Протоколы и интерфейсы БС LTE. Лекция 10.

Интерфейс X2. TS 36.423

ВЛАД РЫЖОВ

Fast Track в Телеком, 2024

НТР
новые телеком решения

PHOENIX
EDUCATION

МФТИ

Что сегодня будет происходить? Адженда

Список процедур X2	Разбор типов процедур	Примеры сообщений	Пример ASN1
5 минут	25 минут	5 минут	10 минут

Какие компоненты сети соединяет интерфейс X2? Каковы его функции?

Список процедур X2	**Разбор типов процедур**	**Примеры сообщений**	**Пример ASN1**
5 минут	**25 минут**	**5 минут**	**10 минут**

Список процедур. Класс-1.

Elementary Procedure	Initiating Message	Successful Outcome Response message	Unsuccessful Outcome Response message
Handover Preparation	HANDOVER REQUEST	HANDOVER REQUEST ACKNOWLEDGE	HANDOVER PREPARATION FAILURE
Reset	RESET REQUEST	RESET RESPONSE	
X2 Setup	X2 SETUP REQUEST	X2 SETUP RESPONSE	X2 SETUP FAILURE
eNB Configuration Update	ENB CONFIGURATION UPDATE	ENB CONFIGURATION UPDATE ACKNOWLEDGE	ENB CONFIGURATION UPDATE FAILURE
Resource Status Reporting Initiation	RESOURCE STATUS REQUEST	RESOURCE STATUS RESPONSE	RESOURCE STATUS FAILURE
Mobility Settings Change	MOBILITY CHANGE REQUEST	MOBILITY CHANGE ACKNOWLEDGE	MOBILITY CHANGE FAILURE
Cell Activation	CELL ACTIVATION REQUEST	CELL ACTIVATION RESPONSE	CELL ACTIVATION FAILURE
SeNB Addition Preparation	SENB ADDITION REQUEST	SENB ADDITION REQUEST ACKNOWLEDGE	SENB ADDITION REQUEST REJECT
MeNB initiated SeNB Modification Preparation	SENB MODIFICATION REQUEST	SENB MODIFICATION REQUEST ACKNOWLEDGE	SENB MODIFICATION REQUEST REJECT
SeNB initiated SeNB Modification	SENB MODIFICATION REQUIRED	SENB MODIFICATION CONFIRM	SENB MODIFICATION REFUSE
SeNB initiated SeNB Release	SENB RELEASE REQUIRED	SENB RELEASE CONFIRM	
X2 Removal	X2 REMOVAL REQUEST	X2 REMOVAL RESPONSE	X2 REMOVAL FAILURE
Retrieve UE Context	RETRIEVE UE CONTEXT REQUEST	RETRIEVE UE CONTEXT RESPONSE	RETRIEVE UE CONTEXT FAILURE
SgNB Addition Preparation	SGNB ADDITION REQUEST	SGNB ADDITION REQUEST ACKNOWLEDGE	SGNB ADDITION REQUEST REJECT

Elementary Procedure	Initiating Message	Successful Outcome Response message	Unsuccessful Outcome Response message
EN-DC X2 Removal	EN-DC X2 REMOVAL REQUEST	EN-DC X2 REMOVAL RESPONSE	EN-DC X2 REMOVAL FAILURE
EN-DC Resource Status Reporting Initiation	EN-DC RESOURCE STATUS REQUEST	EN-DC RESOURCE STATUS RESPONSE	EN-DC RESOURCE STATUS FAILURE
MeNB initiated SgNB Modification Preparation	SGNB MODIFICATION REQUEST	SGNB MODIFICATION REQUEST ACKNOWLEDGE	SGNB MODIFICATION REQUEST REJECT
SgNB initiated SgNB Modification	SGNB MODIFICATION REQUIRED	SGNB MODIFICATION CONFIRM	SGNB MODIFICATION REFUSE
SgNB change	SGNB CHANGE REQUIRED	SGNB CHANGE CONFIRM	SGNB CHANGE REFUSE
MeNB initiated SgNB Release	SGNB RELEASE REQUEST	SGNB RELEASE REQUEST ACKNOWLEDGE	SGNB RELEASE REQUEST REJECT
SgNB initiated SgNB Release	SGNB RELEASE REQUIRED	SGNB RELEASE CONFIRM	
EN-DC X2 Setup	EN-DC X2 SETUP REQUEST	EN-DC X2 SETUP RESPONSE	EN-DC X2 SETUP FAILURE
EN-DC Configuration Update	EN-DC CONFIGURATION UPDATE	EN-DC CONFIGURATION UPDATE ACKNOWLEDGE	EN-DC CONFIGURATION UPDATE FAILURE
EN-DC Cell Activation	EN-DC CELL ACTIVATION REQUEST	EN-DC CELL ACTIVATION RESPONSE	EN-DC CELL ACTIVATION FAILURE
E-UTRA - NR Cell Resource Coordination	E-UTRA - NR CELL RESOURCE COORDINATION REQUEST	E-UTRA - NR CELL RESOURCE COORDINATION RESPONSE	

Список процедур. Класс-2.

