Wireless Communication Term Paper:

Mobility Management in RRC_CONNECTED

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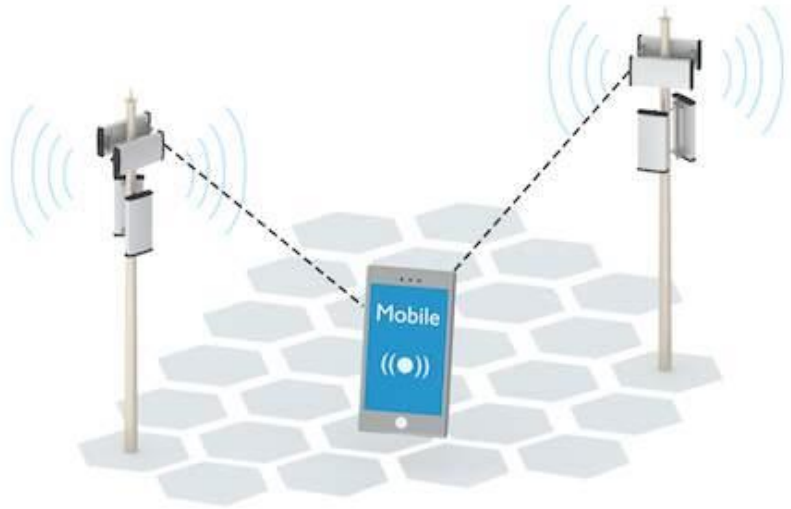
Introduction

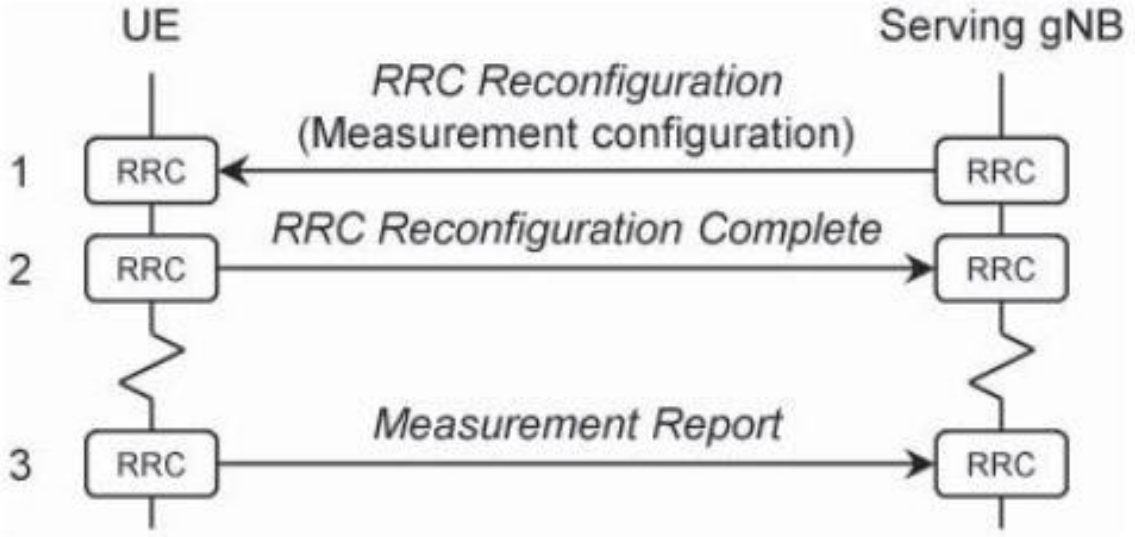
- Mobility and Hand over
- RRC_CONNECTED
- Dual Connectivity
- PDU sessions



Measurement Configuration and Reporting

Instruct to Mobile:

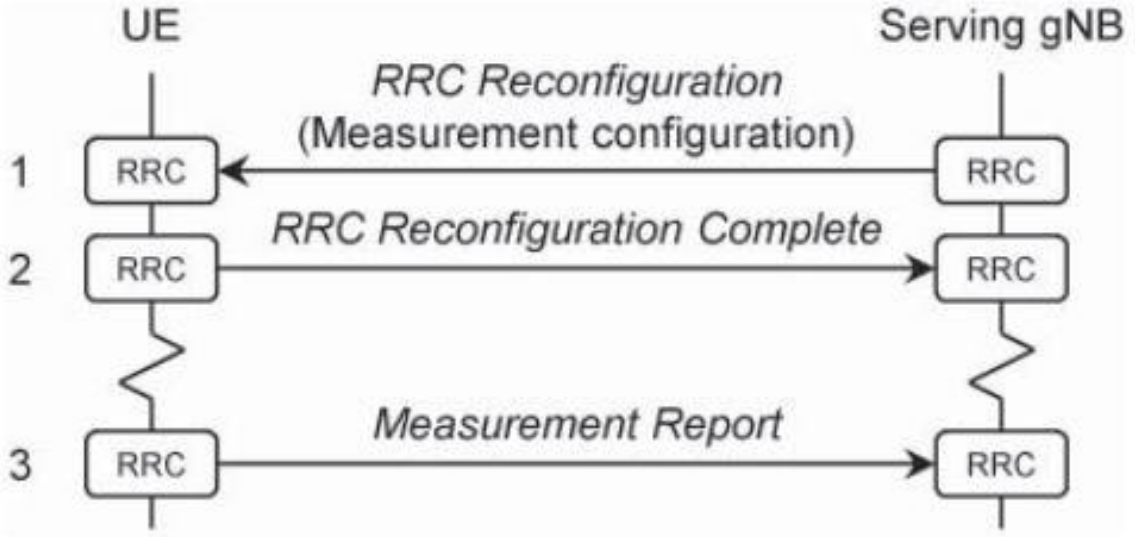
I. measurement objects
II. reporting configurations
III. measurement identities



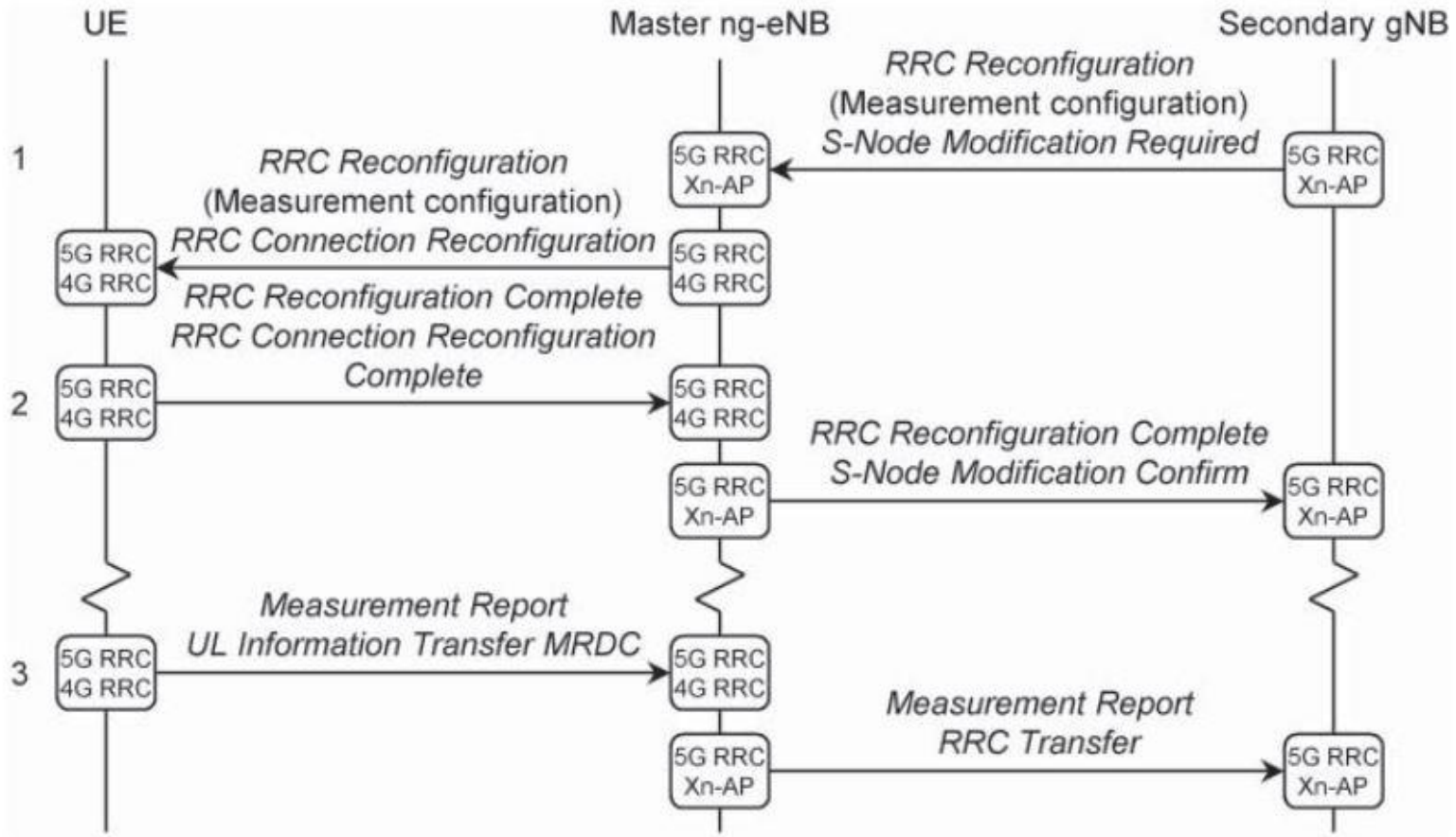
Measurement Configuration and Reporting

Measurement:

I. measurement gaps
II. Repo. Config. triggered
III. measurement identities



Signaling between secondary node & mobile



Measurement Objects

(SS/PBCH) blocks:

I. Centre frequency
II. Subcarrier spacing
III. Transmission period
IV. timing offset
V. Bitmap of (SS/PBCH) blocks
VI. neighbors forward over F1 and Xn

(CSI-RS) resources:

I. frequency of point A
II. Subcarrier spacing
III. Transmission period
IV. timing offset
V. it might be unavailable

Measurement Objects

Measurement parameter:

I. reference signal received power (RSRP)
II. reference signal received quality (RSRQ)
III. signal-to-interference plus noise ratio (SINR)

a. Send strongest beam
b. Send strongest beam average

Reporting Configurations

Event	Description	Possible applications
A1	Serving cell > Threshold	Stop measuring lower-priority carriers
A2	Serving cell < Threshold	Start measuring lower-priority carriers
		RRC release and redirection to another carrier
		Release PSCell or SCell
A3	Neighbour > SpCell + Offset	Replace SpCell by equal-priority neighbour
A4	Neighbour > Threshold	Replace SpCell by higher-priority neighbour
		Add PSCell or SCell
A5	SpCell < Threshold 1, and SCell or Neighbour > Threshold 2	Replace SpCell by lower-priority neighbour
		Replace SpCell by SCell
A6	Neighbour > SCell + Offset	Replace SCell by neighbour

PSCell: Primary SCG cell; SCell: secondary cell; SpCell: special cell.

Reporting Configurations

Example: event A3

$$M_n + Of_n + Oc_n > M_p + Of_p + Oc_p + Off + Hys$$

$$M_n + Of_n + Oc_n > M_p + Of_p + Oc_p + Off - Hys$$

Hysteresis parameter:

- Hys: reporting State
- Off: handover(not optional)
- Of_n, Of_p: handover & freq. specific
- Oc_n, Oc_p: handover cell specific

- From SpCell: PCell or PSCell
- To neighbor with Same f_c
- S. t. timeToTrigger (0–5120 ms)

Measurement Gaps

- promises not to schedule the mobile
- No downlink data send
- No uplink transmission opportunities
- duration (1.5-6 ms)
- period (20-160 ms)

a. radio access technology
b. Centre frequency
c. Subcarrier spacing

❖intra-frequency measurement
❖inter-frequency measurement

Xn-based Handover Procedure

Step 1:

- mobile sends a measurement report

Step 2:

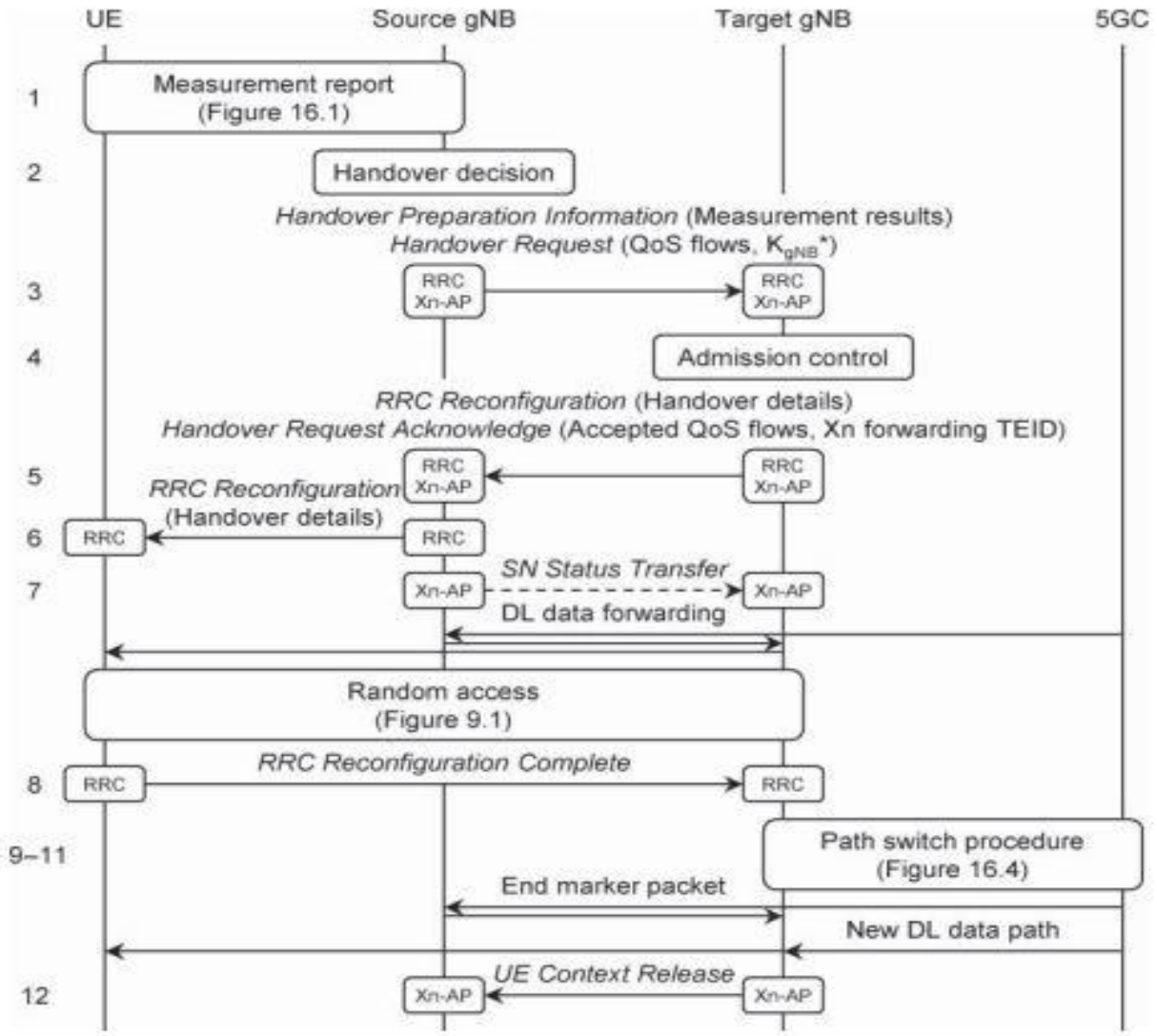
- Decide to handover
- Look up controlling node

Step 3:

- Send Xn-AP Handover Request
  - Target cell
  - Mobile's AMF
  - Mobile PDU session
  - Security key
  - Handover Preparation Information

Step 4:

- Admit mobile
- Admit its PDU session and QoS



