BS ISO 17515-1:2015

BSI Standards Publication

Intelligent transport systems — Communications access for land mobiles (CALM) — Evolved Universal Terrestrial Radio Access Network (E-UTRAN)

Part 1: General usage

National foreword

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Part 1: General usage

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Foreword

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The committee responsible for this document is ISO/TC 204, *Intelligent transport systems*.

ISO 17515 consists of the following parts, under the general title *Intelligent transport systems — Communications access for land mobiles (CALM) — Evolved Universal Terrestrial Radio Access Network (E-UTRAN)*:

— *Part 1: General usage*

Additional parts, dealing with direct communications and routing functionalities, are under preparation.

Introduction

This International Standard is a member of the set of International Standards developed under the acronym “Communications Access for Land Mobiles” (CALM) that refers to ISO/TC 204 work items. An introduction to this set of International Standards is provided in ISO 21217.

This part of ISO 17515 is part 1 of a multipart standard which determines usage of technology developed under the acronym E-UTRAN for usage as a communication interface in an ITS station unit.

The term long-term evolution (LTE) is commonly used to refer to the set of standards containing the E-UTRAN technical specifications. In this part of ISO 17515, the term “E-UTRAN” is used to refer to these specifications and can be treated as a synonym for “LTE”.

INTERNATIONAL STANDARD **ISO 17515-1:2015(E)**

Intelligent transport systems — Communications access for land mobiles (CALM) — Evolved Universal Terrestrial Radio Access Network (E-UTRAN) —

Part 1: General usage

1 Scope

This part of ISO 17515 enables usage of the E-UTRAN cellular network technology as an ITS access technology in an ITS station by specifying details of the "Communication Adaptation Layer" (CAL) and the "Management Adaptation Entity" (MAE) of communication interfaces specified in ISO 21218, and session management by reference to ISO 25111.

Wherever practicable, this part of ISO 17515 has been developed by reference to suitable extant standards, adopted by selection.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 21217:2014, *Intelligent transport systems — Communications access for land mobiles (CALM) — Architecture*

ISO 21218:2013, *Intelligent transport systems — Communications access for land mobiles (CALM) — Access technology support*

ISO 24102-3:2013, *Intelligent transport systems — Communications access for land mobiles (CALM) — ITS station management — Part 3: Service access points*

ISO 25111:2009, *Intelligent transport systems — Communications access for land mobiles (CALM) — General requirements for using public networks*

3GPP TS 36.331, *Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification (Release 10)*

ETSI/TS 102 760-1, *Intelligent Transport Systems (ITS); Communications Access for Land Mobiles (CALM); Test specifications for Access Technology Support (ISO 21218); Part 1: Implementation Conformance Statement (ICS) proforma*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
I-Parameter
parameter of a CI

[SOURCE: ISO 21218]

3.2
Link-ID
identifier of a link given by the address of a VCI

[SOURCE: ISO 21218]

3.3
MI-COMMAND
command issued by the ITS-S management entity and sent to the ITS-S access layer via the MI-SAP

[SOURCE: ISO 24102-3]

3.4
MI-REQUEST
command issued by the ITS-S access layer and sent to the ITS-S management entity via the MI-SAP

[SOURCE: ISO 24102-3]

4 Abbreviated terms

For the purposes of this document, the following abbreviated terms apply.

3GPP	3rd Generation Partnership Project
CAL	Communication Adaptation Layer (see ISO 21217)
CI	Communication Interface (see ISO 21217)
E-UTRAN	Evolved Universal Terrestrial Radio Access Network
IN-SAP	Communication SAP as offered by the CAL to the ITS-S networking and transport layer (see ISO 21218)
ITS-S	ITS Station (see ISO 21217)
LTE	Long Term Evolution
MAE	Management Adaptation Entity (see ISO 21217)
MI-SAP	Management SAP as offered by the ITS-S management towards the MAE (see ISO 21218)
UC-VCI	VCI for reception from and transmission to a unicast MAC address (see ISO 21218)
UE	User Equipment