Elementary Procedure	Initiating Message
Load Indication	LOAD INFORMATION
Handover Cancel	HANDOVER CANCEL
SN Status Transfer	SN STATUS TRANSFER
UE Context Release	UE CONTEXT RELEASE
Resource Status Reporting	RESOURCE STATUS UPDATE
Error Indication	ERROR INDICATION
Radio Link Failure Indication	RLF INDICATION
Handover Report	HANDOVER REPORT
X2 Release	X2 RELEASE
X2AP Message Transfer	X2AP MESSAGE TRANSFER
SeNB Reconfiguration Completion	SENB RECONFIGURATION COMPLETE
MeNB initiated SeNB Release	SENB RELEASE REQUEST
SeNB Counter Check	SENB COUNTER CHECK REQUEST
SgNB Reconfiguration Completion	SGNB RECONFIGURATION COMPLETE
SgNB Counter Check	SGNB COUNTER CHECK REQUEST

	REQUEST
RRC Transfer	RRC TRANSFER
Secondary RAT Data Usage Report	SECONDARY RAT DATA USAGE REPORT
SgNB Activity Notification	SGNB ACTIVITY NOTIFICATION
Data Forwarding Address Indication	DATA FORWARDING ADDRESS INDICATION
gNB Status Indication	GNB STATUS INDICATION
EN-DC Configuration Transfer	EN-DC CONFIGURATION TRANSFER
Trace Start	TRACE START
Deactivate Trace	DEACTIVATE TRACE
Handover Success	HANDOVER SUCCESS
Conditional Handover Cancel	CONDITIONAL HANDOVER CANCEL
Early Status Transfer	EARLY STATUS TRANSFER
EN-DC Resource Status Reporting	EN-DC RESOURCE STATUS UPDATE
Cell Traffic Trace	CELL TRAFFIC TRACE
F1-C Traffic Transfer	F1-C TRAFFIC TRANSFER

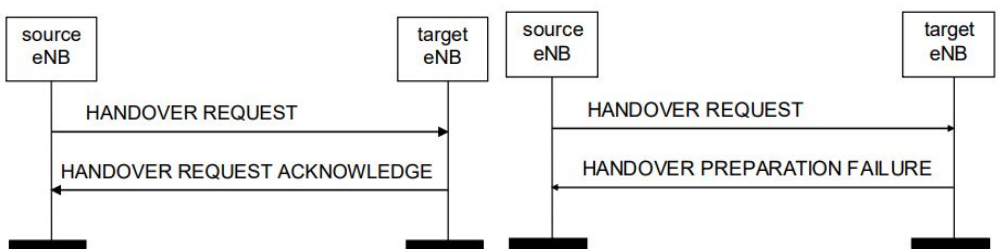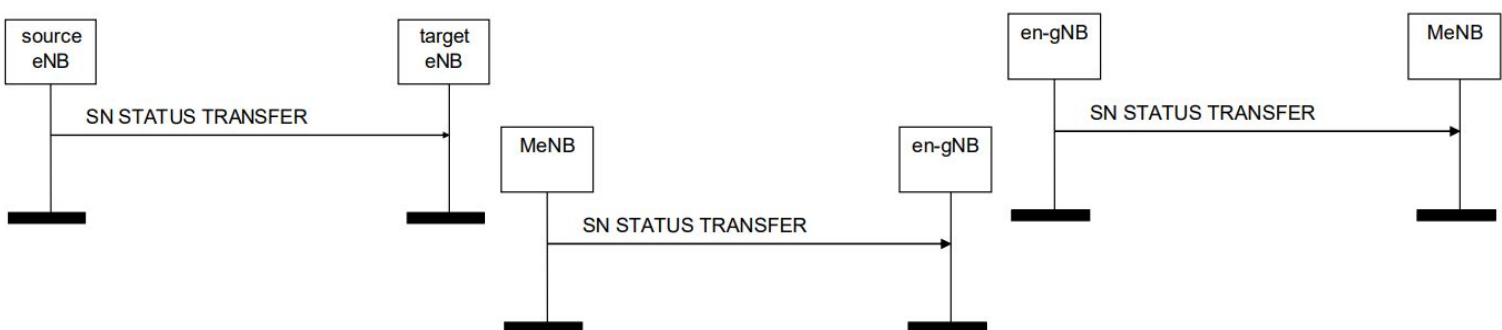| Список процедур X2	Разбор типов процедур	Примеры сообщений	Пример ASN1
5 минут	25 минут	5 минут	10 минут

