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*Technical Specification*

**LTE;  
Evolved Universal Terrestrial Radio  
Access Network (E-UTRAN);  
X2 general aspects and principles  
(3GPP TS 36.420 version 8.0.0 Release 8)**

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# 1 Scope.

The present document is an introduction to the TSG RAN TS 36.42x series of UMTS Technical Specifications that define the X2 interface. It is an interface for the interconnection of two E-UTRAN NodeB (eNB) components within the Evolved Universal Terrestrial Radio Access Network (E-UTRAN) architecture [2].

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## 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
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- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

- [1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".
  - [2] 3GPP TS 36.401: "E-UTRAN architecture description".
  - [3] 3GPP TS 36.421: "X2 layer 1".
  - [4] 3GPP TS 36.422: "X2 signaling transport".
  - [5] 3GPP TS 36.423: "X2 application protocol (X2AP)".
  - [6] 3GPP TS 36.424: "X2 data transport".
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## 3 Definitions, symbols and abbreviations

### 3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [1].

### 3.2 Symbols

For the purposes of the present document, the following symbols apply:

### 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [x] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1].

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## 4 General aspects

### 4.1 Introduction

The interface allowing to interconnect eNBs with each other is referred to as the X2 interface.

### 4.2 X2 interface general principles

The general principles for the specification of the X2 interface are as follows:

- the X2 interface should be open;
- the X2 interface shall support the exchange of signalling information between two eNBs, in addition the interface shall support the forwarding of PDUs to the respective tunnel endpoints;
- from a logical standpoint, the X2 is a point-to-point interface between two eNBs within the E-UTRAN. A point-to-point logical interface should be feasible even in the absence of a physical direct connection between the two eNBs.

### 4.3 X2 interface specification objectives

#### 4.3.1 General

The X2 interface specifications shall facilitate the following:

- inter-connection of eNBs supplied by different manufacturers;
- support of continuation between eNBs of the E-UTRAN services offered via the S1 interface;
- separation of X2 interface Radio Network functionality and Transport Network functionality to facilitate introduction of future technology.

#### 4.3.2 Addressing of eNBs over the X2 interface

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### 4.4 X2 interface capabilities

#### 4.4.1 Radio application related signalling

The X2 interface provides capability to support radio interface mobility between eNBs, of UEs having a connection with E-UTRAN.

#### 4.4.2 X2 tunnels

### 4.5 X2 interface characteristics

#### 4.5.1 Uses of SCTP

##### 4.5.1.1 General

The SCTP is used to support the exchange of X2 Application Protocol (X2AP) signalling messages between two eNBs

A single SCTP association per X2-C interface instance shall be used with one pair of stream identifiers for X2-C common procedures. Only a few pairs of stream identifiers should be used for X2-C dedicated procedures. The upper limit for the number of stream identifiers for dedicated procedures is FFS.

Source-eNB communication context identifiers that are assigned by the source-eNB for X2-C dedicated procedures, and target-eNB communication context identifiers that are assigned by the target-eNB for X2-C dedicated procedures, shall be used to distinguish UE specific X2-C signalling transport bearers. The communication context identifiers are conveyed in the respective X2AP messages.

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## 5 Functions of the X2 interface

### 5.1 Function list

The list of functions on the X2 interface is the following:

- Intra LTE-Access-System Mobility Support for UE in LTE\_ACTIVE:
  - Context transfer from source eNB to target eNB;
  - Control of user plane tunnels between source eNB and target eNB;
  - Handover cancellation.
- Load Management
- Inter-cell Interference Coordination
  - Uplink Interference Load Management;
- General X2 management and error handling functions:
  - Error indication.
- Trace functions

### 5.2 Function description

#### 5.2.1 Intra LTE-Access-System mobility support for UE in LTE\_ACTIVE

This function allows the eNB to handover the control of a certain UE to another eNB.

##### 5.2.1.1 Context transfer from source eNB to target eNB

This function allows transferring information required to maintain the E-UTRAN services for an UE in LTE\_ACTIVE from source to target eNB.

##### 5.2.1.2 Control of user plane tunnels between source eNB and target eNB

This function allows establishing and releasing tunnels between source and target eNB to allow for data forwarding.

##### 5.2.1.3 Handover cancellation

This function allows informing an already prepared target eNB that a prepared handover will not take place. It allows releasing the resources allocated during a preparation.

### 5.2.2 Load management

This function allows exchanging overload and traffic load information between eNBs, such that the eNBs can control the traffic load appropriately.



## 5.2.3 Inter-cell interference coordination

This function allows keeping inter-cell interference under control. For this neighbouring eNBs exchange appropriate information allowing that eNBs make radio resource assignments such that interference is mitigated.

### 5.2.3.1 Uplink interference load management

This function allows indicating an uplink interference overload and resource blocks especially sensitive to inter-cell interference between neighbouring eNBs, such that neighbour eNBs can co-ordinate with each other such that the mutual interference caused by their uplink radio resource allocations is mitigated.

