



**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**

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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 3, sub-part 6 of a multi-part deliverable. Full details of the entire series can be found in ETSI TS 102 744-1-1 [i.4].

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 defines the Adaptation Layer (AL) operation of the Family SL satellite radio interface between the Radio Network Controller (RNC) and the User Equipment (UE) used in the satellite network. The Adaptation Layer (AL) peer-to-peer interface is described in TS 102 744-3-5 [11].

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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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 necessary for the application of the present document.

- [1] 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)".
- [2] ETSI TS 125 304: "Universal Mobile Telecommunications System (UMTS); User Equipment (UE) procedures in idle mode and procedures for cell reselection in connected mode (3GPP TS 25.304 Release 4)".
- [3] 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)".
- [4] ETSI TS 133 102: "Universal Mobile Telecommunications System (UMTS); 3G security; Security architecture (3GPP TS 33.102 Release 4)".
- [5] ETSI TS 133 105: "Universal Mobile Telecommunications System (UMTS); Cryptographic algorithm requirements (3GPP TS 33.105 Release 4)".
- [6] RSA Laboratories. PKCS #1: RSA Cryptography Standard, Version 2.0. 1998.
- [7] ETSI TS 102 744-1-3: "Satellite Earth Stations and Systems (SES); Family SL Satellite Radio Interface (Release 1); Part 1: General Specifications; Sub-part 3: Satellite Radio Interface Overview".
- [8] 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".
- [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".
- [10] 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".
- [11] 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".

- [12] ETSI TS 122 011: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Service accessibility (3GPP TS 22.011 Release 4)".

2.2 Informative references

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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] Recommendation ITU-T X.200, "Information Technology - Open Systems Interconnection - Basic Reference Model: The Basic Model", July 1994.
- [i.2] Recommendation ITU-T X.210, "Information Technology - Open Systems Interconnection - Basic Reference Model: Conventions for the Definition of OSI Services", November 1993.
- [i.3] Robert Sedgewick, Algorithms, 2nd. Ed., Addison Wesley, New York, 1988. ISBN 0-201-06673-4.
- [i.4] 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".

3 Symbols and abbreviations

3.1 Symbols

For the purposes of the present document, the symbols given in ETSI TS 102 744-1-4 [8], clause 3 apply.

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in ETSI TS 102 744-1-4 [8], clause 3 apply.

4 General Architecture

The Adaptation Layer allows the Physical, Radio Link Control (RLC), and Media Access Control (MAC) layers of the terrestrial UMTS radio interface (Uu) between the RNC and UE to be replaced with their equivalents from the satellite network radio interface. The Adaptation Layer is a direct replacement for Radio Resource Control (RRC) in the UMTS protocol stack.

Figure 4.1 illustrates the position of the Adaptation Layer within the Family SL air interface protocol stack. An overview of the radio interface layering and relationship to the Adaptation Layer is provided in ETSI TS 102 744-1-3 [7], clause 4 and ETSI TS 102 744-3-5 [11], clause 4. An overview of the Adaptation Layer operation is provided in ETSI TS 102 744-1-3 [7], clause 5.