5 Adoption of other standards and internationally adopted practices

Equipment and systems complying with this part of ISO 17515 shall operate in the environment of, and to the parameters defined in the following International Standards:

— ISO 21217:2014, *Intelligent transport systems — Communications access for land mobiles (CALM) — Architecture*;

— ISO 21218:2013, *Intelligent transport systems — Communications access for land mobiles (CALM) — Access technology support*;

— ISO 24102-3:2013, *Intelligent transport systems — Communications access for land mobiles (CALM) — ITS station management — Part 3: Service access points*;

— ISO 25111:2009, *Intelligent transport systems — Communications access for land mobiles (CALM) — General requirements for using public networks*;

— 3GPP TS 36.331, *Long-Term Evolution of the 3GPP Radio Technology, 3GPP Release 10*, and shall operate within the limits and parameters defined in regional and national regulations.

6 Communication and management adaptation

6.1 Communication interface

The concept of a communication interface (CI) is introduced in ISO 21217 as part of the ITS station reference architecture. Interfaces, management, behaviour, and parameters of CIs are specified in ISO 21218, especially the adaptation of a CI access technology

— to the communication service access point IN-SAP, and

— to the management service access point MI-SAP, with reference to ISO 24102-3.

Such adaptation enables a common definition of IN-SAP and MI-SAP service primitives for all kinds of access technologies. Details of this adaptation functionality dedicated to the access technology E-UTRAN are specified in 6.2 and 6.3.

6.2 Communication adaptation

6.2.1 Communication adaptation layer

The “Communication Adaptation Layer” (CAL) specified in ISO 21218 provides the IN-SAP towards the ITS-S networking and transport layer.

An E-UTRAN implementation according to this International Standard shall support UC-VCIs and the related procedures specified in ISO 21218. The Link-ID shall be constructed as specified in ISO 21218:2013, 6.3 and C.3.

6.3 Management adaptation

6.3.1 Management adaptation entity

The “Management Adaptation Entity” (MAE) specified in ISO 21218 provides the MI-SAP towards the ITS-S management entity described in ISO 21217. The MI-SAP services, service primitives and service primitive functions are specified in ISO 24102-3.

The MI-COMMANDs presented in Table 1 shall be supported:

Table 1 — MI-COMMANDs

&mxref (ISO 24102-3)	&MXParam (ISO 24102-3)	Comments
2	CIstateChng	Allows the ITS-S management entity to request a change of CI-state.
6	CONcmd	Allows the ITS-S management entity to request connection / disconnection from the E-UTRAN network service.
9	VciCmd	Allows the ITS-S management entity to request creation of a UC-VCI, to reset a UC-VCI, and to delete a UC-VCI.

The MI-REQUESTs presented in Table 2 shall be supported:

Table 2 — MI-REQUESTs

&mxref (ISO 24102-3)	&MXParam (ISO 24102-3)	Comments
7	Events21218	Allows the CI to report events to the ITS-S management entity.

6.3.2 Mapping of E-UTRAN connection states to IS0 21218 CI states

A CI with E-UTRAN access technology according to this part of ISO 17515 shall support the CI states not-existent (0), existent (1), registered (4), active (8) and connected (16) specified in ISO 21218. The mapping of CI states to E-UTRAN connection states shall be as presented in Table 3:

Table 3 — Mapping of E-UTRAN connection states to ISO 21218 CI states

CI states (ISO 21218)	E-UTRAN connection state	Comments
not-existent (0)	POWER_OFF	This is the trivial state. The implementation is without power.
existent (1)	none	This is an interim state of ISO 21218. There is no equivalent state for E-UTRAN.
registered (4)	none	This is an interim state for E-UTRAN, i.e. searching for a base station.
active (8)	RRC_IDLE	This is the state of E-UTRAN that a base station is accessible, but no connection is established.
connected (16)	RRC_CONNECTED	This is the operational state of E-UTRAN after successful presentation of access credentials.
suspended (64)	not applicable	This state is not supported by E-UTRAN, as it requires maintaining state variables and pending transmission requests while at least the transmitter is completely switched off.
inactive (128)	POWER_OFF	The CI state inactive is not explicitly supported by E-UTRAN. The best suited approximation is the POWER_OFF state.

