



**Satellite Earth Stations and Systems (SES);
Family SL Satellite Radio Interface (Release 1);
Part 1: General Specifications;
Sub-part 3: Satellite Radio Interface Overview**

PREVIEW
https://standards.iteh.ai/standards/ETSI/TS-102-744-1-3-v1.1.1-8e64-4119-8e90-c7ed0b281010/2015-10-01/7cca8a16-8e64-4119-8e90-c7ed0b281010

Reference

DTS/SES-00299-1-3

Keywords

3GPP, GPRS, GSM, GSO, interface, MSS, radio, satellite, TDM, TDMA, UMTS

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Satellite Earth Stations and Systems (SES).

The present document is part 1, sub-part 3 of a multi-part deliverable. Full details of the entire series can be found in ETSI TS 102 744-1-1 [i.6].

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

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Introduction

This multi-part deliverable (Release 1) defines a satellite radio interface that provides UMTS services to users of mobile terminals via geostationary (GEO) satellites in the frequency range 1 518,000 MHz to 1 559,000 MHz (downlink) and 1 626,500 MHz to 1 660,500 MHz and 1 668,000 MHz to 1 675,000 MHz (uplink).

1 Scope

The present document provides an overview of the Family SL radio interface between the Radio Network Controller (RNC) and the User Equipment (UE). The Family SL radio interface operates in spectrum allocated to mobile satellite services (see ETSI TS 102 744-2-1 [i.7], clauses 5.1.2 and 6.1.2).

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the reference document (including any amendments) applies.

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The following referenced documents are necessary for the application of the present document.

- [1] ETSI TS 102 744-1-4: "Satellite Earth Stations and Systems (SES); Family SL Satellite Radio Interface (Release 1); Part 1: General Specifications; Sub-part 4: Applicable External Specifications, Symbols and Abbreviations".
- [2] ETSI TS 102 744-3-6: "Satellite Earth Stations and Systems (SES); Family SL Satellite Radio Interface (Release 1); Part 3: Control Plane and User Plane Specifications; Sub-part 6: Adaptation Layer Operation".

2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the reference document (including any amendments) applies.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

- [i.1] ETSI TS 125 413: "Universal Mobile Telecommunications System (UMTS); UTRAN Iu interface Radio Access Network Application Part (RANAP) signalling (3GPP TS 25.413 Release 4)".
- [i.2] ETSI TS 125 301: "Universal Mobile Telecommunications System (UMTS); Radio Interface Protocol Architecture (3GPP TS 25.301 Release 4)".
- [i.3] ETSI TS 125 322: "Universal Mobile Telecommunications System (UMTS); Radio Link Control (RLC) protocol specification (3GPP TS 25.322 Release 4)".
- [i.4] ETSI TS 124 007: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Mobile radio interface signalling layer 3; General Aspects (3GPP TS 24.007 Release 4)".
- [i.5] ETSI TS 124 008: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Mobile radio interface Layer 3 specification; Core network protocols; Stage 3 (3GPP TS 24.008 Release 4)".
- [i.6] ETSI TS 102 744-1-1: "Satellite Earth Stations and Systems (SES); Family SL Satellite Radio Interface (Release 1); Part 1: General Specifications; Sub-part 1: Services and Architectures".

- [i.7] ETSI TS 102 744-2-1: "Satellite Earth Stations and Systems (SES); Family SL Satellite Radio Interface (Release 1); Part 2: Physical Layer Specifications; Sub-part 1: Physical Layer Interface".
- [i.8] ETSI TS 102 744-2-2: "Satellite Earth Stations and Systems (SES); Family SL Satellite Radio Interface (Release 1); Part 2: Physical Layer Specifications; Sub-part 2: Radio Transmission and Reception".
- [i.9] ETSI TS 102 744-3-1: "Satellite Earth Stations and Systems (SES); Family SL Satellite Radio Interface (Release 1); Part 3: Control Plane and User Plane Specifications; Sub-part 1: Bearer Control Layer Interface".
- [i.10] ETSI TS 102 744-3-2: "Satellite Earth Stations and Systems (SES); Family SL Satellite Radio Interface (Release 1); Part 3: Control Plane and User Plane Specifications; Sub-part 2: Bearer Control Layer Operation".
- [i.11] ETSI TS 102 744-3-3: "Satellite Earth Stations and Systems (SES); Family SL Satellite Radio Interface (Release 1); Part 3: Control Plane and User Plane Specifications; Sub-part 3: Bearer Connection Layer Interface".
- [i.12] ETSI TS 102 744-3-4: "Satellite Earth Stations and Systems (SES); Family SL Satellite Radio Interface (Release 1); Part 3: Control Plane and User Plane Specifications; Sub-part 4: Bearer Connection Layer Operation".
- [i.13] ETSI TS 102 744-3-5: "Satellite Earth Stations and Systems (SES); Family SL Satellite Radio Interface (Release 1); Part 3: Control Plane and User Plane Specifications; Sub-part 5: Adaptation Layer Interface".
- [i.14] ETSI TS 102 744-3-7: "Satellite Earth Stations and Systems (SES); Family SL Satellite Radio Interface (Release 1); Part 3: Control Plane and User Plane Specifications; Sub-part 7: NAS Layer Interface Extensions for MBMS Services".
- [i.15] ETSI TS 102 744-3-8: "Satellite Earth Stations and Systems (SES); Family SL Satellite Radio Interface (Release 1); Part 3: Control Plane and User Plane Specifications; Sub-part 8: NAS Layer and User Plane Operation for MBMS Services".

