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**Evolved Universal Terrestrial Radio**  
**Access Network (E-UTRAN);**  
**Architecture description**  
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# Foreword

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# 1 Scope

The present document describes the overall architecture of the E-UTRAN, including internal interfaces and assumptions on the radio, S1 and X2 interfaces.

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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.
- For a specific reference, subsequent revisions do not apply.
- 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 36.300: "Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN) Overall description Stage 2".
- [3] 3GPP TS 23.401: "General Packet Radio Service (GPRS) enhancements for Evolved Universal Terrestrial Radio Access Network (E-UTRAN) access".
- [4] 3GPP TS 36.414: "Evolved Universal Terrestrial Access Network (E-UTRAN); S1 data transport".
- [5] 3GPP TS 36.424: "Evolved Universal Terrestrial Access Network (E-UTRAN); X2 data transport".
- [6] 3GPP TS 36.440: "Evolved Universal Terrestrial Radio Access Network (E-UTRAN); General aspects and principles for interfaces supporting Multimedia Broadcast Multicast Service (MBMS) within E-UTRAN".
- [7] ITU-T Recommendation G.823 (2000-03): "The control of jitter and wander within digital networks which are based on the 2048 kbit/s hierarchy".
- [8] ITU-T Recommendation G.824 (2000-03): "The control of jitter and wander within digital networks which are based on the 1544 kbit/s hierarchy".
- [9] ITU-T Recommendation G.825 (2001-08): "The control of jitter and wander within digital networks which are based on the synchronous digital hierarchy (SDH)".
- [10] ITU-T Recommendation G.8261/Y.1361 (2008-04): "Timing and Synchronization aspects in Packet networks".
- [11] 3GPP TS 23.003: "Numbering, addressing and identification".
- [12] 3GPP TR 44.901: "External Network Assisted Cell Change (NACC)".
- [13] 3GPP TS 48.018: "General Packet Radio Service (GPRS); Base Station System (BSS) - Serving GPRS Support Node (SGSN); BSS GPRS Protocol (BSSGP)".
- [14] 3GPP TS 23.251: "Network Sharing; Architecture and functional description".
- [15] 3GPP TS 22.268: "Public Warning System (PWS) requirements".
- [16] 3GPP TS 33.401: "3GPP System Architecture Evolution (SAE); Security architecture".
- [17] 3GPP TS 32.421: "Telecommunication management; Subscriber and equipment trace; Trace concepts and requirements".

- [18] 3GPP TS 32.422: "Telecommunication management; Subscriber and equipment trace; Trace control and configuration management".
- [19] 3GPP TS 32.423: "Telecommunication management; Subscriber and equipment trace; Trace data definition and management".
- [20] 3GPP TS 32.441: "Telecommunication management; Trace Management Integration Reference Point (IRP); Requirements".
- [21] 3GPP TS 32.442: "Telecommunication management; Trace Management Integration Reference Point (IRP); Information Service (IS)".
- [22] 3GPP TS 32.446: "Telecommunication management; Trace Management Integration Reference Point (IRP); Solution Set (SS) definitions".
- [23] 3GPP TS 25.411: "UTRAN Iu interface layer 1".
- [24] 3GPP TS 23.682: "Architecture enhancements to facilitate communications with packet data networks and applications".

## 3 Definitions 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].

**Dual Connectivity:** Defined in TS 36.300 [2].

**E-RAB:** An E-RAB uniquely identifies the concatenation of an S1 Bearer and the corresponding Data Radio Bearer. When an E-RAB exists, there is a one-to-one mapping between this E-RAB and an EPS bearer of the Non Access Stratum (NAS) as defined in TS 23.401 [3].

**S1:** logical interface between an eNB and an EPC, providing an interconnection point between the E-UTRAN and the EPC. It is also considered as a reference point.

**X2:** logical interface between two eNBs. Whilst logically representing a point-to-point link between eNBs, the physical realization need not be a point-to-point link.

### 3.2 Abbreviations

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].

|        |  |
|--------|--|
| AP     | Application Protocol                   |
| AS     | Access Stratum                         |
| CGI    | Cell Global Identifier                 |
| CIoT   | Cellular IoT                           |
| CMAS   | Commercial Mobile Alert Service        |
| C-RNTI | Cell RNTI                              |
| ECGI   | E-UTRAN Cell Global Identifier         |
| ECM    | EPS Connection Management              |
| EEC    | Ethernet Equipment Clock               |
| eNB    | E-UTRAN Node B                         |
| EMM    | EPS Mobility Management                |
| E-RAB  | E-UTRAN Radio Access Bearer            |
| ESM    | EPS Session Management                 |
| E-SMLC | Evolved Serving Mobile Location Centre |
| ETWS   | Earthquake and Tsunami Warning System  |
| EPC    | Evolved Packet Core                    |