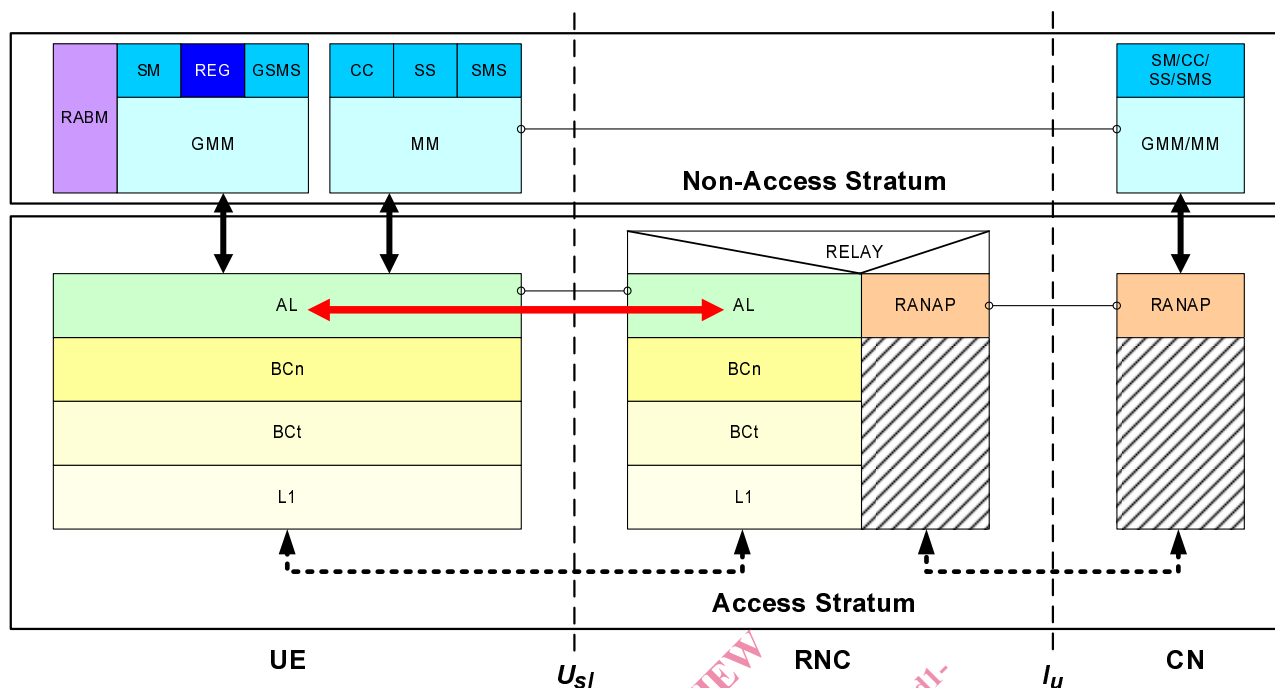


Figure 4.1: Adaptation Layer Position in Protocol Stack (Control Plane Illustrated)

The Adaptation Layer performs many of the same functions as RRC, namely:

- interpretation of system information related to the Access Stratum and forwarding of system information related to the Non-Access Stratum;
- Public Land Mobile Network (PLMN) and spot beam selection (initial and re-selection);
- establishment, maintenance and release of a UE-Specific Signalling Connection ("RRC Connection" in UMTS) between the UE and the RNC;
- Non-Access Stratum message transport;
- establishment, reconfiguration and release of radio bearer connections;
- connection mobility functions (handover);
- integrity protection and control of ciphering; and
- paging.

Unlike RRC, the Adaptation Layer does not provide a system information broadcast facility to UEs in idle mode, nor is it associated with power control (link adaptation), or radio resource management. In the satellite network, these functions are provided by the Bearer Control layer.

The Adaptation Layer is present only in the Control Plane. In the User Plane, the Bearer Connection layer directly provides the services and service access points required by higher layers (such as Packet Data Convergence Protocol (PDCP) in the Packet Switched (PS) domain and Circuit Switched User Plane Handler (CSH) in the Circuit Switched (CS) domain). Note however that some Adaptation Layer agents in the Control Plane are responsible for configuring agents in the User Plane.

The present document describes the principal architecture of the Adaptation Layer on both the UE and RNC side of the modified U_u interface in terms of abstract service primitives and Service Access Points (SAPs), using concepts from Recommendation ITU-T X.200 [i.1] and X.210 [i.2]. These concepts are not intended to unnecessarily constrain implementations. Figure 4.2 illustrates the Service Access Points to adjacent layers.

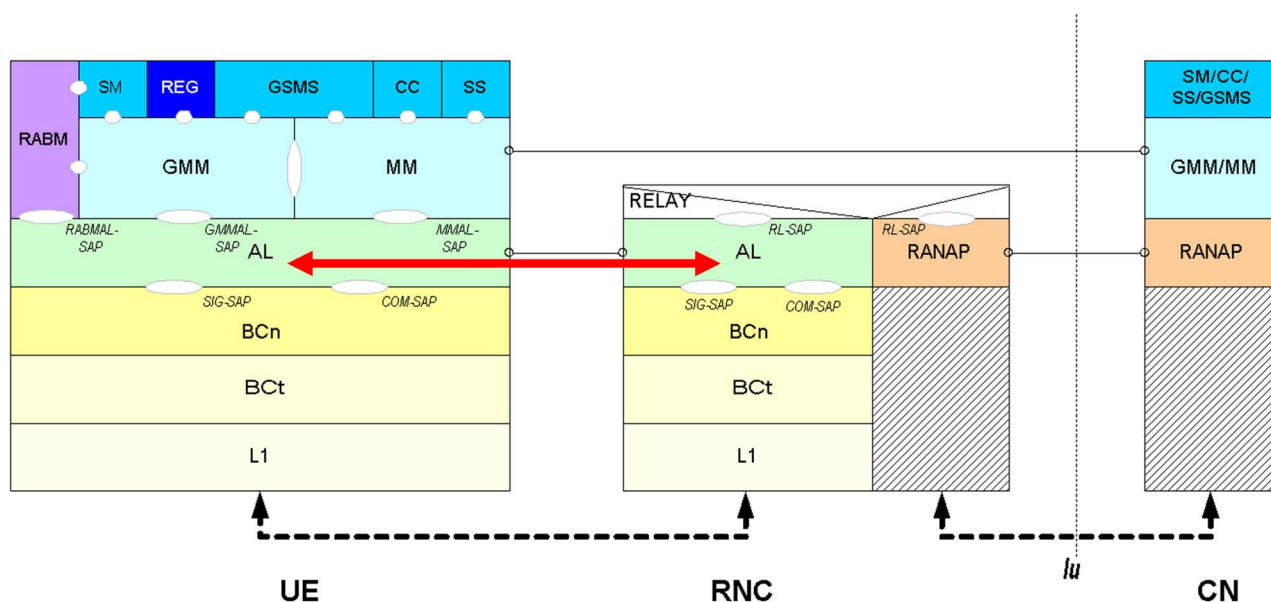


Figure 4.2: Adaptation Layer Position in Protocol Stack (Control Plane Illustrated)

5 AL Control Plane - UE Side

5.1 Services Provided to Upper Layers

The UE Adaptation Layer (AL) provides message transport and event notification services to the UMTS Layer 3 Mobility Management sublayer (GPRS Mobility Management (GMM), Mobility Management (MM), and Radio Access Bearer Management (RABM)) in the Non-Access Stratum via the Service Access Points (SAPs) defined in ETSI TS 124 007 [1], as shown in Figure 5.1.

