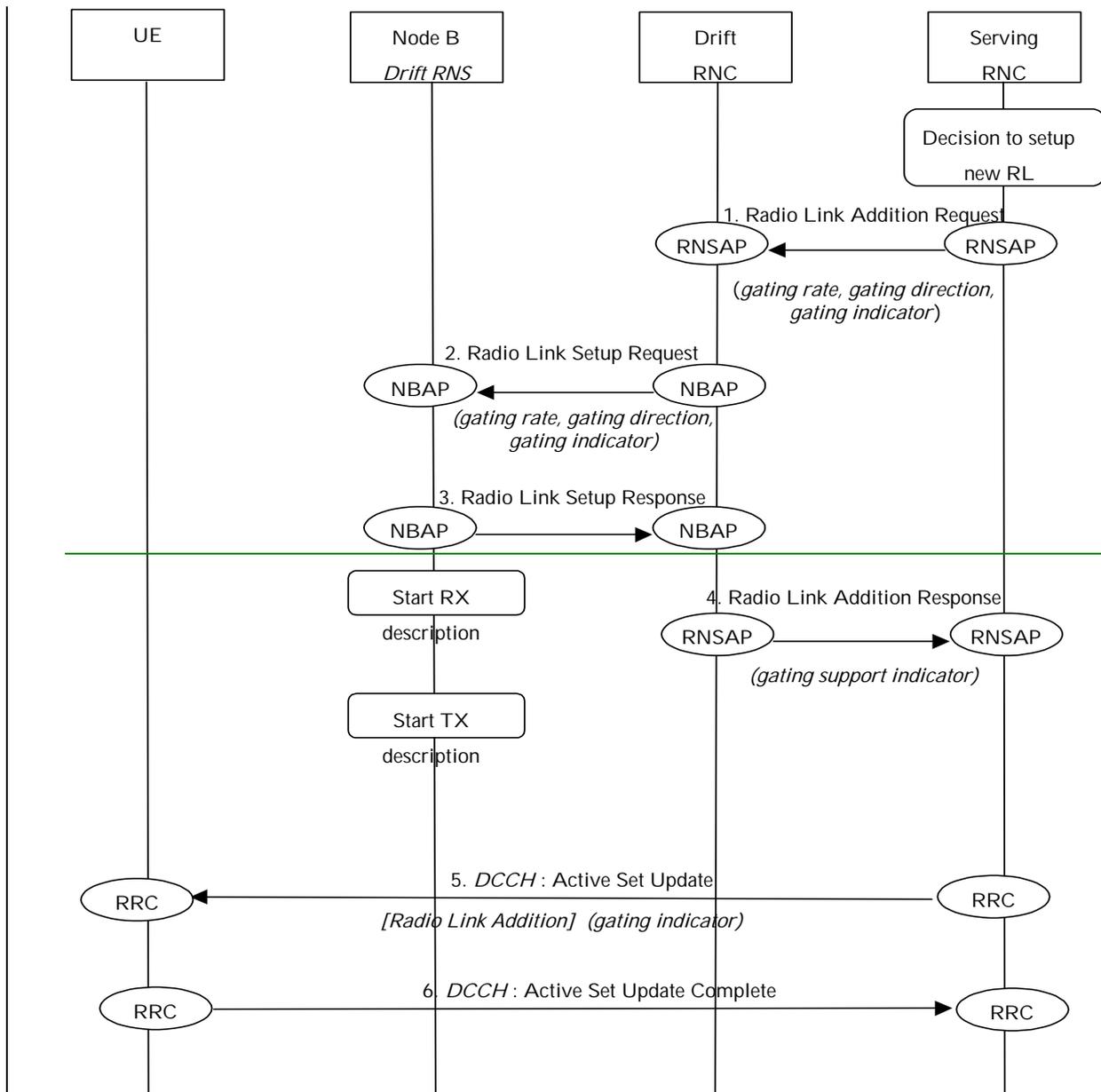
1   SRNC decides to setup a radio link via a new cell controlled by another RNC. SRNC requests DRNC for radio
     resources by sending RNSAP message **Radio Link SetupAddition Request**. If gating operation is on, SRNC
     includes gating parameter: gating indicator with gating on.
     Parameters: *gating indicator*.

2   If requested resources are available, DRNC sends NBAP message **Radio Link Setup Request** to Node B. If
     SRNC sends gating indicator with gating on and Node B supports gating operation, DRNC includes gating
     indicator in **Radio Link Setup Request** message.
     Parameters: *gating rate, gating direction, gating cycle, gating indicator*

23   Node B allocates requested resources. Successful outcome is reported in NBAP message **Radio Link Setup
     Response**.
     Then Node B starts the UL reception and then DL transmission based on the gating parameters.

4.   DRNC sends RNSAP message **Radio Link Addition Setup Response** to SRNC.

5.   SRNC sends RRC message **Active Set Update** (Radio Link Addition) to UE on DCCH. If DRNC sends failure
     response with cause gating not supported, SRNC will terminate gating operation and include gating indicator
     with gating off in **Active Set Update**.

Parameters: *gating indicator*
6.   UE acknowledges with RRC message **Active Set Update Complete**.