

20 апреля 2024

Протоколы и интерфейсы БС LTE. Лекция 5.

# RRC. Процедуры

ВЛАД РЫЖОВ

Fast Track в Телеком, 2024



# Что сегодня будет происходить? Адженда

**System Information**

**5 минут**

**Paging**

**5 минут**

**Connection  
establishment**

**5 минут**

**Security**

**5 минут**

**Connection  
Reconfiguration**

**5 минут**

**Handover**

**5 минут**

**Mobility**

**5 минут**

**Connection Release**

**5 минут**

**Есть ли в AS уровень выше чем RRC?  
Какие функции выполняет RRC?**

# Напоминание о процедурах RRC

**Table 3.2** Summary of RRC procedures and messages in LTE Release 8: (S): a message used upon success of the corresponding procedure; (F): a message used upon failure of the corresponding procedure

Procedure	Messages	Logical Channel	Purpose
System Information Acquisition	MasterInformationBlock(DL) SystemInformationBlockType1(DL) SystemInformation(DL)	BCCH	Acquiring system information (see Section 3.2)
Paging	Paging(DL)	PCCH	Triggering mobile terminating calls, indicating system information updates, and PWS notifications (see Section 3.3)
RRC Connection Establishment	RRCCoNECTIONRequest(UL)  (S)RRCCoNECTIONSetup(DL) (F)RRCCoNECTIONReject(DL) (S)RRCCoNECTIONSetupComplete(UL)	CCCH (SRB0)  DCCH (SRB1)	Entering RRC_CONNECTED (see Section 3.4)
Initial Security Activation	SecurityModeCommand(DL)  (F)SecurityModeFailure(UL) (S)SecurityModeComplete(UL)	DCCH (SRB1)  DCCH (SRB1)	Activating integrity protection and ciphering in AS layer (see Section 3.5)
RRC Connection Reconfiguration	RRCCoNECTIONReconfiguration(DL)  (S)RRCCoNECTIONReconfigurationComplete(UL)	DCCH (SRB1) DCCH (SRB1)	Addition, modification, and removal of radio bearers, measurement configurations, and handover command (see Sections 3.6, 3.8, 3.9 and 3.11)
Counter Check	CounterCheck(DL) CounterCheckResponse(UL)	DCCH (SRB1)	AS security verification
DL Information Transfer	DLInformationTransfer(DL)	DCCH (SRB1/SRB2)	Transferring NAS or non-3GPP dedicated information





# Напоминание о процедурах RRC

**Table 3.2** (Continued)

Procedure	Messages	Logical Channel	Purpose
UL Information Transfer	ULInformationTransfer(UL)	DCCH (SRB1/SRB2)	Transferring NAS or non-3GPP dedicated information
UE Capability Transfer	UECapabilityEnquiry(DL) UECapabilityInformation(UL)	DCCH (SRB1)	Transferring UE radio access capability information (see Section 3.7)
Measurement Reporting	MeasurementReport(UL)	DCCH (SRB1)	Reporting measurement results (see Section 3.9)
Mobility from E-UTRA	MobilityFromEUTRA Command(DL)	DCCH (SRB1)	Mobility to a cell using another RAT, such as GERAN, UTRAN, and CDMA2000 (see Section 3.11)
Handover from E-UTRA Preparation Request (CDMA2000)	HandoverFromEUTRAPreparationRequest (DL)	DCCH (SRB1)	Preparation for mobility to CDMA2000 (see Section 3.11)
UL Handover Preparation Transfer (CDMA2000)	ULHandoverPreparation Transfer(UL)	DCCH (SRB1)	Transferring the CDMA2000 dedicated information upon reception of the <i>HandoverFromEUTRAPreparationRequest</i> (see Section 3.11)
RRC Connection Re-establishment	RRCCConnection ReestablishmentRequest(UL)  ⓈRRCCConnection Reestablishment(DL) ⓈRRCCConnection ReestablishmentReject(DL) ⓈRRCCConnection ReestablishmentComplete(UL)	CCCH (SRB0)    DCCH (SRB1)	Recovering from failures on the radio interface by reestablishing an RRC connection (see Section 3.10)
RRC Connection Release	RRCCConnectionRelease(DL)	DCCH (SRB1)	Leaving RRC_CONNECTED (see Section 3.12)