## 5.2.4 General X2 management and error handling functions

These functions allow for managing of signalling associations between eNBs, surveying X2 interface and recovering from errors.

### 5.2.4.1 Error indication

This function allows the reporting of general error situations on application level.

## 5.2.5 Trace functions

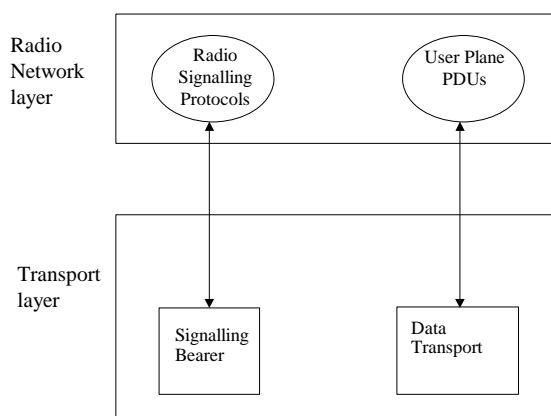
Trace recoding sessions on eUTRAN interfaces for a particular UE is initiated by the EPC. The trace initiation information is also propagated to the Target eNB during handover, attached to certain handover messages on X2.

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# 6 X2 interface protocols and protocol structure

## 6.1 General

There shall exist a clear separation between the Radio Network Layer and the Transport Layer. Therefore, the radio network signaling and X2 data streams are separated from the data transport resource and traffic handling as shown in Figure 6.1.1.



**Figure 6.1.1: Separation of Radio Network Protocols and transport over X2**

## 6.2 Radio signalling protocols

### 6.2.1 X2AP protocol

The protocol responsible for providing signalling information across the X2 interface is called the X2 Application Protocol (X2AP). The X2AP is terminated by the two eNBs inter-connected via the X2 interface X2AP Procedure Modules.

## 6.3 User plane protocol

### 6.3.1 Tunnelling protocol GTP-U

## 6.4 X2 interface protocol structure

The X2 interface protocol architecture consists of two functional layers:

- Radio Network Layer, defines the procedures related to the interaction between eNBs. The radio network layer consists of a Radio Network Control Plane and a Radio Network User Plane.
- The transport network layer provides services for user plane and signaling transport.

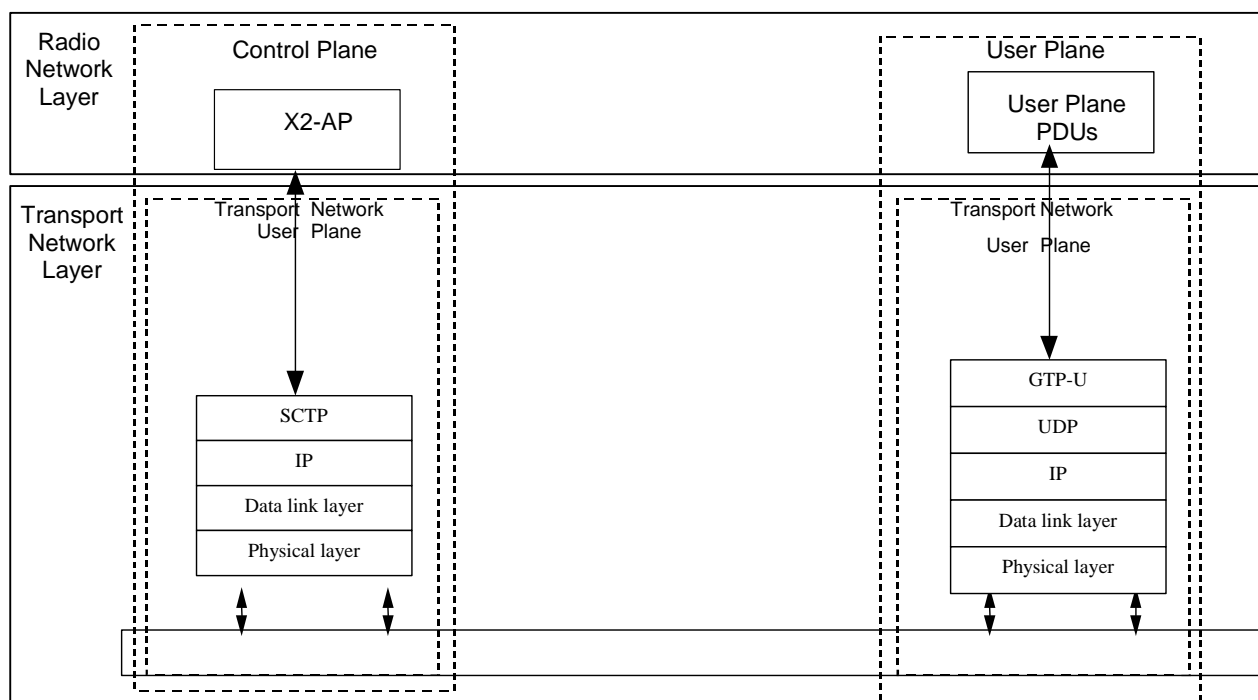


Figure 6.4.1: X2 Interface protocol structure

## 7 Other X2 interface specifications

### 7.1 UTRAN X2 interface: X2 layer 1 (TS 36.421)

3GPP TS 36.421 specifies the range of physical layer technologies that may be used to support the X2 interface.