6.3.3 Connection and disconnection procedure

When the CI state is “active” (8) and I-Parameter Connect (19) is set to “automatic” (0), or upon reception of the MI-COMMAND “CIstateChng” with the value “connect” (16), the E-UTRAN CI shall execute the E-UTRAN connection procedure *RRCConnectionRequest*. The E-UTRAN connection procedure *RRCConnectionRequest* is described in Annex A.

Upon reception of the MI-COMMAND “CIstateChng” with the value “disconnect” (32) the E-UTRAN CI shall execute the E-UTRAN connection release procedure *RRCReleaseRequest*. The E-UTRAN connection release procedure *RRCReleaseRequest* is described in Annex A.

6.4 CI parameters

6.4.1 General

E-UTRAN CIs shall support the I-Parameters presented in ETSI/TS 102 760-1, 6.4.2, Table 4 and ETSI/TS 102 760-1, 6.4.3, Table 5, and all mandatory I-Parameters in ETSI/TS 102 760-1.

NOTE In the above sentence, the term "support" means that the parameters can be accessed by the ITS-S management entity.

6.4.2 E-UTRAN specific parameters

E-UTRAN-specific I-parameters shall be as specified in Table 4.

Table 4 — E-UTRAN specific I-parameters

I-Param (ISO 21218)	I-Parameter name/ `ASN.1 Type` (ISO 21218)	Description and detail specification
2	CommProfile/ `CommProfile`	As specified in Table 5.
11	CIclass/ `CIclass`	Communication interface class with value CIC-I2.
12	CIaccessClass/ `CIaClass`	CI access class with value CIAC-2 or CIAC-3, dependent on contract with network operator.
13	CIstatus/ `CIstatus`	Status of CI. Mandatory values are not_existent (0), existent (1), registered (4), active (8), connected (16).
17	MedType/ `MedType`	Identifies the type of access technology, i.e. E-UTRAN, with value ISO 17515 (10).

6.4.3 Communication profile parameters

The I-parameters specified in ISO 21218 and presented in Table 5 shall be used as communication profile parameters of E-UTRAN to be considered in I-Parameter No. 2 of ASN.1 type CommProfile.

Table 5 — E-UTRAN communication profile parameters

I-Param No (ISO 21218)	I-Parameter name/ `ASN.1 Type` (ISO 21218)	Comment
11	CIclass/ `CIclass`	Identifies communication interface class.
12	CIaccessClass/ `CIaClass`	Identifies communication interface access class.
17	MedType/ `MedType`	Identifies the type of access technology, i.e. E-UTRAN.
19	Connect/ `Connect`	Identifies whether a CI connects to the network service automatically or manually upon request by the user. Default value shall be automatic (0).
39	DataRate/ `DataRate`	Identifies the data rate in the link in units of 100 bit/s.
40	DataRateNW/ `DataRateNW`	Identifies an estimate of average data rate available at the IN-SAP in 100 bit/s.
41	DataRatesNW/ `DataRatesNW`	Identifies minimum and maximum values of I-parameter DataRateNW.

Table 5 *(continued)*

I-Param No (ISO 21218)	I-Parameter name/ `ASN.1 Type` (ISO 21218)	Comment
44	BlockLength/ `INTEGER(0..65535)`	Identifies the maximum supported length of LPDUs in integer multiples of an octet.
51	LogicalChannels/ `LogicalChannels`	Identifies supported logical channels.

7 Session establishment and termination procedures

A user controlled session shall be established as specified in ISO 25111:2009, 6.1.3, and shall be terminated as specified in ISO 25111:2009, 6.1.6.

A continuous session shall be established as specified in ISO 25111:2009, 6.1.4.

A time controlled session shall be established as specified in ISO 25111:2009, 6.1.5.