|         |   |
|---------|---|
| EPS     | Evolved Packet System   |
| E-UTRA  | Evolved UTRA  |
| E-UTRAN | Evolved UTRAN   |
| FDD     | Frequency Division Duplex                                       |
| GUMMEI  | Globally Unique MME Identifier                                  |
| ID      | Identity  |
| IP      | Internet Protocol   |
| LTE     | Long Term Evolution   |
| MBMS    | Multimedia Broadcast Multicast Service                          |
| MBSFN   | Multimedia Broadcast multicast service Single Frequency Network |
| MeNB    | Master eNB  |
| NDS     | Network Domain Security   |
| MME     | Mobility Management Entity                                      |
| NAS     | Non-Access Stratum  |
| OTDOA   | Observed Time Difference Of Arrival (positioning method)        |
| PLMN    | Public Land Mobile Network                                      |
| PWS     | Public Warning System   |
| RA-RNTI | Random Access RNTI  |
| RET     | Remote Electrical Tilting                                       |
| RIM     | RAN Information Management                                      |
| RNL     | Radio Network Layer   |
| RNTI    | Radio Network Temporary Identifier                              |
| RRC     | Radio Resource Control  |
| RTP     | Real-time Transport Protocol                                    |
| QoS     | Quality of Service  |
| SFN     | System Frame Number   |
| S-GW    | Serving Gateway   |
| SAP     | Service Access Point  |
| SCG     | Secondary Cell Group  |
| SeNB    | Secondary eNB   |
| SON     | Self Organizing Networks  |
| S-TMSI  | S-Temporary Mobile Subscriber Identity                          |
| TCP     | Transmission Control Protocol                                   |
| TDD     | Time Division Duplex  |
| TDM     | Time Division Multiplexing                                      |
| TMA     | Tower Mounted Amplifier   |
| TNL     | Transport Network Layer   |
| UDP     | User Datagram Protocol  |
| UE      | User Equipment  |
| UMTS    | Universal Mobile Telecommunication System                       |
| UTDOA   | Uplink Time Difference of Arrival                               |

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## 4 General principles

The general principles guiding the definition of E-UTRAN architecture as well as the E-UTRAN interfaces are the following:

- Logical separation of signalling and data transport networks.
- E-UTRAN and EPC functions are fully separated from transport functions. Addressing scheme used in E-UTRAN and EPC shall not be tied to the addressing schemes of transport functions. The fact that some E-UTRAN or EPC functions reside in the same equipment as some transport functions does not make the transport functions part of the E-UTRAN or the EPC.
- Mobility for RRC connection is fully controlled by the E-UTRAN.
- When defining the E-UTRAN interfaces the following principles were followed:
  - The functional division across the interfaces shall have as few options as possible;
  - Interfaces should be based on a logical model of the entity controlled through this interface;

- One physical network element can implement multiple logical nodes.

## 5 General architecture

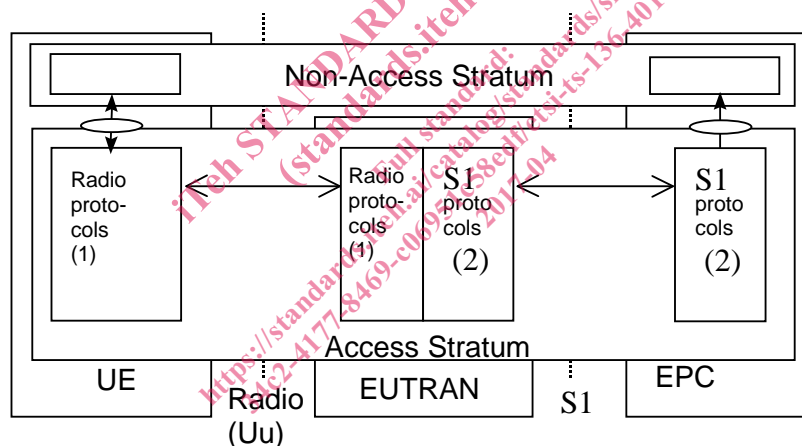
### 5.1 General

The protocols over Uu and S1 interfaces are divided into two structures:

- **User plane protocols**  
These are the protocols implementing the actual E-RAB service, i.e. carrying user data through the access stratum.
- **Control plane protocols**  
These are the protocols for controlling the E-RABs and the connection between the UE and the network from different aspects (including requesting the service, controlling different transmission resources, handover etc.). Also a mechanism for transparent transfer of NAS messages is included.

### 5.2 User plane

The E-RAB service is offered from SAP to SAP by the Access Stratum. Figure 5.2-1 shows the protocols on the Uu and S1 interfaces that linked together provide this E-RAB service.



Note 1: The radio interface protocols are defined in 3GPP TS 36.2xx and TS 36.3xx.

Note 2: The S1 interface protocols are defined in 3GPP TS 36.41x.

**Figure 5.2-1: S1 and Uu user plane**

### 5.3 Control plane

Figure 5.3-1 shows the control plane (signalling) protocol stacks on S1 and Uu interfaces.