## 7.2 UTRAN X2 interface: X2 signaling transport (TS 36.422)

3GPP TS 36.422 specifies how the X2AP signaling messages are transported over X2.

## 7.3 UTRAN X2 interface: X2 application protocol (X2AP) (TS 36.423)

3GPP TS 36.423 specifies the radio network layer signaling procedures of the control plane between eNodeBs in EUTRAN.

## 7.4 UTRAN X2 interface: X2 data transport (TS 36.424)

3GPP TS 36.424 specifies the standards for user data transport protocols over the EUTRAN X2 interface.

## 7.5 Summary of UTRAN X2 interface Technical Specifications

The relationship between the technical specifications that define the E-UTRAN X2 interface is shown in Figure 7.5.1.

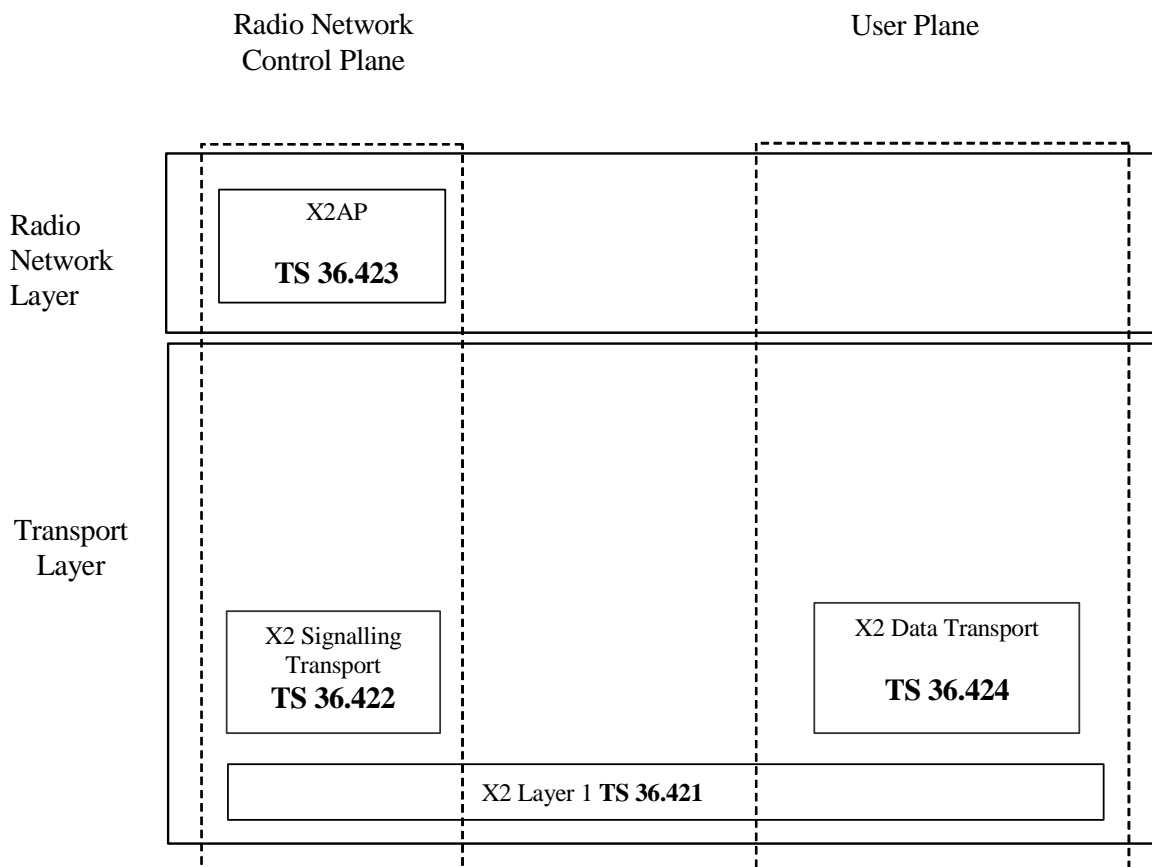


Figure 7.5.1: X2 Interface Technical Specifications

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## Annex A (informative): Change history

Change history							
Date	TSG #	TSG Doc.	CR	Rev	Subject/Comment	Old	New
2007-11	38	RP-070853			specification presented to TSG-RAN for information and approval		1.0.0
2007-12	38				specification approved at TSG-RAN and placed under change control	1.0.0	8.0.0

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# History

<b>Document history</b>		
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