Annex A
(informative)

E-UTRAN initial access/default bearer establishment

A.1 General

This Annex describes the initial connection, reestablishment, and release procedure in E-UTRAN systems. The basic signalling messages between UE and e-NodeB for initial connection are RRCConnectionRequest, RRCConnectionSetup and RRCConnectionSetupComplete.

To establish a session, the UE sends RRCConnectionRequest to an e-NodeB and after receiving RRCConnectionSetup from the e-NodeB, UE sends RRCConnectionSetupComplete to the e-NodeB. If the e-NodeB sends RRCConnectionReject to the UE, connection setup fails.

The RRCConnectionReestablish procedure is similar to the initial connection, except the signalling messages' names. Finally, connection release procedure is done by the RRCConnectionRelease message from the e-NodeB.

A.2 E-UTRAN initial connection procedure

Figure A.1 and Figure A.2 illustrate the initial connection procedure of E-UTRAN for two cases, i.e. success and network reject.

In Figure A.1, connection is initiated with the message RRCConnectionRequest sent from the UE to E-UTRAN, and acknowledged with the message RRCConnectionSetup. When the UE sends the message RRCConnectionSetupComplete to an E-UTRAN, the initial connection is established.

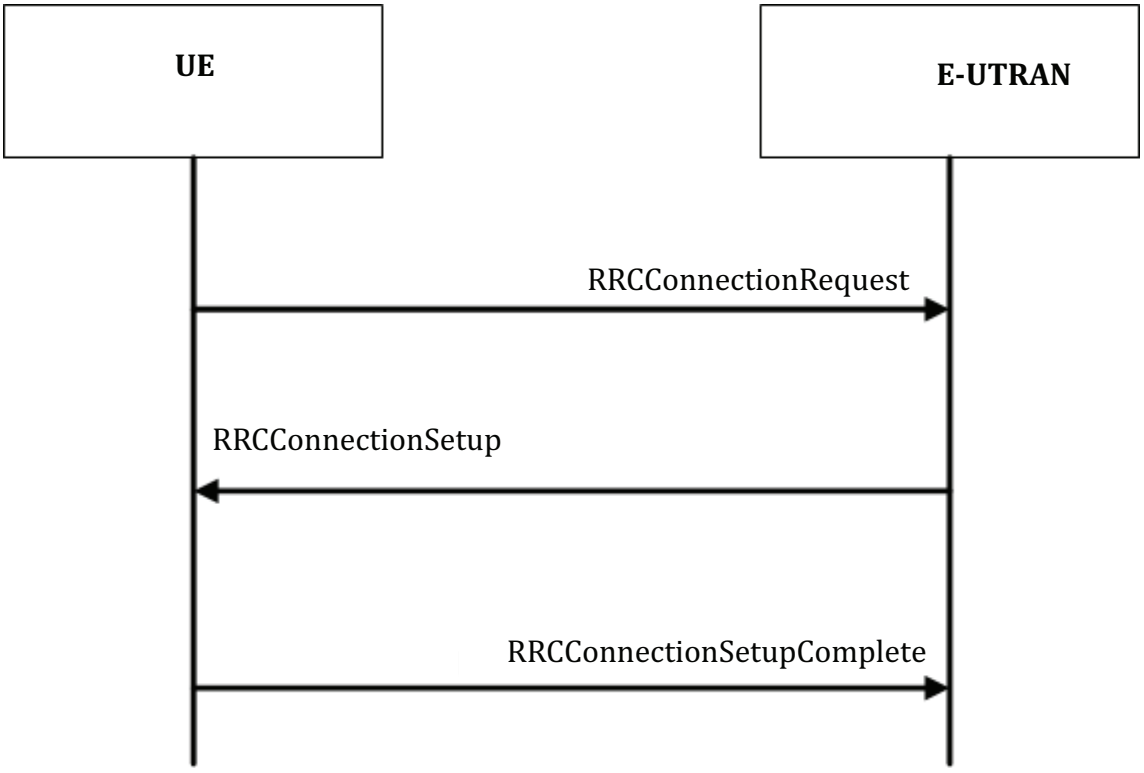

Figure A.1 — Successful RRC connection establishment

In Figure A.2, connection is initiated with the message RRCConnectionRequest sent from the UE to E-UTRAN. E-UTRAN sends the message RRCConnectionReject to the UE indicating that the connection setup failed.