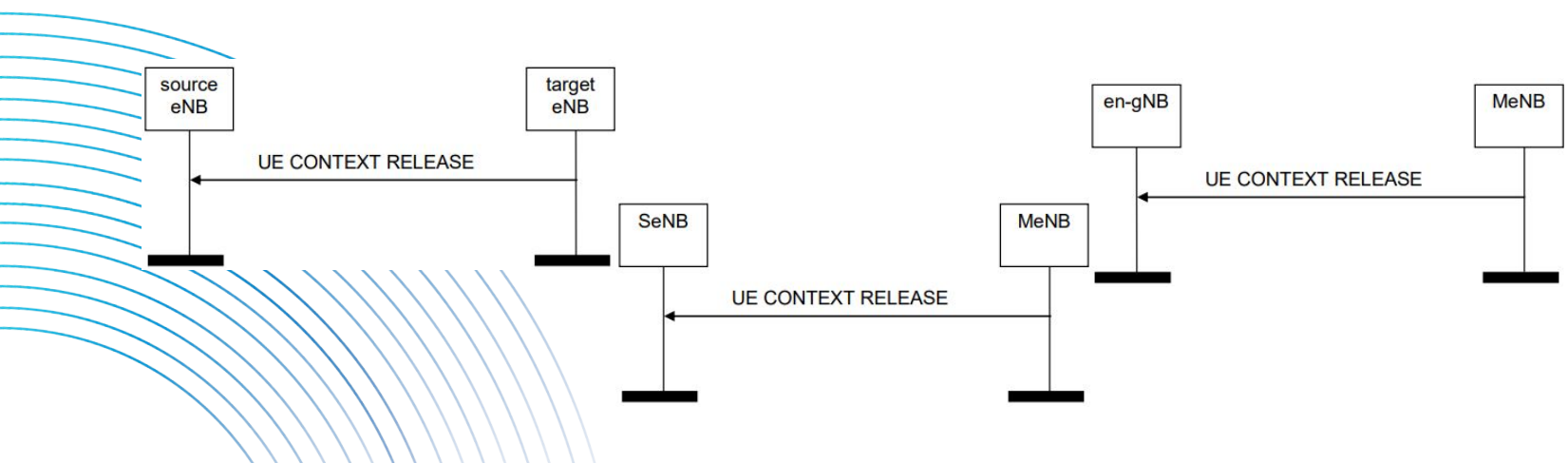# Basic mobility procedures

Handover Preparation
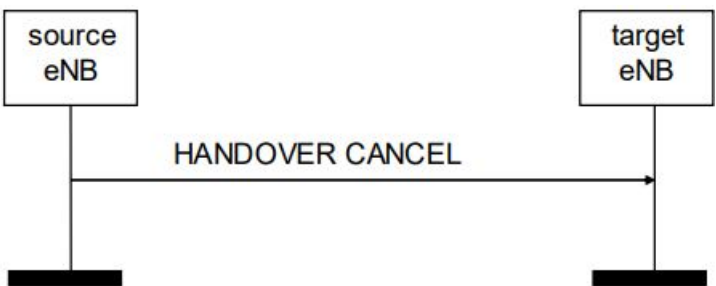

SN Status Transfer

UE Context Release

Handover Cancel

8

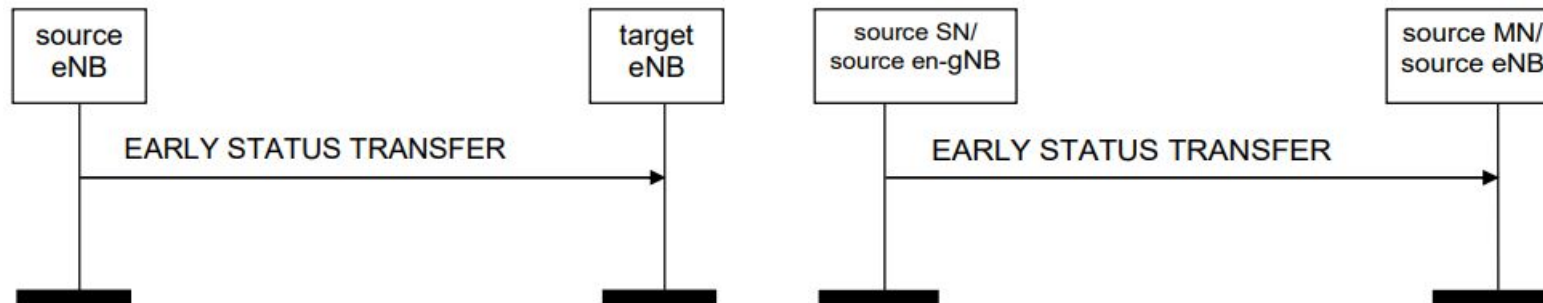# Basic mobility procedures

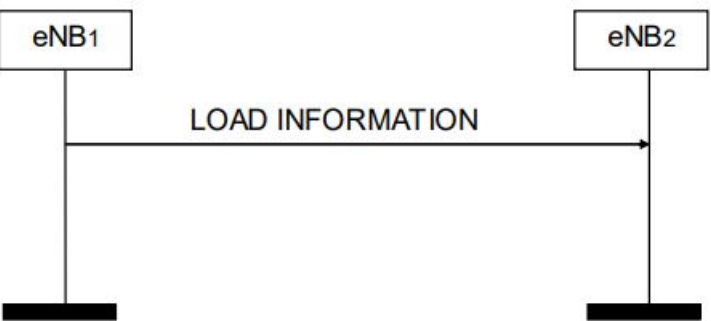### Handover Success