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Reconfiguration**

**5 минут**

**Handover**

**5 минут**

**Mobility**

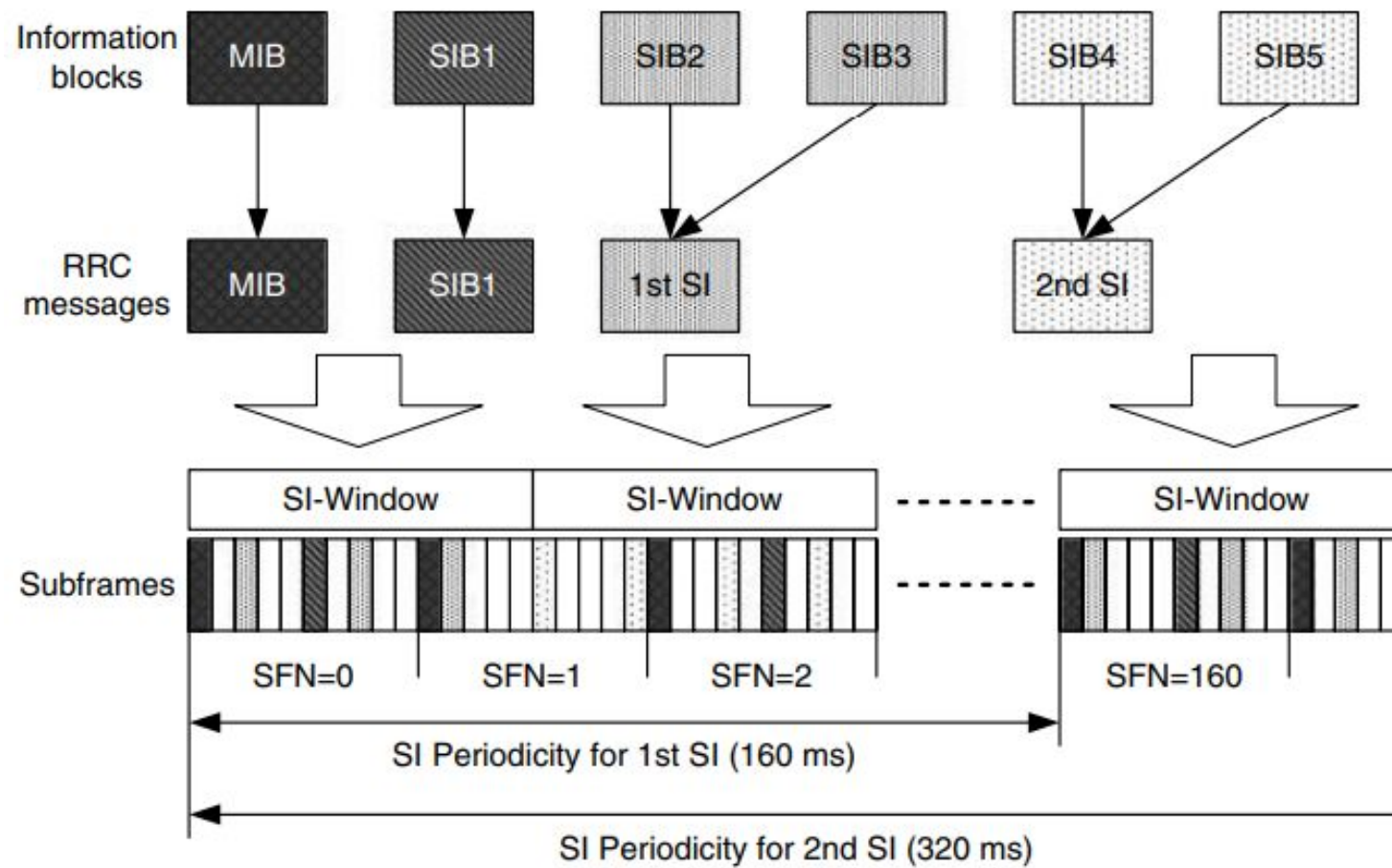
**5 минут**

**Connection Release**

**5 минут**

**Что содержится в SIB/MIB?**

# SIB. Скедулинг.





# SIB. Типы.

**Table 3.3** Summary of system information blocks in LTE (except SIB9 through SIB13)

Type	Main Content	Transport Channel	Applicable RRC state
MIB	DL bandwidth, System frame number	BCH	RRC_IDLE and RRC_CONNECTED
SIB1	Cell access related information, System information value tag, Scheduling of other system information	DL-SCH	RRC_IDLE and RRC_CONNECTED
SIB2	Common radio resource configuration, AC barring information, UL carrier frequency and bandwidth, MBSFN subframe configuration	DL-SCH	RRC_IDLE and RRC_CONNECTED
SIB3	Cell reselection information common for intra-frequency, inter-frequency, and inter-RAT cell reselection, Intra-frequency cell reselection information other than neighboring cell information	DL-SCH	RRC_IDLE only
SIB4	Neighboring cell information for intra-frequency cell reselection	DL-SCH	RRC_IDLE only
SIB5	Other E-UTRA frequencies, Neighboring cell information for inter-frequency cell reselection	DL-SCH	RRC_IDLE only
SIB6	UTRA frequencies for FDD and TDD, Inter-RAT cell reselection information for UTRA	DL-SCH	RRC_IDLE for UEs supporting UTRAN
SIB7	GERAN frequencies, Inter-RAT cell reselection information for GERAN	DL-SCH	RRC_IDLE for UEs supporting GERAN
SIB8	CDMA2000 frequencies, Inter-RAT cell reselection information for CDMA2000	DL-SCH	RRC_IDLE and RRC_CONNECTED for UEs supporting CDMA2000