Xn-based Handover Procedure

Step 5:

- Xn-AP Handover Request Acknowledge
  - Accepted PDU session
  - Accepted QoS flows
  - tunnel endpoint identifier over Xn
  - RRC Reconfiguration message

Step 6:

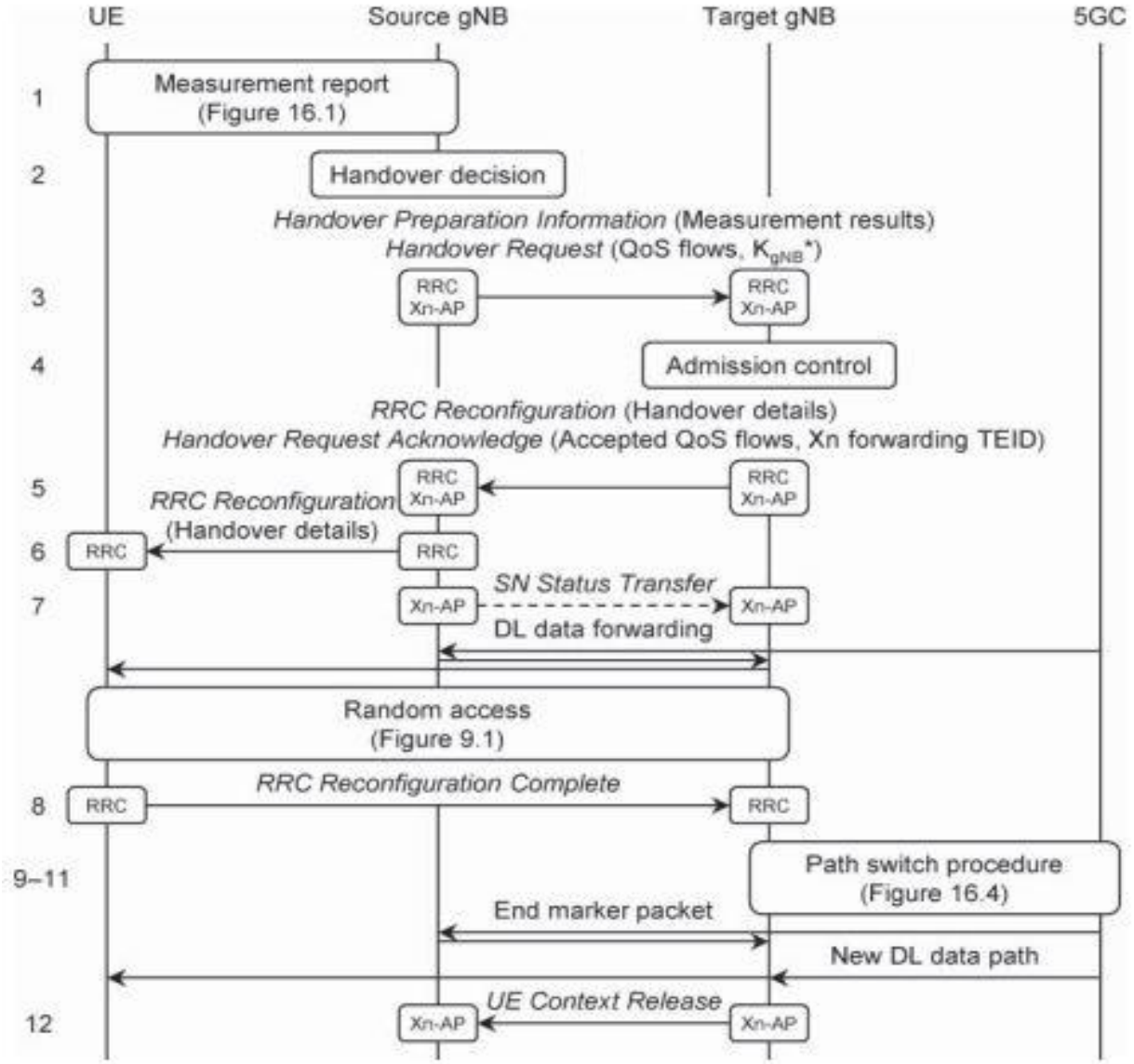
- Send handover command to mobile
- Forward undelivered data