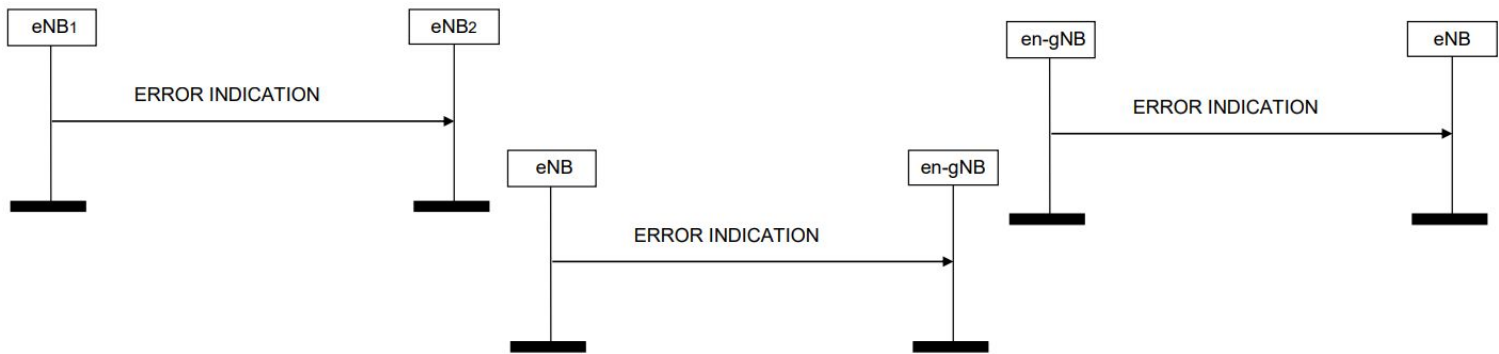### Conditional Handover Cancel

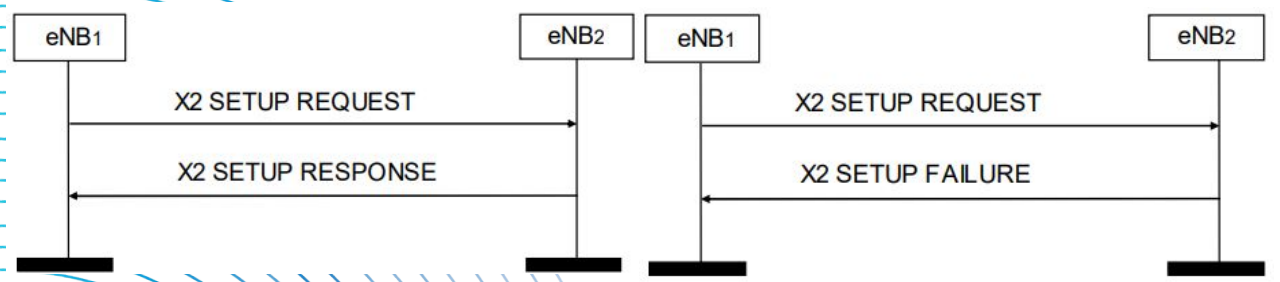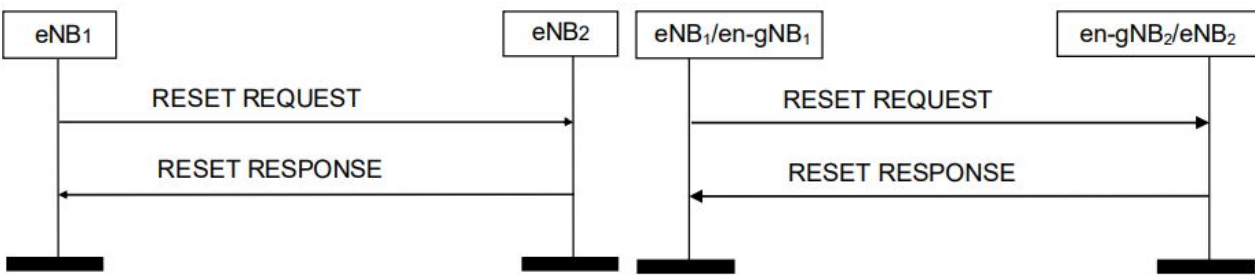### Early Status Transfer

Global Procedures

Load Indication

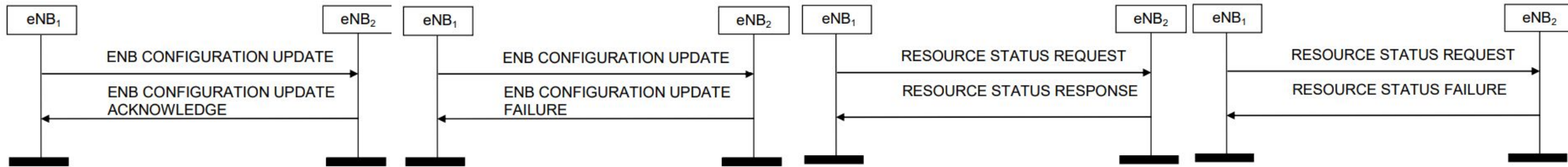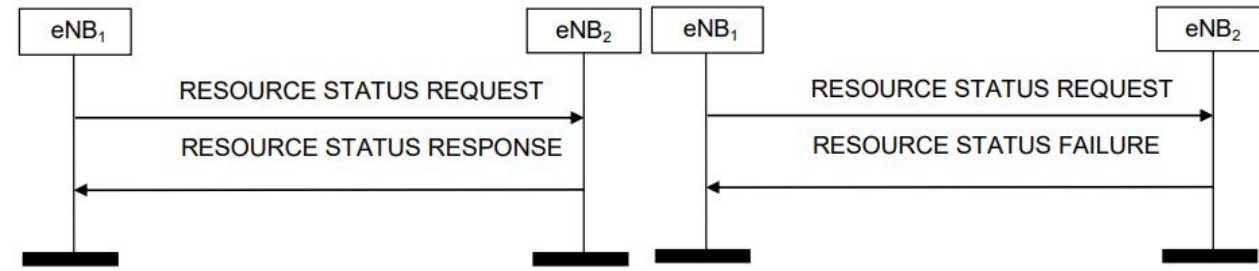## Error Indication