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Reconfiguration**

**5 минут**

**Handover**

**5 минут**

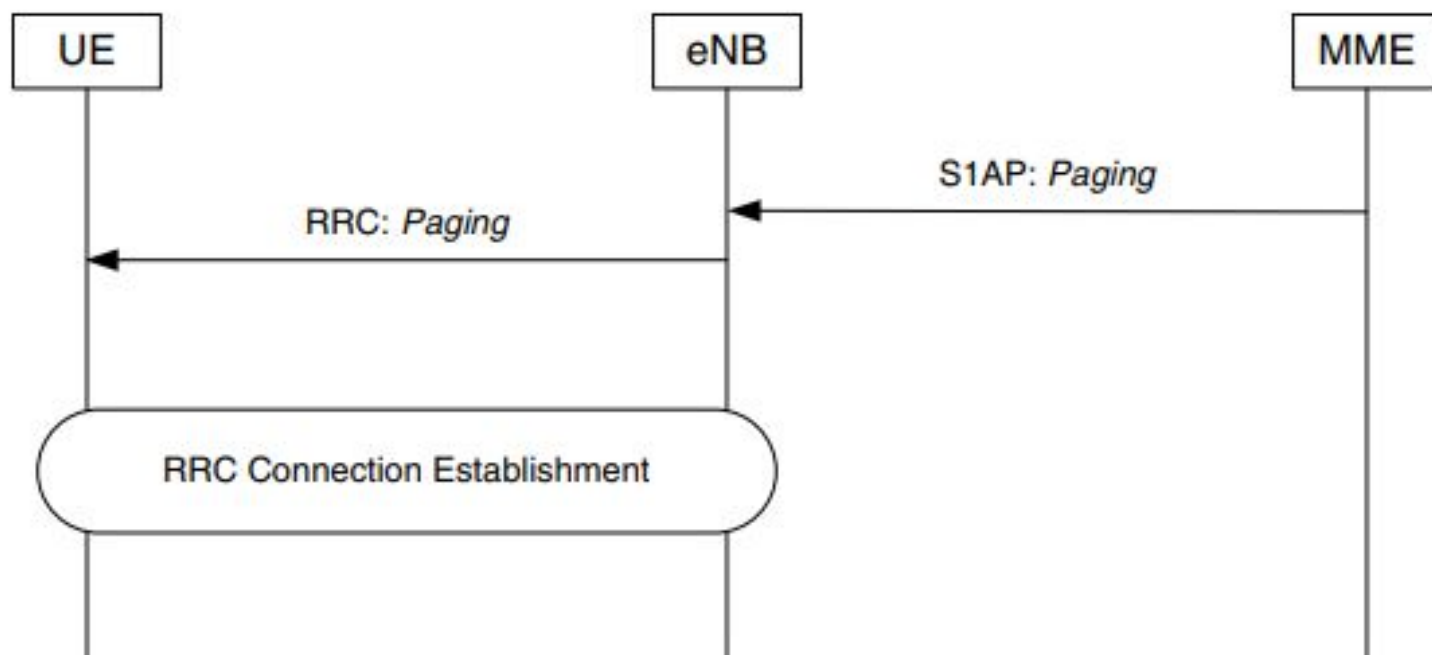
**Mobility**

**5 минут**

**Connection Release**

**5 минут**

# Paging процедура



**System Information**

**5 минут**

**Paging**

**5 минут**

**Connection  
establishment**

**5 минут**

**Security**

**5 минут**

**Connection  
Reconfiguration**

**5 минут**

**Handover**

**5 минут**

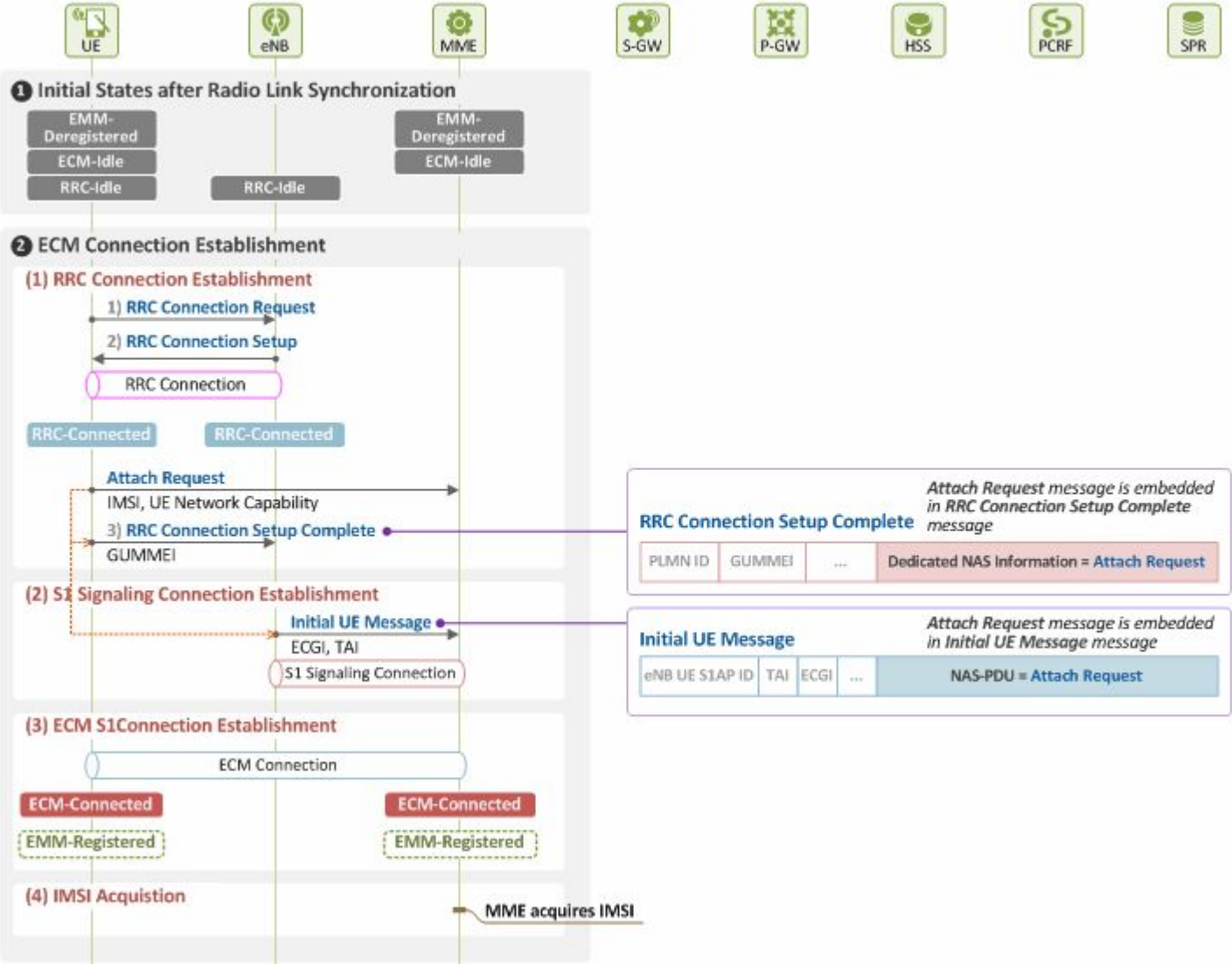
**Mobility**

**5 минут**

**Connection Release**

**5 минут**

# Connection establishment





**System Information**

**5 минут**

**Paging**

**5 минут**

**Connection  
establishment**