Step 7:

- Send undelivered data list in Xn-AP SN Status Transfer

Step 8:

- Random access
- Send RRC acknowledgement



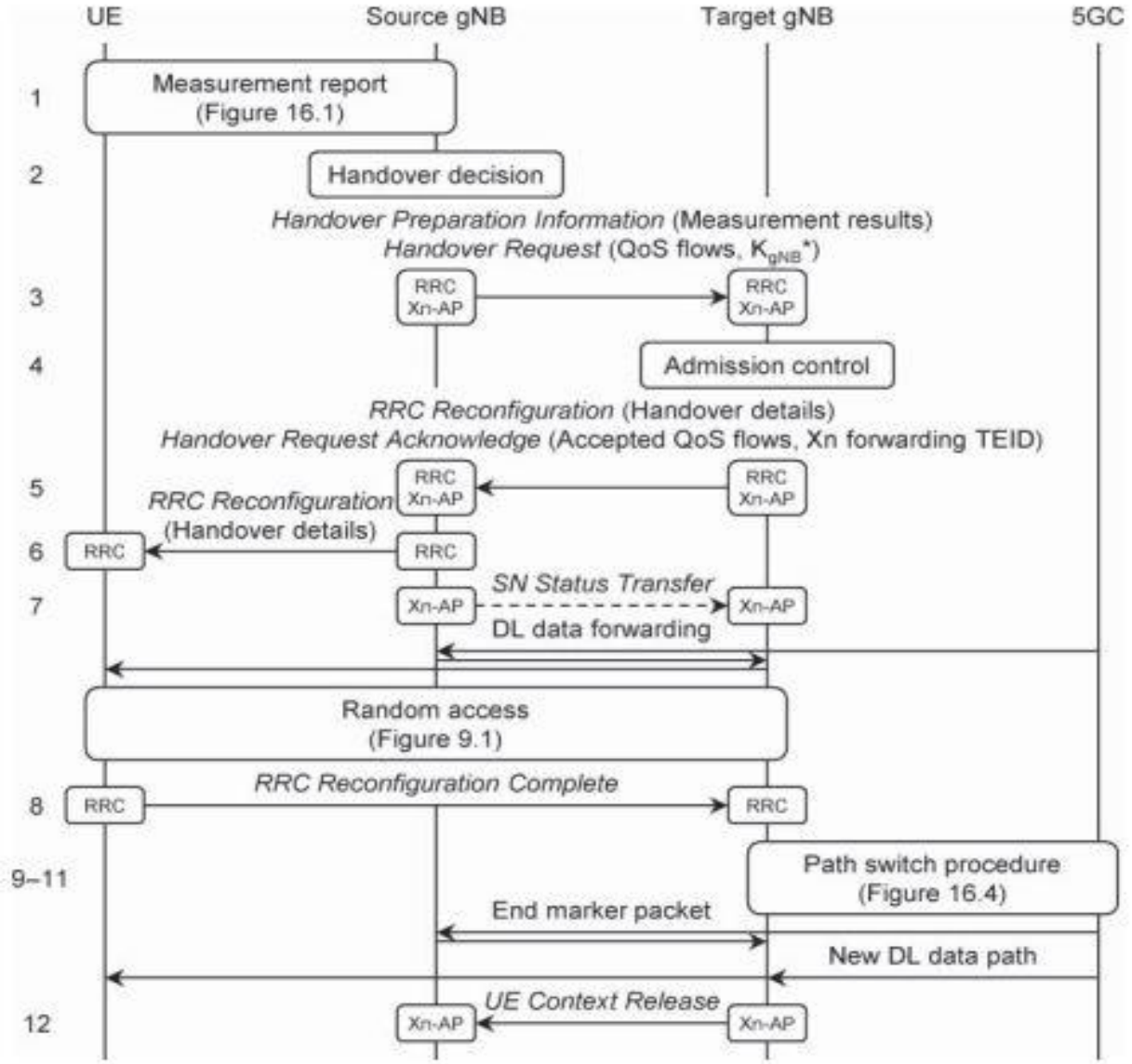
Xn-based Handover Procedure

Step 9-11:

- Target node informs the 5G core
- Path switch procedure

Step 12:

- Target node informs the source node
- Source node release resources



Path Switch Procedure

Core Network:

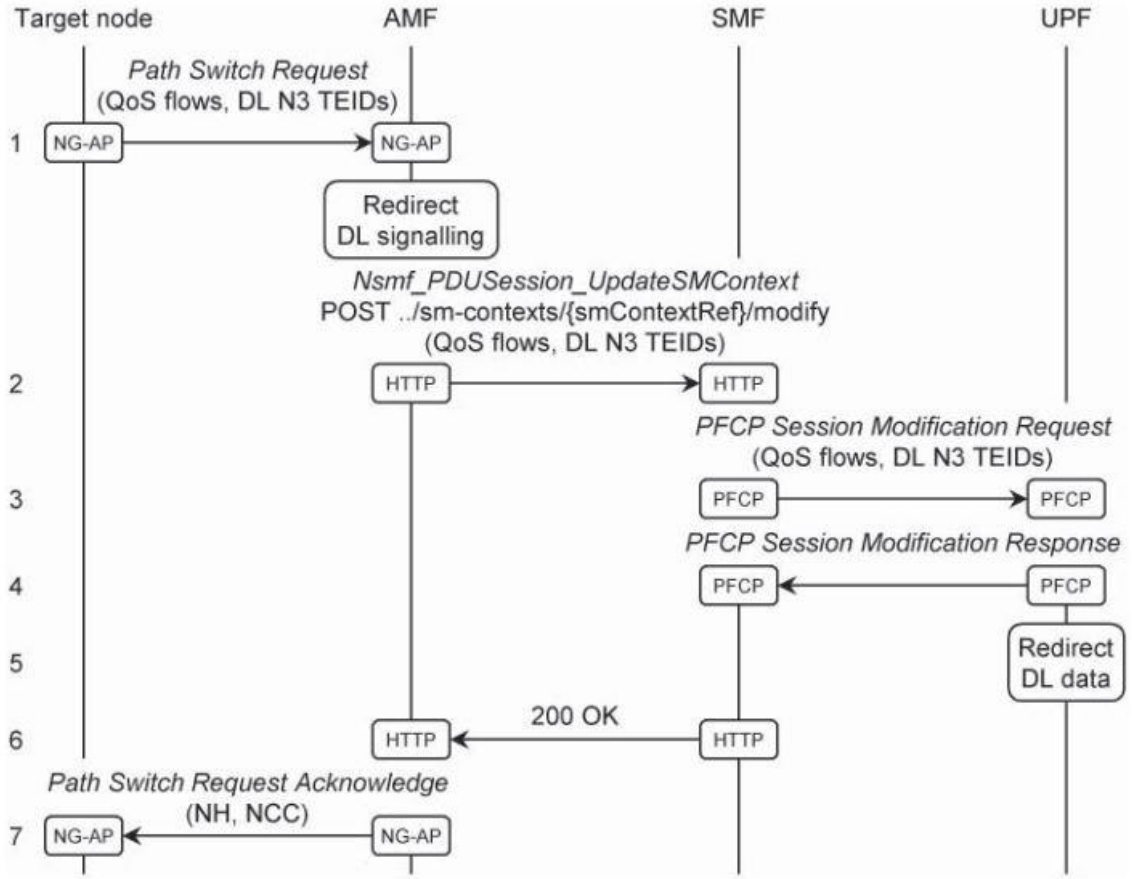
- Indicates the end of the old downlink data stream
- Send end marker packets to source

Source Node:

- Forward end marker packets to target

Target Note:

- Start Sending data received from core



Other Handover Procedure

NG-based Handover Procedure

- The nodes communicate using 5G core network
- Essential for nodes without connectivity over Xn

Handovers Between gNB and ng-eNB

- Triggered by B1 or B2 event
- 4G RRC message

PSCell: Primary SCG cell; SCell: secondary cell; SpCell: special cell.