3 Symbols and abbreviations

3.1 Symbols

For the purposes of the present document, the symbols given in ETSI TS 102 744-1-4 [1], clause 3 apply.

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in ETSI TS 102 744-1-4 [1], clause 3 apply.

4 Introduction

4.1 Radio interface layering

4.1.0 General

The satellite radio interface is carried over a satellite link and consists of the Non-Access Stratum and Access Stratum layers.

The Non-Access Stratum is essentially unchanged from the UMTS Non-Access Stratum, as defined in ETSI TS 124 007 [i.4] and ETSI TS 124 008 [i.5], with some functional extensions to support new services, as described in ETSI TS 102 744-3-7 [i.14] and ETSI TS 102 744-3-8 [i.15].

The Access Stratum of the satellite radio interface provides a set of services that directly support the UMTS Non-Access Stratum Control Plane entities (such as GMM and MM) and User Plane functions residing in the Core Network in the upper layers of the Mobile Terminal.

As such there are a number of requirements on the Access Stratum protocols to ensure that the attributes of the satellite link (high delay, variable error rate, aperiodic disruptions) are countered. The satellite Access Stratum is considered as a number of communication layers, as follows:

- Adaptation Layer (AL);
- Bearer Connection Layer (BCn);
- Bearer Control Layer (BCt); and
- Physical Layer (L1).

Each layer communicates with its peer, the layer above and the layer below. For each layer there are a set of protocol unit definitions which are used to communicate with the peer. In addition between each layer there are a set of interface definitions which provide the mechanisms for control and transfer of information. An overview of the main functions of each of the layers of the Access Stratum is described in the present document, with the detailed specifications for the different layers provided in the sub-parts shown in Table 4.1.

Table 4.1: Mapping of Family SL Access Stratum Layer to Part/Sub-part

Family SL Access Stratum Layer	Described in Sub-part
Adaptation Layer (AL)	ETSI TS 102 744-3-5 [i.13] ETSI TS 102 744-3-6 [2]
Bearer Connection Layer (BCn)	ETSI TS 102 744-3-3 [i.11] ETSI TS 102 744-3-4 [i.12]
Bearer Control Layer (BCt)	ETSI TS 102 744-3-1 [i.9] ETSI TS 102 744-3-2 [i.10]
Physical Layer (L1)	ETSI TS 102 744-2-1 [i.7] ETSI TS 102 744-2-2 [i.8]

4.1.1 Control plane protocol stack

The Control Plane of the protocol stack is shown in Figure 4.1. The Access Stratum and the Non-Access Stratum are separately indicated in the diagram. The parts of the protocol stack that are modified for the Family SL satellite link relative to the standard 3GPP protocols are described in ETSI TS 102 744-1-1 [i.6], clause 6.