**5 минут**

**Security**

**5 минут**

**Connection  
Reconfiguration**

**5 минут**

**Handover**

**5 минут**

**Mobility**

**5 минут**

**Connection Release**

**5 минут**

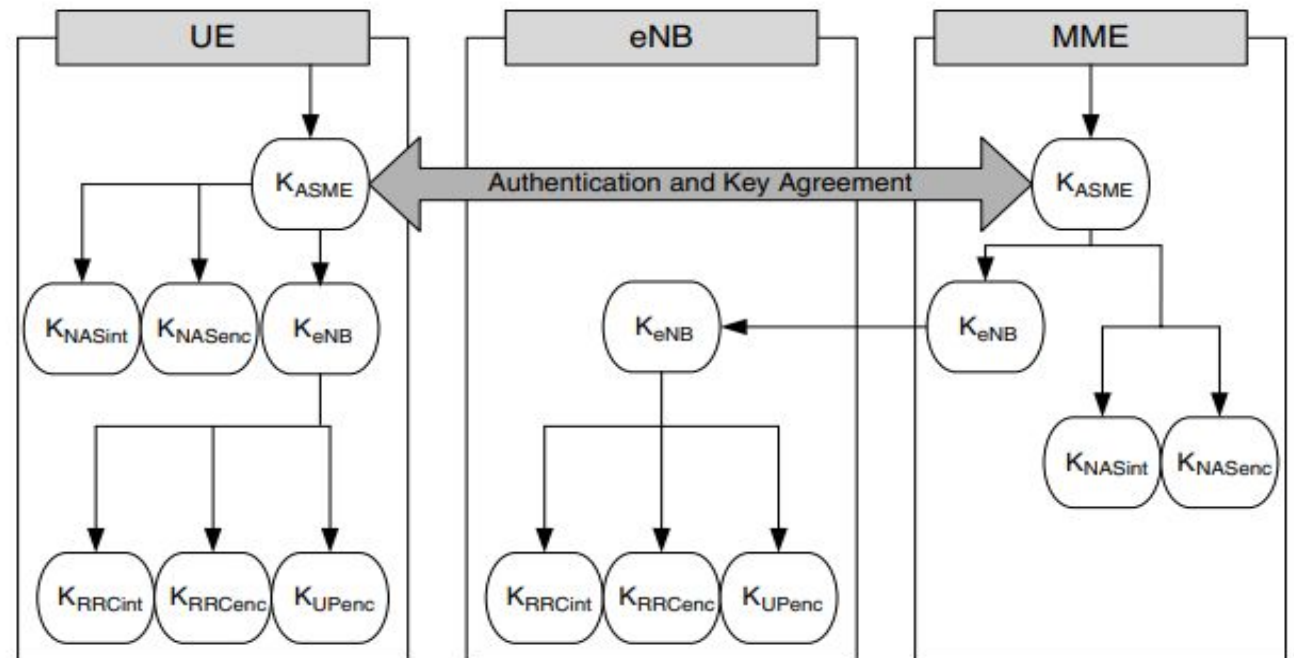
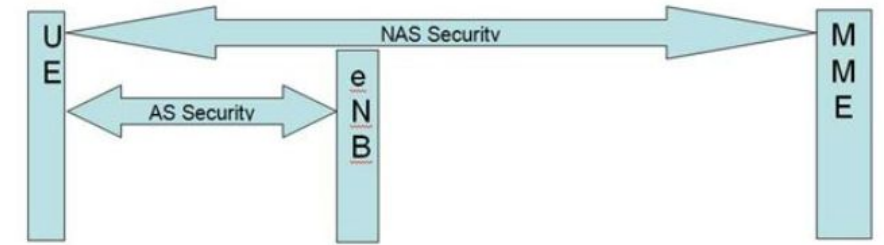
# Security

## AS security

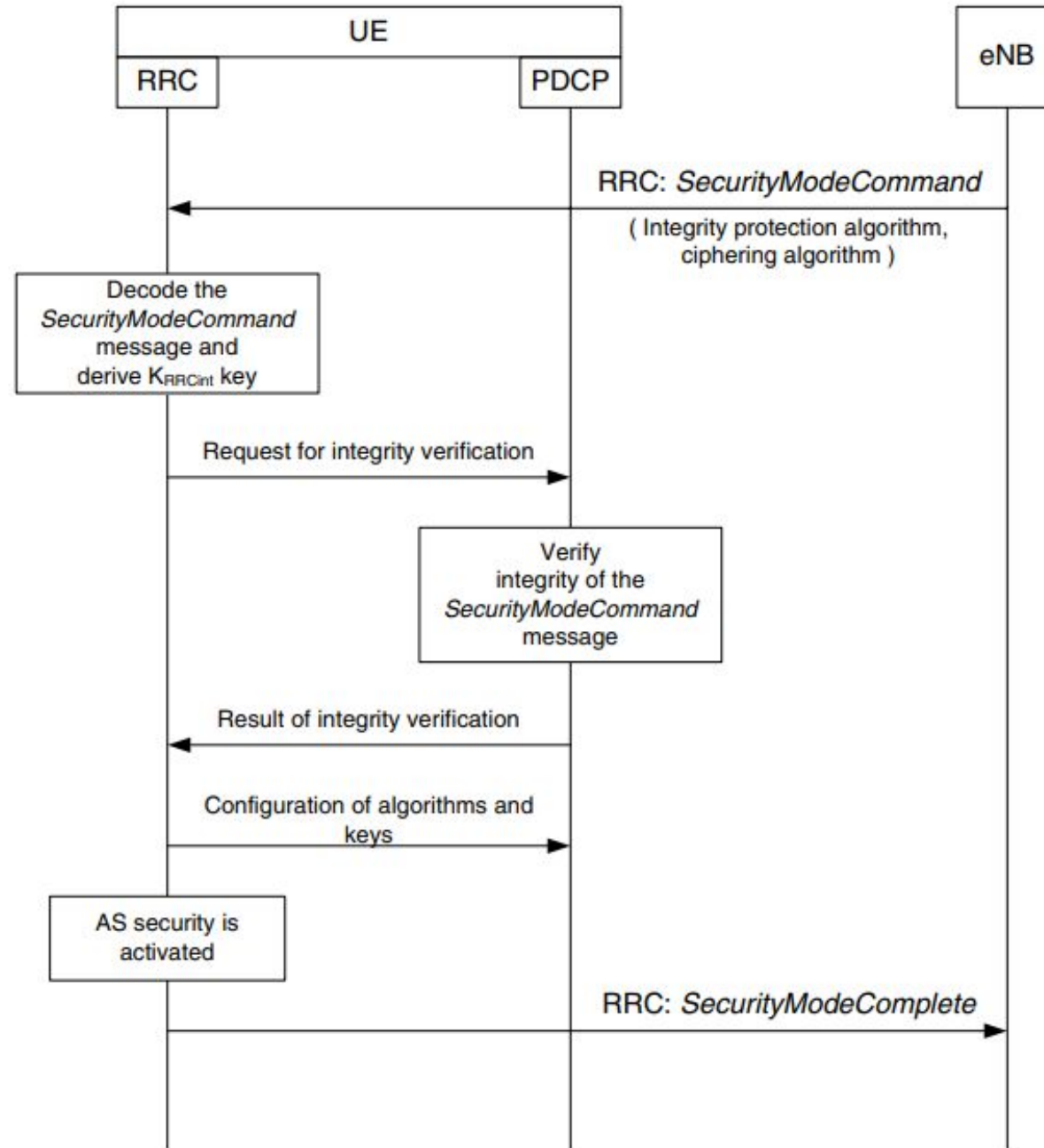
- защищает передачу сигналов RRC и пользовательских данных между UE и E-UTRAN
- обеспечивает защиту целостности и шифрование сигналов RRC в CP
- обеспечивает шифрование пользовательских данных в UP.
- процедура *Security Mode Command* используется для активации безопасного доступа в AS между UE и E-UTRAN.