X2 Setup

Reset
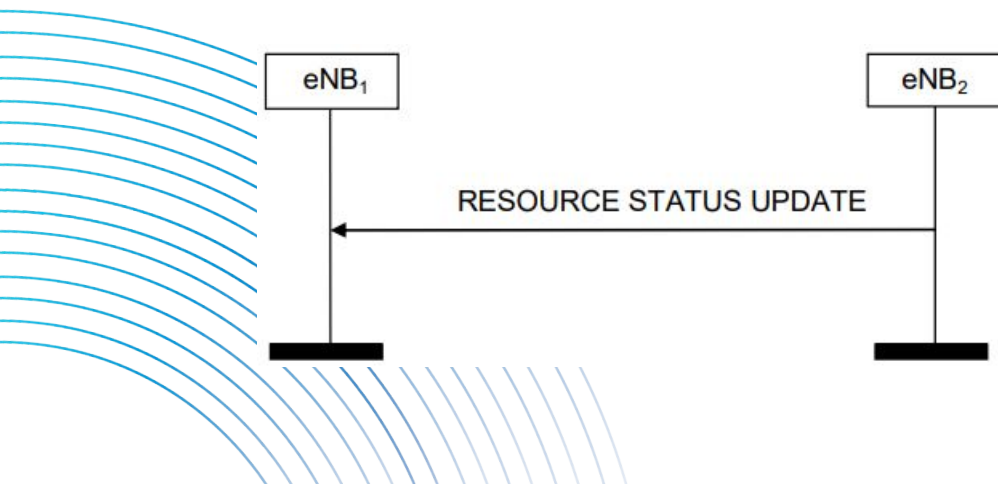
Global Procedures

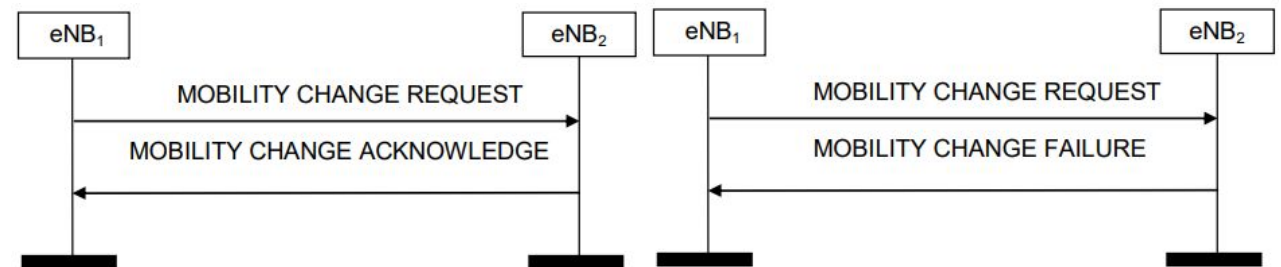### eNB Configuration Update

Resource Status Reporting Initiation

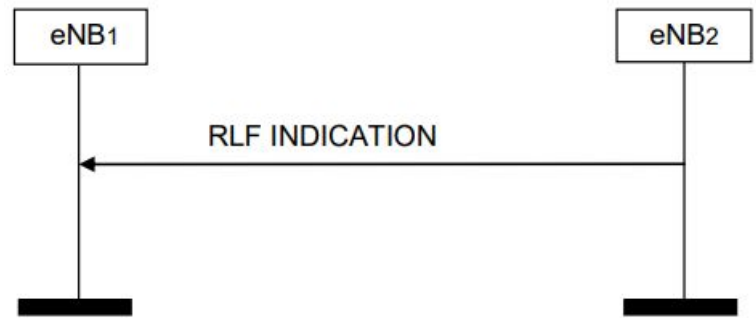### Resource Status Reporting