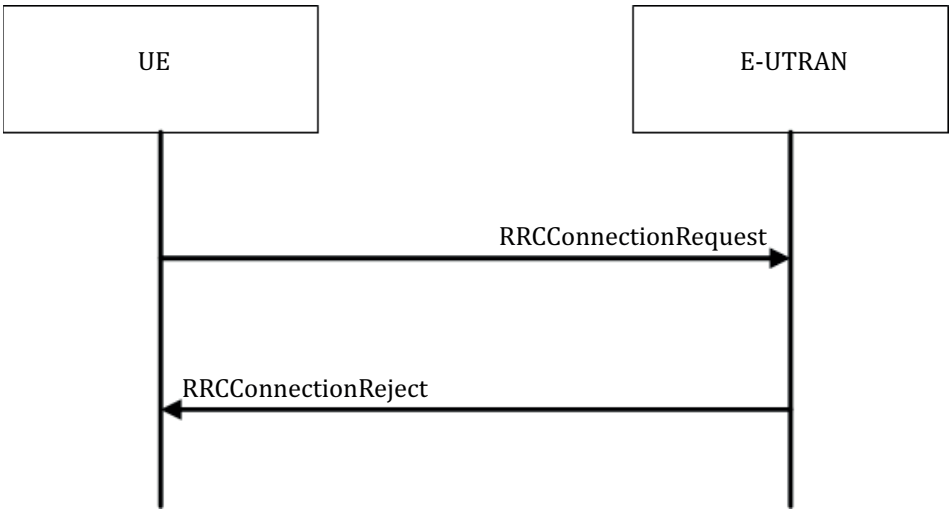

Figure A.2 — RRC connection establishment request with network reject failure

A.3 E-UTRAN connection re-establishment procedure

Figure A.3 and Figure A.4 illustrate the connection reestablishment procedure of E-UTRAN for two cases, i.e. success and network reject.

In Figure A.3, connection reestablishment is requested with the message RRCConnectionReestablishmentRequest sent from the UE to E-UTRAN, and acknowledged with the message RRCConnectionReestablishmentSetup. When the UE sends the message RRCConnectionReestablishmentSetupComplete to an E-UTRAN, the connection is re-established.