## NAS security

- защищает передачу сигналов NAS между UE и MME
- обеспечивает защиту целостности и шифрование сигналов NAS. Процедура управления режимом безопасности в NAS используется для активации защиты NAS между UE и MME.
- процедура *Security Mode Command* используется для активации безопасного доступа в NAS между UE и MME.



# Security



**System Information**

**5 минут**

**Paging**

**5 минут**

**Connection  
establishment**

**5 минут**

**Security**

**5 минут**

**Connection  
Reconfiguration**

**5 минут**

**Handover**

**5 минут**

**Mobility**

**5 минут**

**Connection Release**

**5 минут**

# Connection Reconfiguration

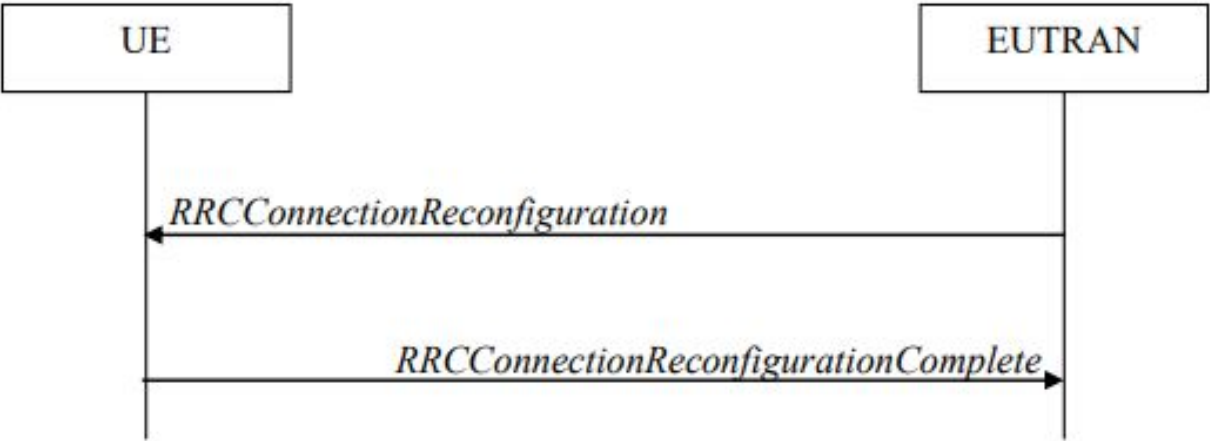


Figure 5.3.5.1-1: RRC connection reconfiguration, successful

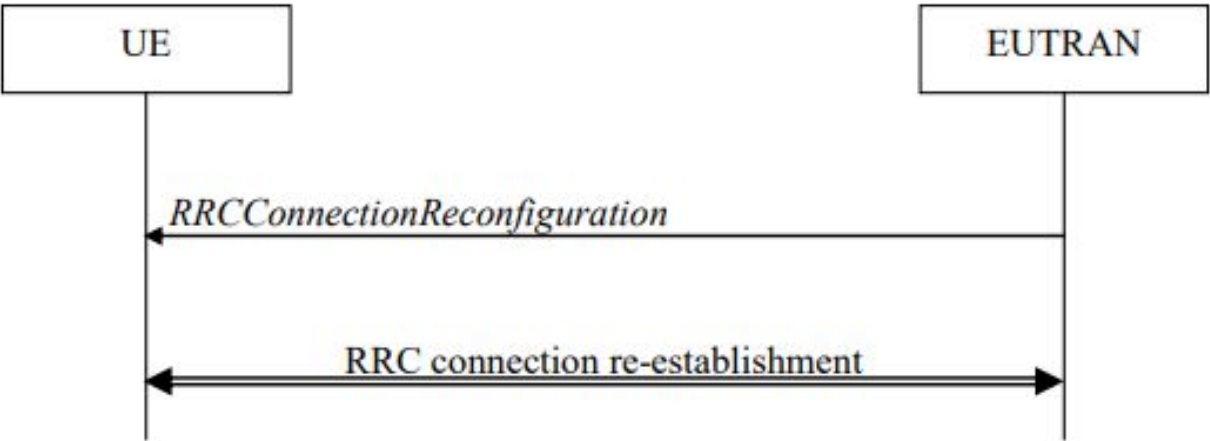