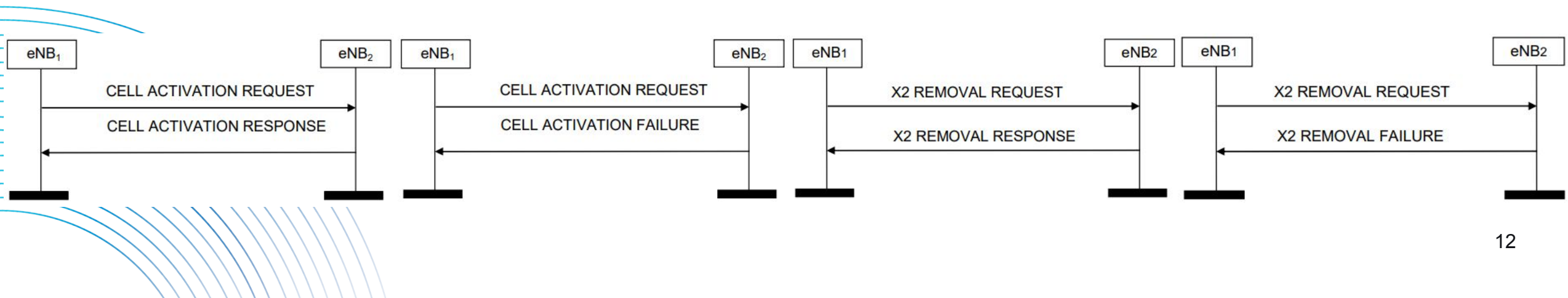### Mobility Settings Change

Global Procedures

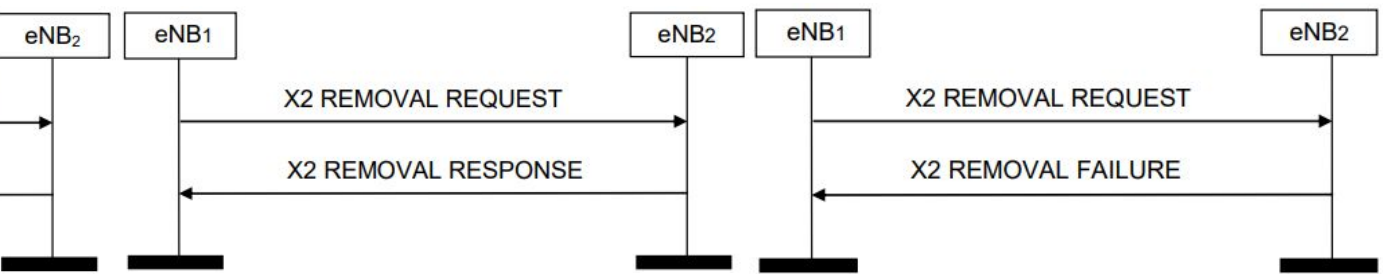## Radio Link Failure Indication

Handover Report
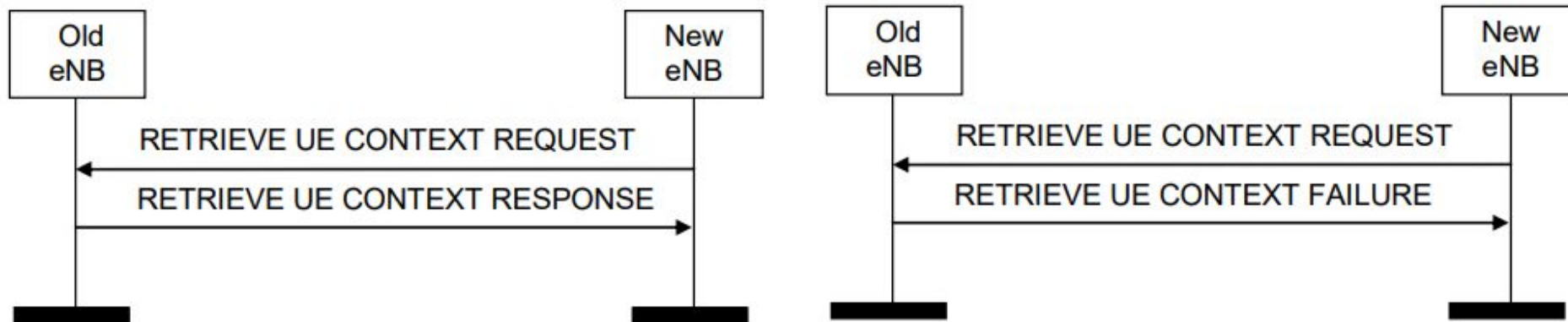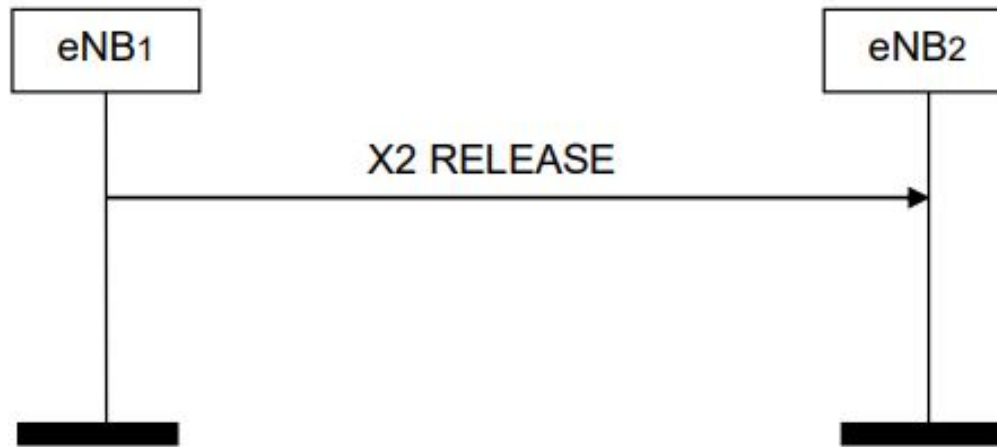