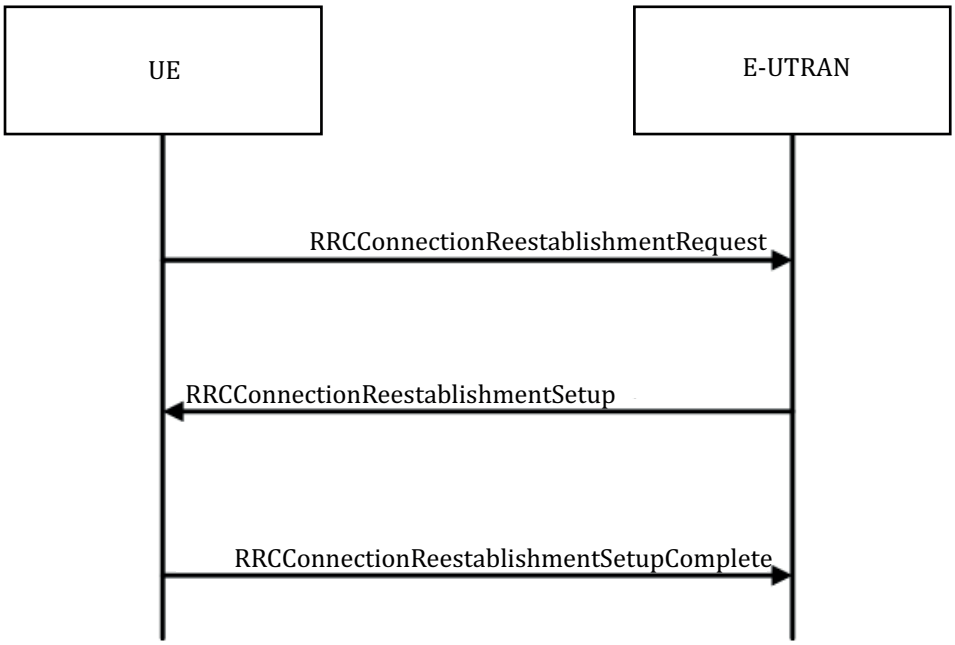

Figure A.3 — Successful RRC connection re-establishment

In Figure A.4, connection reestablishment is requested with the message RRCConnectionReestablishmentRequest sent from the UE to E-UTRAN. E-URTAN sends the message RRCConnectionReestablishmentReject to the UE indicating that the connection re-establishment failed.

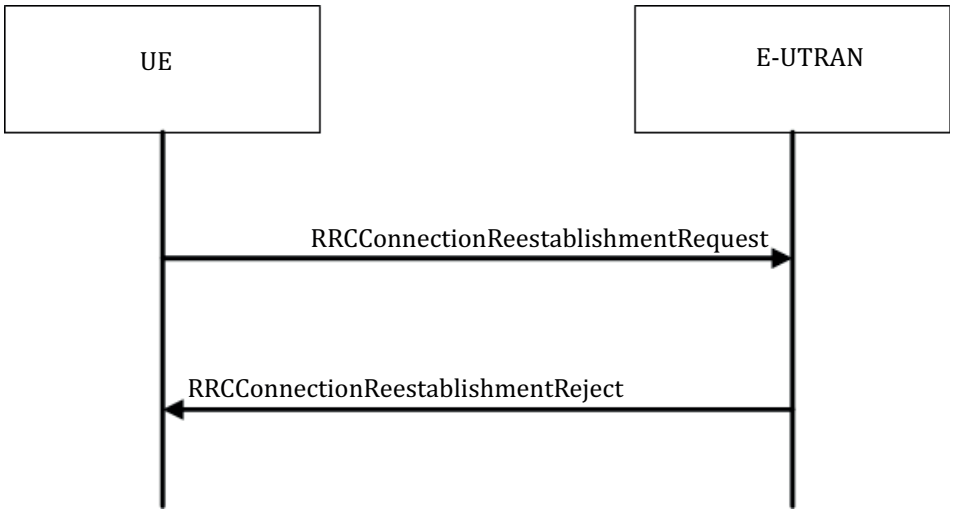

Figure A.4 — RRC connection re-establishment request with network reject failure

A.4 E-UTRAN connection release procedure

Figure A.5 illustrates the connection release procedure of E-UTRAN. In order to release a connection, E-UTRAN sends the message RRCConnectionRelease to the UE. This message is not acknowledged.

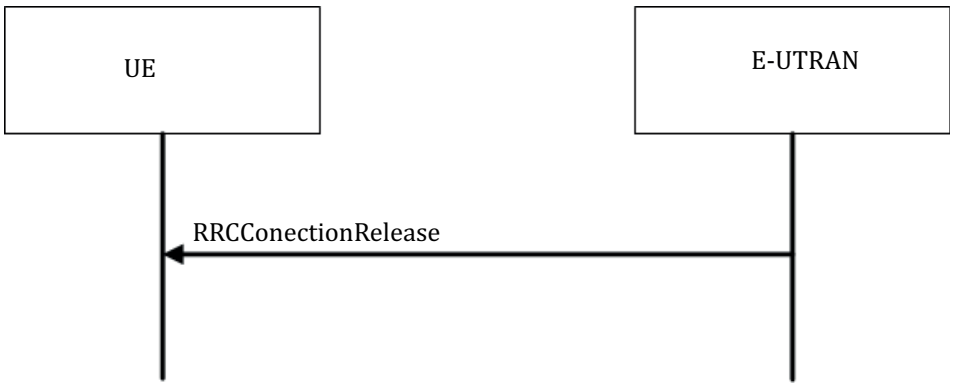

Figure A.5 — E-UTRAN connection release procedure

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