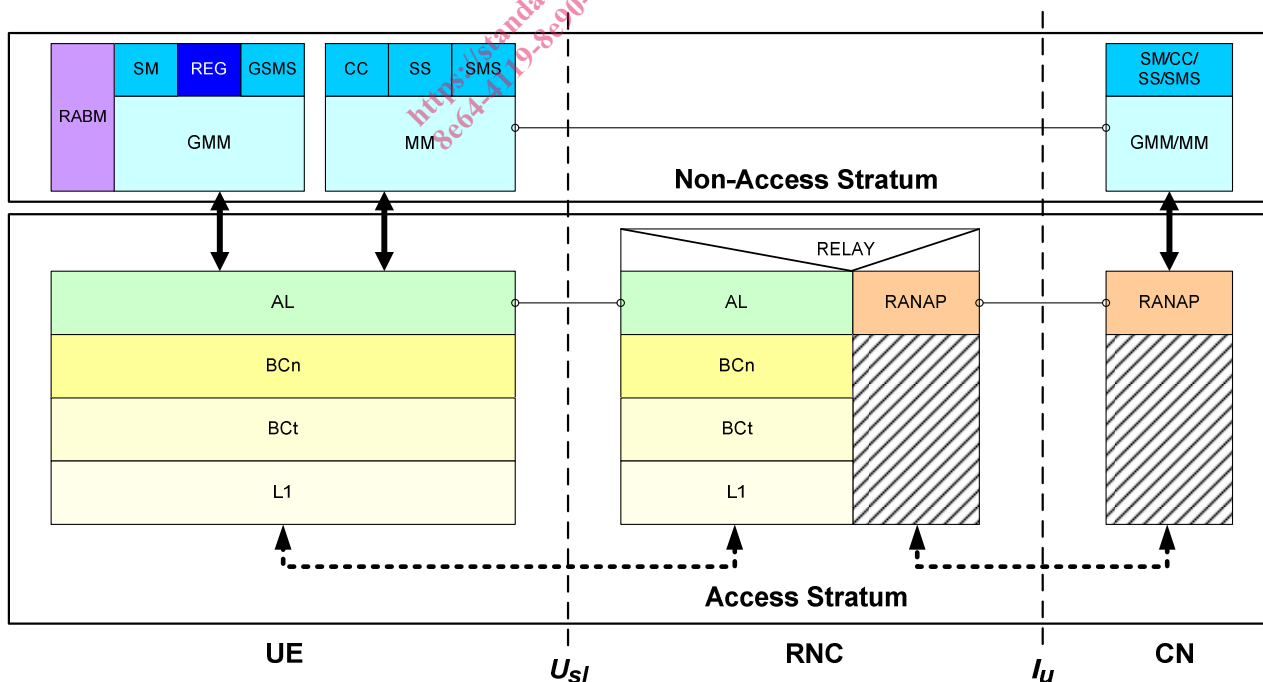


Figure 4.1: Control Plane Protocol Stack Layering

4.1.2 User plane protocol stack

The protocol stack for the User Plane of the Packet Switched Domain is shown in Figure 4.2.