Cell Activation

X2 Removal

Global Procedures

Retrieve UE Context

X2 Release

X2AP Message Transfer

Список процедур X2
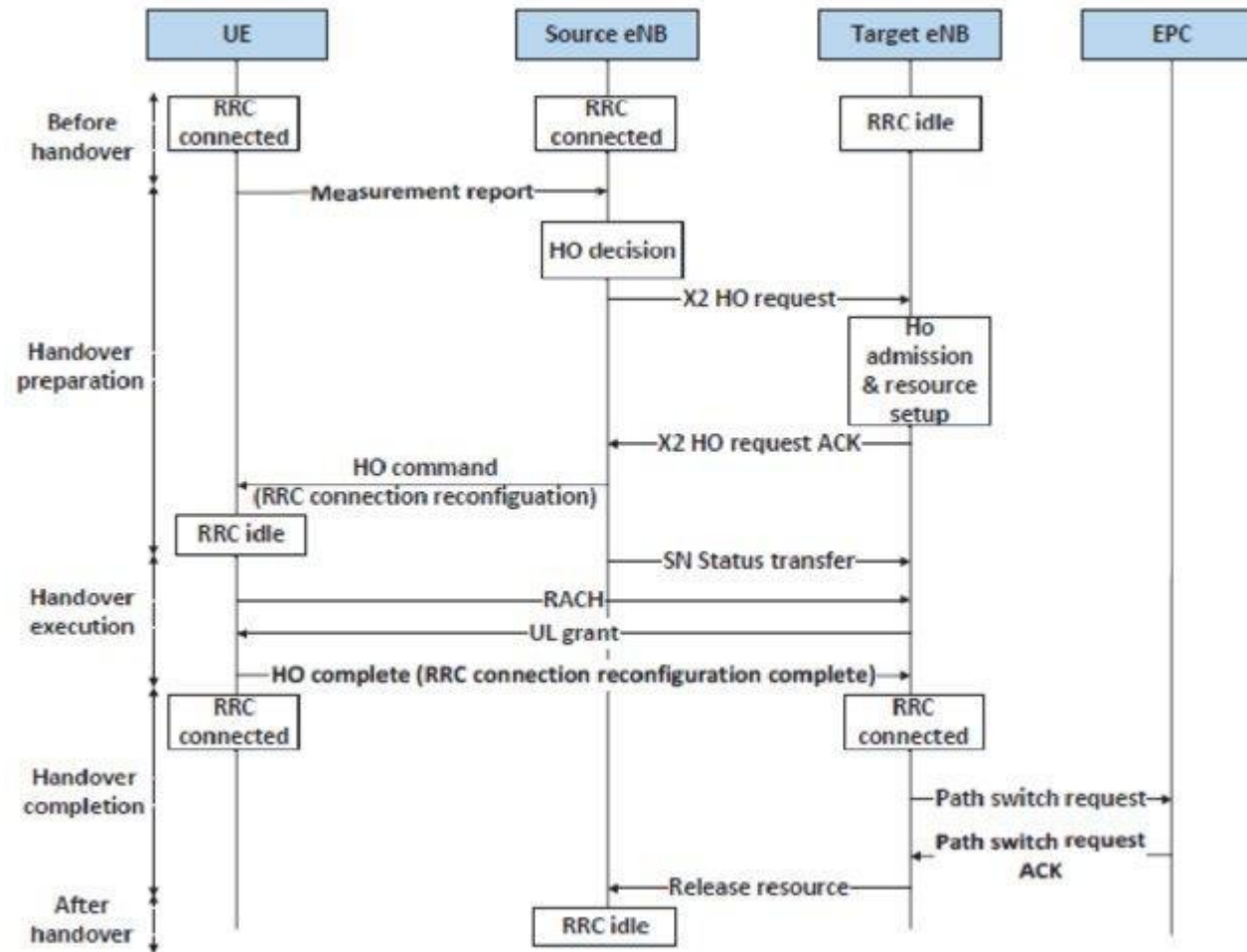
5 минут

Разбор типов процедур

25 минут

Примеры сообщений

5 минут

Пример ASN1

10 минут

X2 HO call flow

X2 HO. HandoverRequest. ASN1

```
handoverPreparation X2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE         HandoverRequest
    SUCCESSFUL OUTCOME         HandoverRequestAcknowledge
    UNSUCCESSFUL OUTCOME       HandoverPreparationFailure
    PROCEDURE CODE             id-handoverPreparation
    CRITICALITY                reject
}

HandoverRequest ::= SEQUENCE {
    protocolIEs         ProtocolIE-Container       {{HandoverRequest-IEs}},
    ...
}

HandoverRequest-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-Old-eNB-UE-X2AP-ID                CRITICALITY reject  TYPE UE-X2AP-ID                     PRESENCE mandatory}|
    { ID id-Cause                             CRITICALITY ignore  TYPE Cause                          PRESENCE mandatory}|
    { ID id-TargetCell-ID                     CRITICALITY reject  TYPE ECGI                           PRESENCE mandatory}|
    { ID id-GUMMEI-ID                         CRITICALITY reject  TYPE GUMMEI                         PRESENCE mandatory}|
    { ID id-UE-ContextInformation             CRITICALITY reject  TYPE UE-ContextInformation          PRESENCE mandatory}|
    { ID id-UE-HistoryInformation             CRITICALITY ignore  TYPE UE-HistoryInformation          PRESENCE mandatory}|
    { ID id-TraceActivation                   CRITICALITY ignore  TYPE TraceActivation                PRESENCE optional}|
    { ID id-SRVCCOperationPossible            CRITICALITY ignore  TYPE SRVCCOperationPossible         PRESENCE optional}|
    { ID id-CSGMembershipStatus               CRITICALITY reject  TYPE CSGMembershipStatus            PRESENCE optional}|
    { ID id-MobilityInformation               CRITICALITY ignore  TYPE MobilityInformation            PRESENCE optional}|
    { ID id-Masked-IMEISV                     CRITICALITY ignore  TYPE Masked-IMEISV                  PRESENCE optional}|
    { ID id-UE-HistoryInformationFromTheUE    CRITICALITY ignore  TYPE UE-HistoryInformationFromTheUE PRESENCE optional}|
    { ID id-ExpectedUEBehaviour               CRITICALITY ignore  TYPE ExpectedUEBehaviour            PRESENCE optional}|
    { ID id-ProSeAuthorized                   CRITICALITY ignore  TYPE ProSeAuthorized                PRESENCE optional}|
    { ID id-UE-ContextReferenceAtSeNB         CRITICALITY ignore  TYPE UE-ContextReferenceAtSeNB      PRESENCE optional}|
    { ID id-Old-eNB-UE-X2AP-ID-Extension      CRITICALITY reject  TYPE UE-X2AP-ID-Extension           PRESENCE optional}|
    { ID id-V2XServicesAuthorized             CRITICALITY ignore  TYPE V2XServicesAuthorized          PRESENCE optional}|
    { ID id-UE-ContextReferenceAtWT           CRITICALITY ignore  TYPE UE-ContextReferenceAtWT        PRESENCE optional}|
    { ID id-NRUESecurityCapabilities          CRITICALITY ignore  TYPE NRUESecurityCapabilities       PRESENCE optional}|
    { ID id-UE-ContextReferenceAtSgNB         CRITICALITY ignore  TYPE UE-ContextReferenceAtSgNB      PRESENCE optional}|
    { ID id-AerialUEsubscriptionInformation   CRITICALITY ignore  TYPE AerialUEsubscriptionInformation PRESENCE optional}|
    { ID id-Subscription-Based-UE-DifferentiationInfo    CRITICALITY ignore  TYPE Subscription-Based-UE-DifferentiationInfo    PRESENCE optional},
    ...
}
```