Table 16.2 Measurement events involving other radio access technologies.

Event	Description	Possible applications
B1	Inter-RAT neighbour > Threshold	Replace 5G PCell by higher-priority 4G neighbour Add 4G PSCell alongside 5G PCell
B2	PCell < Threshold 1, and Inter-RAT neighbour > Threshold 2	Replace 5G PCell by lower-priority 4G neighbour

PCell: Primary cell; PSCell: primary SCG cell.

Secondary Node Addition

Step 1:

- Send Xn-AP S-Node Addition Request
  - stratum security key
  - embedded RRC message CG-ConfigInfo
  - MN-terminated DRBs
  - SN-terminated QoS flows

Step 2:

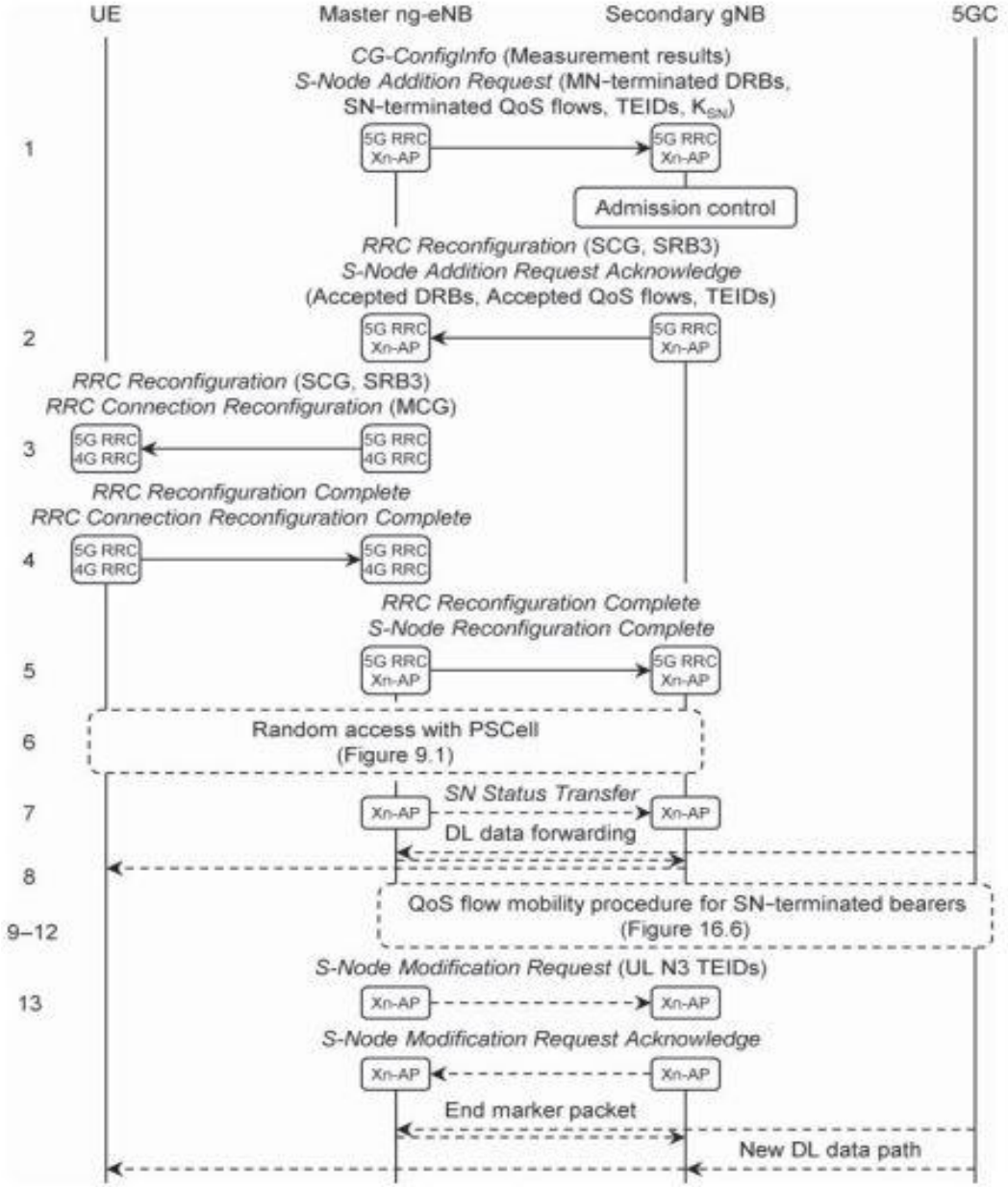
- Xn-AP S-Node Addition Request Acknowledge
- Accepted DRBs
- Accepted QoS flows
- RRC Reconfiguration message