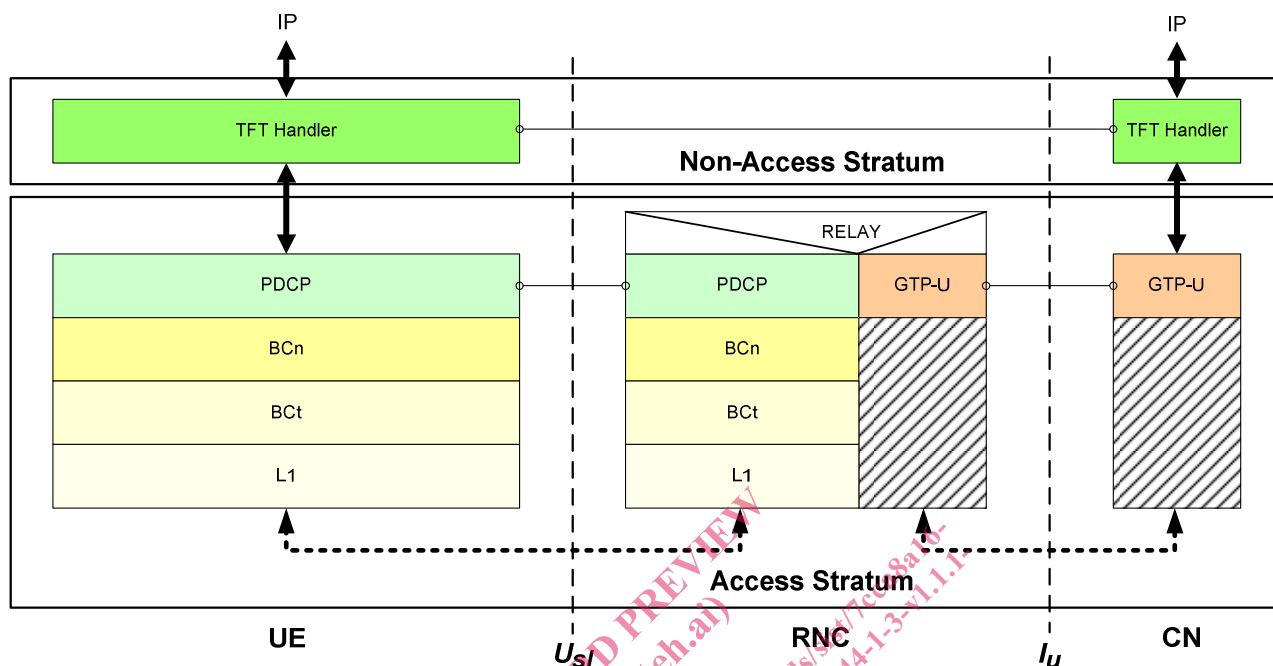


Figure 4.2: Packet Switched User Plane Protocol Stack Layering

For the Circuit Switched Domain, the lower layers (L1, BCt and BCn) of the protocol stack are identical, however, the PDCP and PPP/IP layers are replaced by the appropriate entity to provide Circuit Switched Services (e.g. Voice Codec or ISDN Interworking Function). Figure 4.3 illustrates the user plane protocol stack for the Circuit Switched domain.

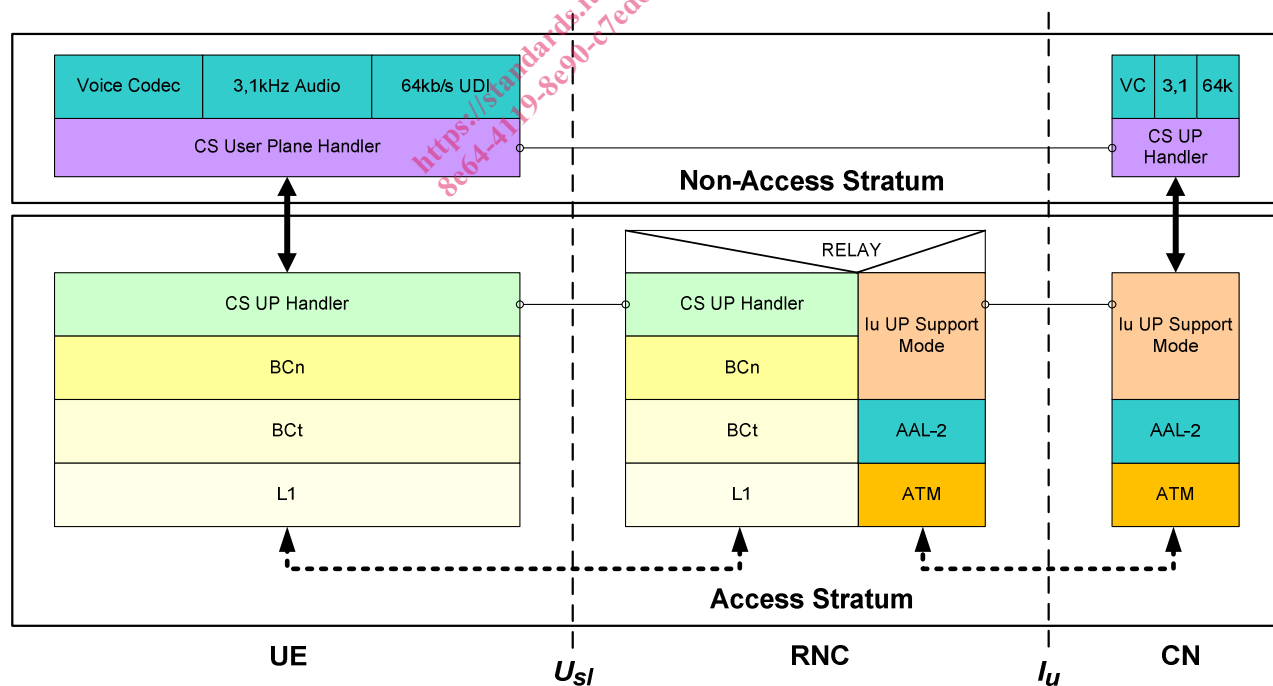


Figure 4.3: Circuit Switched User Plane Protocol Stack Layering

4.2 SDUs and PDUs

Each of the layers exchanges a set of Protocol Data Units (PDUs) with its peer using the capabilities of the lower layers to transport each PDU.

Each of the peer-layer entities exchanges a sequence of control messages called Signalling Data Units (SDUs) for the purpose of establishing, maintaining and terminating a connection. SDUs are always encapsulated within a Protocol Data Unit (PDU).

Each Protocol Data Unit may contain a higher layer PDU and/or one or more Signalling Data Units (SDUs). See Figures 4.4, 4.5 and 4.6.