- GMMAL-SAP: GMM to AL ("GMMAS-SAP" in UMTS)
- MMAL-SAP: MM to AL ("RR-SAP" in UMTS)
- RABMAL-SAP: RABM to AL ("RABMAS-SAP" in UMTS)

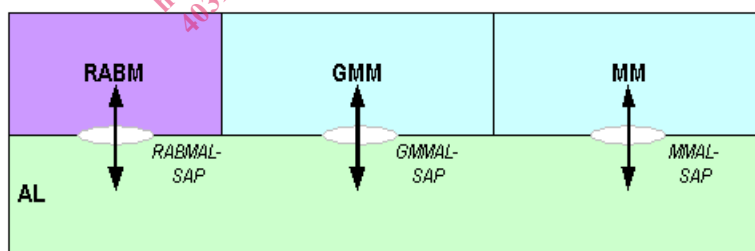


Figure 5.1: Service Access Points to Upper Layers [UE]

The UE Adaptation Layer also provides network (PLMN) discovery and selection services to the Non-Access Stratum via a General Control SAP (GC-SAP) as defined in ETSI TS 125 304 [2].

5.2 Services Expected from Lower Layers

The UE Adaptation Layer uses message transport services provided by the Bearer Connection layer to communicate with its peer in the RNC through two Service Access Points, as shown in Figure 5.2:

- Common Signalling Service Access Point (COM-SAP)
- UE-Specific Signalling Service Access Point (SIG-SAP). The SIG-SAP is a distinguished instance of the Acknowledged Mode Service Access Point (AM-SAP) as defined in ETSI TS 102 744-3-4 [10].

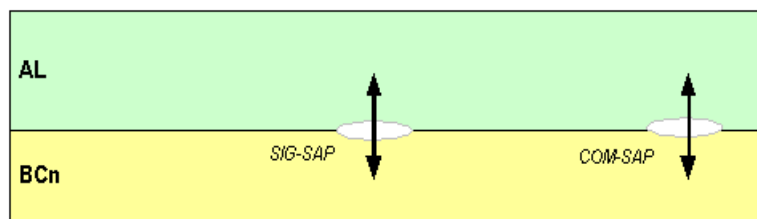


Figure 5.2: Service Access Points to Lower Layers

The Bearer Connection ID (BCnID) is the reference or handle to a particular SAP at the Adaptation Layer - Bearer Connection Layer boundary.

The UE Adaptation Layer also uses configuration and control services from both the Bearer Connection and Bearer Control Layers through two additional Service Access Points, as shown in Figure 5.3:

- Bearer Connection Service Access Point (CBCn-SAP)
- Bearer Control Service Access Point (CBCt-SAP)

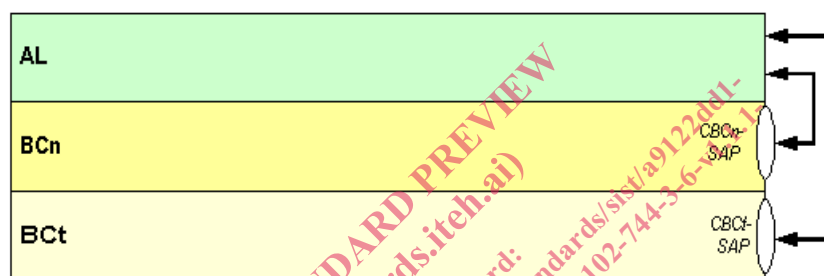


Figure 5.3: Control Service Access Points to Lower Layers [UE]

5.3 Agents in the Adaptation Layer

5.3.0 General

The Adaptation Layer in the UE contains four classes of agent:

- Registration Manager (REGM);
- GMM Service Access Point Handler (GMMH);
- MM Service Access Point Handler (MMH); and
- Radio Bearer Control (RBC).

There is one instance each of REGM, GMMH, and MMH and two instances of RBC (one for the PS domain and one for the CS domain) in the UE. For every UE Adaptation Layer agent, there is a corresponding peer in the RNC.

The UE Adaptation Layer also contains two routing functions associated with Service Access Points that are shared by more than one Adaptation Layer agent:

- SIG-SAP Router (SSR); and
- CBCn-SAP Router (CSR).

5.3.1 Registration Manager (REGM)

REGM is responsible for:

- establishing, maintaining, and releasing the UE Specific Signalling connection by performing the radio interface Registration, Handover, and Deregistration procedures with the RNC;