X2 HO. HandoverRequestAcknowledge. ASN1

```
handoverPreparation X2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE         HandoverRequest
    SUCCESSFUL OUTCOME         HandoverRequestAcknowledge
    UNSUCCESSFUL OUTCOME       HandoverPreparationFailure
    PROCEDURE CODE             id-handoverPreparation
    CRITICALITY                reject
}


HandoverRequestAcknowledge ::= SEQUENCE {
    protocolIEs        ProtocolIE-Container      {{HandoverRequestAcknowledge-IEs}},
    ...
}


HandoverRequestAcknowledge-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-Old-eNB-UE-X2AP-ID                        CRITICALITY ignore  TYPE UE-X2AP-ID                           PRESENCE mandatory}|
    { ID id-New-eNB-UE-X2AP-ID                        CRITICALITY ignore  TYPE UE-X2AP-ID                           PRESENCE mandatory}|
    { ID id-E-RABs-Admitted-List                      CRITICALITY ignore  TYPE E-RABs-Admitted-List                PRESENCE mandatory}|
    { ID id-E-RABs-NotAdmitted-List                   CRITICALITY ignore  TYPE E-RAB-List                          PRESENCE optional}|
    { ID id-TargeteNBtoSource-eNBTransparentContainer CRITICALITY ignore  TYPE TargeteNBtoSource-eNBTransparentContainer  PRESENCE mandatory}|
    { ID id-CriticalityDiagnostics                    CRITICALITY ignore  TYPE CriticalityDiagnostics              PRESENCE optional}|
    { ID id-UE-ContextKeptIndicator                   CRITICALITY ignore  TYPE UE-ContextKeptIndicator             PRESENCE optional}|
    { ID id-SeNB-UE-X2AP-ID-Extension                 CRITICALITY ignore  TYPE UE-X2AP-ID-Extension                PRESENCE optional}|
    { ID id-Old-eNB-UE-X2AP-ID-Extension              CRITICALITY ignore  TYPE UE-X2AP-ID-Extension                PRESENCE optional}|
    { ID id-New-eNB-UE-X2AP-ID-Extension              CRITICALITY reject  TYPE UE-X2AP-ID-Extension                PRESENCE optional}|
    { ID id-WT-UE-ContextKeptIndicator                CRITICALITY ignore  TYPE UE-ContextKeptIndicator             PRESENCE optional},
    ...
}
```

X2 HO. HandoverPreparationFailure. ASN1

```
handoverPreparation X2AP-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE        HandoverRequest
    SUCCESSFUL OUTCOME        HandoverRequestAcknowledge
    UNSUCCESSFUL OUTCOME      HandoverPreparationFailure
    PROCEDURE CODE            id-handoverPreparation
    CRITICALITY               reject
}

HandoverPreparationFailure ::= SEQUENCE {
    protocolIEs      ProtocolIE-Container     {{HandoverPreparationFailure-IEs}},
    ...
}

HandoverPreparationFailure-IEs X2AP-PROTOCOL-IES ::= {
    { ID id-Old-eNB-UE-X2AP-ID            CRITICALITY ignore  TYPE UE-X2AP-ID            PRESENCE mandatory}|
    { ID id-Cause                         CRITICALITY ignore  TYPE Cause                PRESENCE mandatory}|
    { ID id-CriticalityDiagnostics        CRITICALITY ignore  TYPE CriticalityDiagnostics  PRESENCE optional}|
    { ID id-Old-eNB-UE-X2AP-ID-Extension  CRITICALITY ignore  TYPE UE-X2AP-ID-Extension PRESENCE optional},

    ...
}
```

Список процедур X2	Разбор типов процедур	Примеры сообщений	Пример ASN1
5 минут	**25 минут**	**5 минут**	**10 минут**

СПАСИБО