Step 3:

- Send RRC Reconfiguration message of SN

Step 4-5:

- RRC Reconfiguration complete



Secondary Node Addition

Step 6:

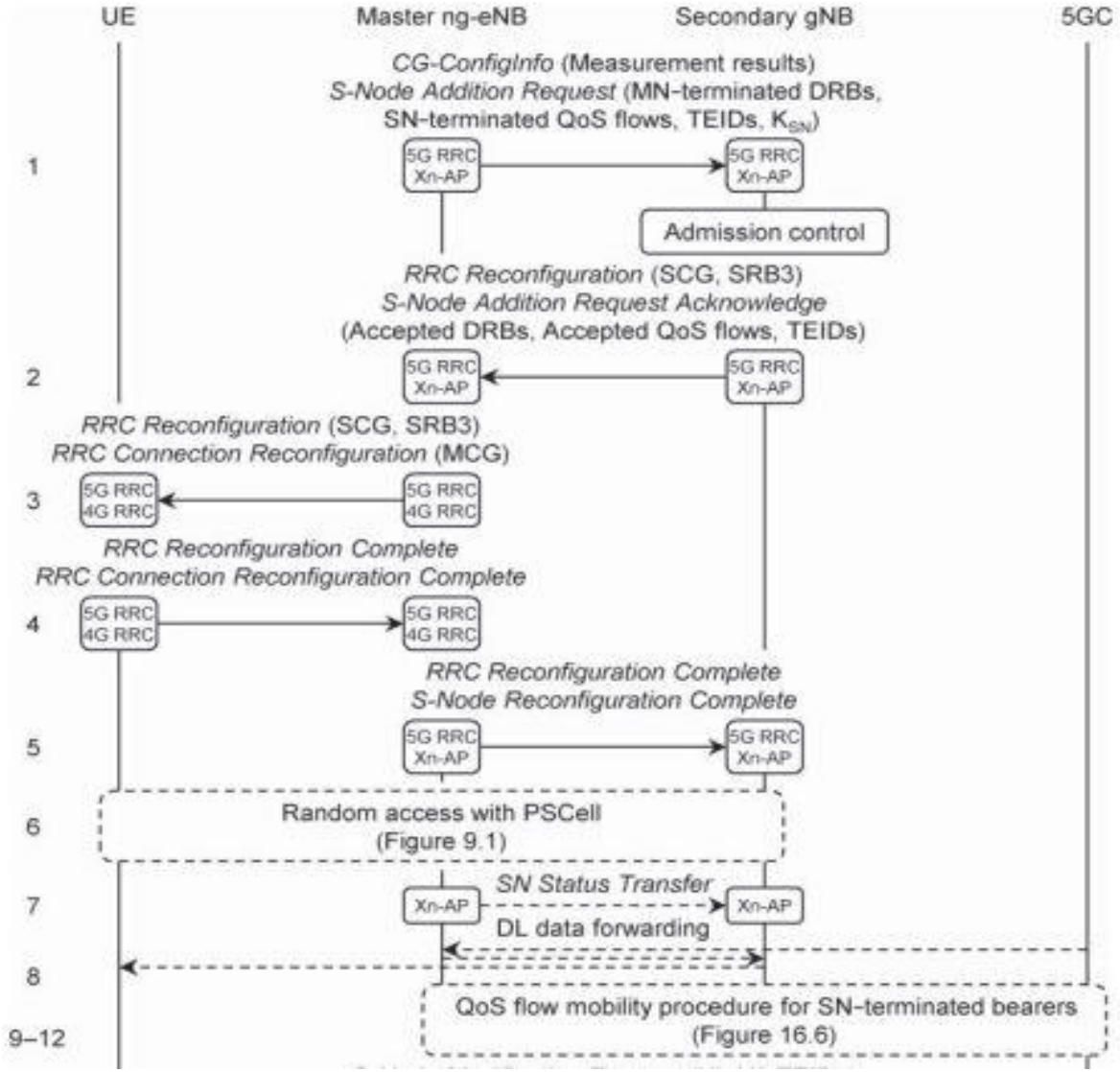
- Mobile runs the random access procedure

Step 7-8:

- Forward undelivered data of SN-terminated bearers

Step 9-12:

- QoS flow mobility procedure
- Similar to Path Switch Procedure



QoS Flow Mobility Procedure

Similar to Path Switch Procedure

redirects the downlink data path for selected QoS flows