Figure 5.3.5.1-2: RRC connection reconfiguration, failure





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Reconfiguration**

**5 минут**

**Handover**

**5 минут**

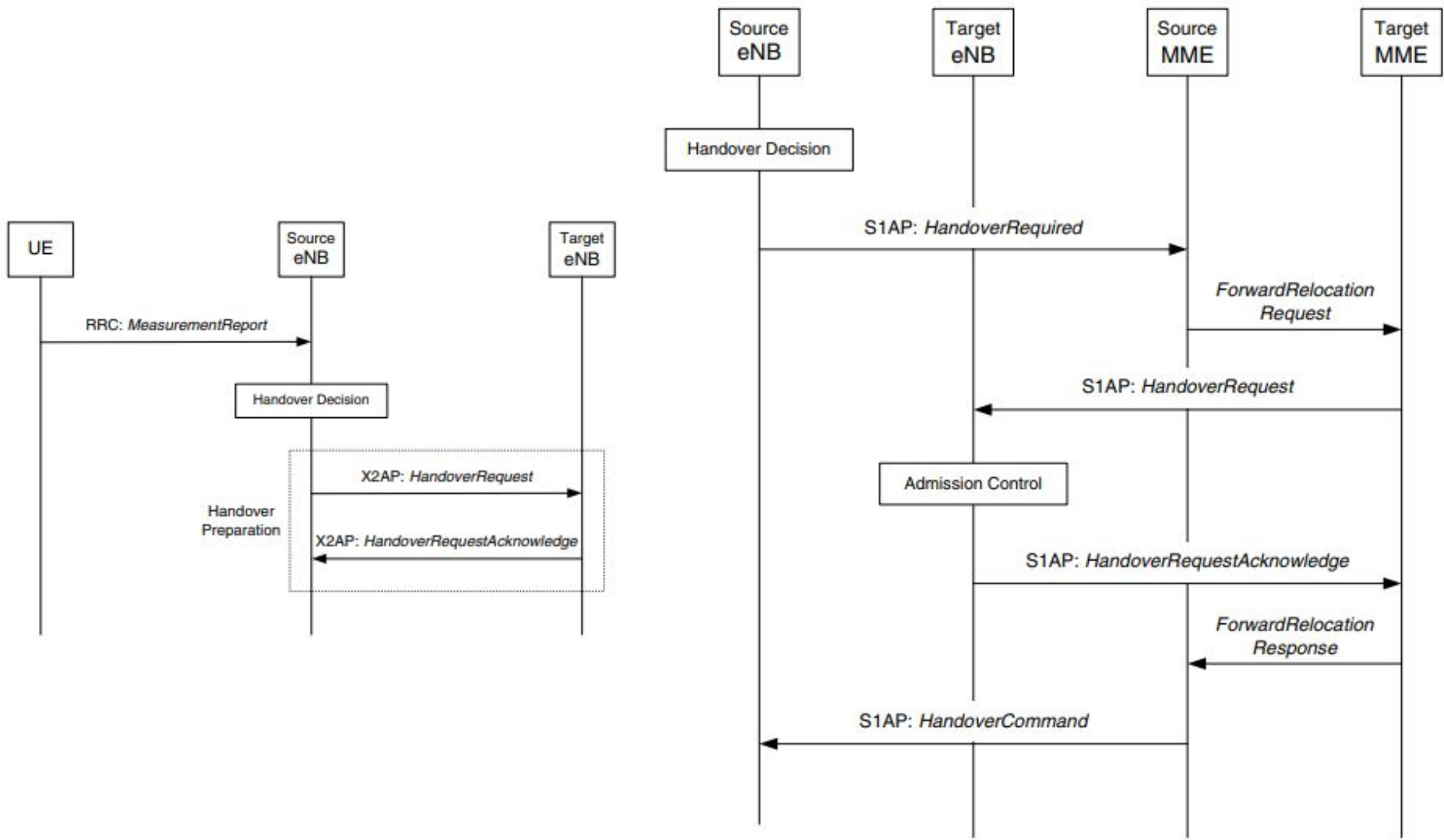
**Mobility**

**5 минут**

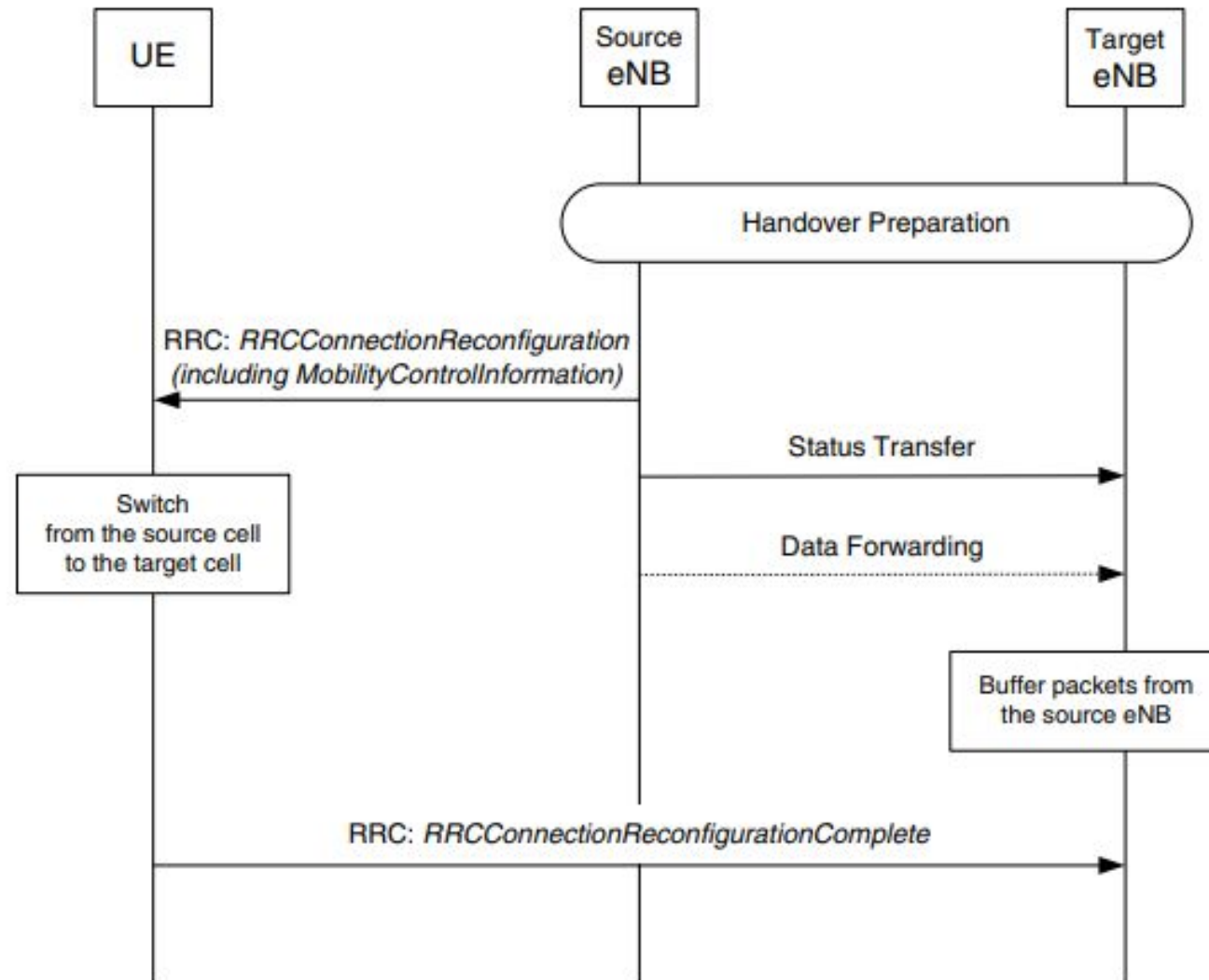
**Connection Release**

**5 минут**

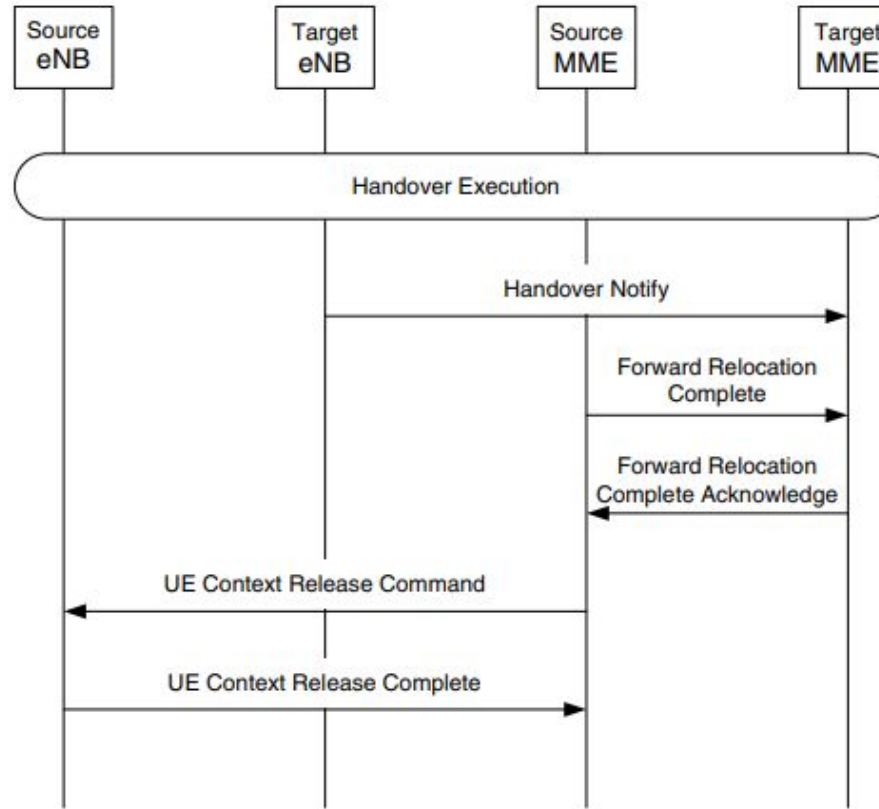
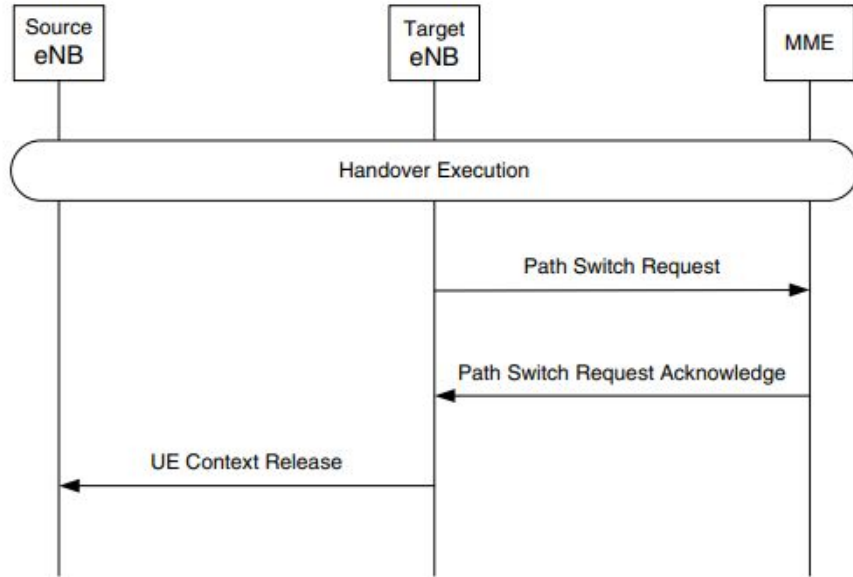
# Handover preparation