Where a lower layer cannot support the transmission of the SDU or higher layer PDU, a layer may be required to segment the SDU or higher layer PDU into a sequence of PDUs. In this case each PDU in the sequence of PDUs transferred to the peer contains a segment of the SDU or higher layer PDU. At the peer, this sequence of PDUs is reassembled into the SDU or higher layer PDU before being processed or passed to the higher layer. This process is termed segmentation and reassembly. Only the Bearer Connection Layer supports segmentation and reassembly.

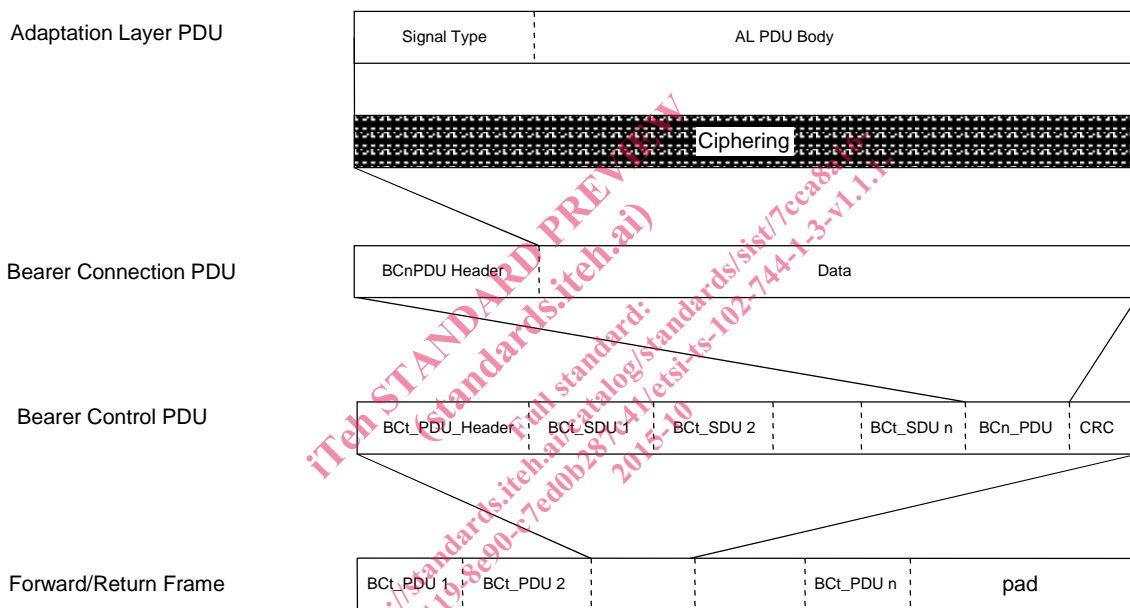


Figure 4.4: Adaptation Layer PDU Transmit Hierarchy (PDU Encapsulation) (Control Plane)

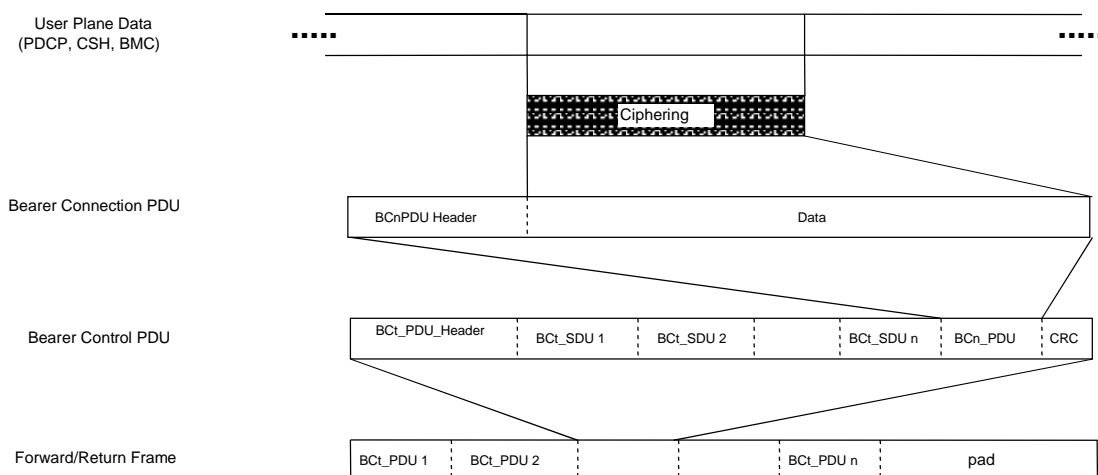


Figure 4.5: User Plane Data Transmit Hierarchy (PDU Encapsulation) (Acknowledged and Unacknowledged Modes)