# Handover execution



# Handover completion



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establishment**

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**Security**

**5 минут**

**Connection  
Reconfiguration**

**5 минут**

**Handover**

**5 минут**

**Mobility**

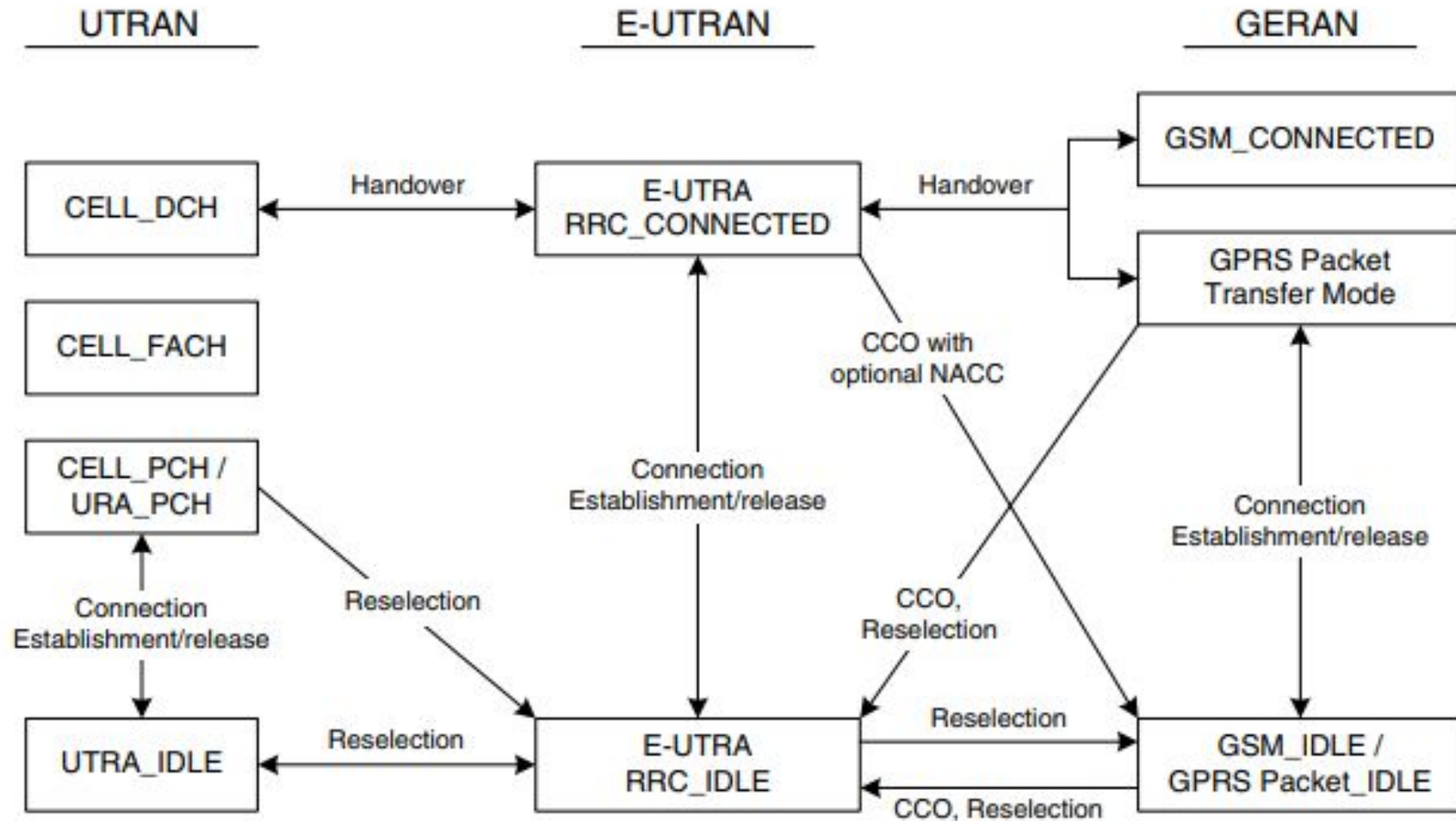
**5 минут**

**Connection Release**

**5 минут**



# Mobility between 3GPP systems



**System Information**

**5 минут**

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establishment**

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**Security**

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**Connection  
Reconfiguration**

**5 минут**

**Handover**

**5 минут**

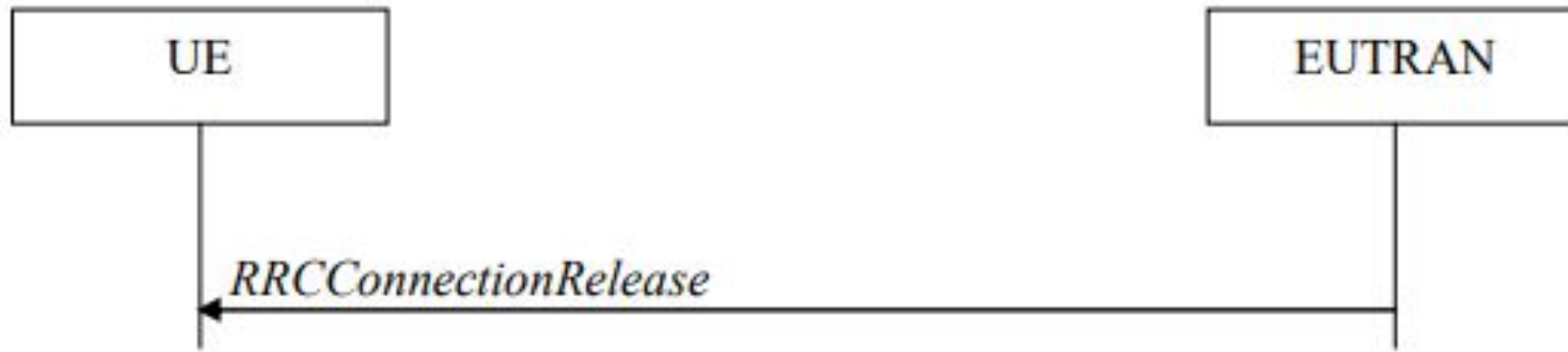
**Mobility**

**5 минут**

**Connection Release**

**5 минут**

# Connection Release



**СПАСИБО**