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TECHNICAL SPECIFICATION

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

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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 1 of a multi-part deliverable covering the Family SL Satellite Radio Interface (Release 1), as identified below:

Part 1: **"General Specifications";**

    Sub-part 1: "Services and Architectures";

    Sub-part 2: "System Operation Overview";

    Sub-part 3: "Satellite Radio Interface Overview";

    Sub-part 4: "Applicable External Specifications, Symbols and Abbreviations";

Part 2: "Physical Layer Specifications";

    Sub-part 1: "Physical Layer Interface";

    Sub-part 2: "Radio Transmission and Reception";

Part 3: "Control Plane and User Plane Specifications";

    Sub-part 1: "Bearer Control Layer Interface";

    Sub-part 2: "Bearer Control Layer Operation";

    Sub-part 3: "Bearer Connection Layer Interface";

    Sub-part 4: "Bearer Connection Layer Operation";

    Sub-part 5: "Adaptation Layer Interface";

    Sub-part 6: "Adaptation Layer Operation";

    Sub-part 7: "NAS Layer Interface Extensions for MBMS Services";

    Sub-part 8: "NAS Layer and User Plane Operation for MBMS Services";

    Sub-part 9: "Initiation and Operation of User Plane";

Part 4: "Enhanced Services and Applications";

    Sub-part 1: "Multiple Voice Services";

    Sub-part 2: "Aeronautical Safety Services";

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).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

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 describes the range of user services that are provided by the Family SL satellite radio interface and the associated satellite network. The present document also describes the satellite network architecture, the radio interface protocol architecture, and the network interfaces.

The Family SL satellite radio interface is intended to form part of the satellite component of IMT-2000 systems and is based on the components and interfaces of terrestrial UMTS.

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.

Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

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 123 060: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); General Packet Radio Service (GPRS); Service description; Stage 2 (3GPP TS 23.060 Release 4)".

[2]   Recommendation ITU-T Q.2210: "Message transfer part level 3 functions and messages using the services of ITU-T Recommendation Q.2140".

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 122 002: "Digital cellular telecommunications system (Phase 2+) (GSM); Universal Mobile Telecommunications System (UMTS); Circuit Bearer Services (BS) supported by a Public Land Mobile Network (PLMN) (3GPP TS 22.002 Release 4)".

[i.2]   ETSI TS 122 003: "Digital cellular telecommunications system (Phase 2+) (GSM); Universal Mobile Telecommunications System (UMTS); Circuit Teleservices supported by a Public Land Mobile Network (PLMN) (3GPP TS 22.003 Release 4)".

[i.3]   ETSI TS 123 002: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Network architecture (3GPP TS 23.002 Release 4)".

[i.4]   ETSI TR 127 901: "Universal Mobile Telecommunications System (UMTS); Report on Terminal Interfaces - An Overview (3GPP TR 27.901 Release 4)".

[i.5]   ETSI TS 123 246: "Universal Mobile Telecommunications System (UMTS); Multimedia Broadcast/Multicast Service (MBMS); Architecture and functional description (3GPP TS 23.246 Release 7)".

[i.6] ETSI TS 126 110: "Universal Mobile Telecommunications System (UMTS); Codec for Circuit Switched Multimedia Telephony Service; General Description (3GPP TS 26.110 Release 4)".

[i.7] Recommendation ITU-T Q.711: "Functional description of the signalling connection control part".

[i.8] ETSI TS 127 010: "Digital cellular telecommunications system (Phase 2+) (GSM); Universal Mobile Telecommunications System (UMTS); Terminal Equipment to Mobile Station (TE-MS) multiplexer protocol (3GPP TS 27.010 Release 4)".

[i.9] ETSI TS 127 007: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; AT command set for User Equipment (UE) (3GPP TS 27.007 Release 4)".

[i.10] ETSI TS 127 005: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Use of Data Terminal Equipment - Data Circuit terminating Equipment (DTE-DCE) interface for Short Message Service (SMS) and Cell Broadcast Service (CBS) (3GPP TS 27.005 Release 4)".

[i.11] ETSI TS 131 101: "Universal Mobile Telecommunications System (UMTS); UICC-terminal interface; Physical and logical characteristics (3GPP TS 31.101 Release 4)".

[i.12] ETSI TS 125 410: "Universal Mobile Telecommunications System (UMTS); UTRAN Iu Interface: General Aspects and Principles (3GPP TS 25.410 Release 4)".

[i.13] ETSI TS 125 411: "Universal Mobile Telecommunications System (UMTS); UTRAN Iu Interface Layer 1 (3GPP TS 25.411 Release 4)".

[i.14] ETSI TS 125 412: "Universal Mobile Telecommunications System (UMTS); UTRAN Iu interface signalling transport (3GPP TS 25.412 Release 4)".

[i.15] 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.16] ETSI TS 125 414: "Universal Mobile Telecommunications System (UMTS); UTRAN Iu interface data transport and transport signalling (3GPP TS 25.414 Release 4)".

[i.17] ETSI TS 125 415: "Universal Mobile Telecommunications System (UMTS); UTRAN Iu interface user plane protocols (3GPP TS 25.415 Release 4)".

[i.18] ETSI TS 125 419: "Universal Mobile Telecommunications System (UMTS); UTRAN Iu-BC interface: Service Area Broadcast Protocol (SABP) (3GPP TS 25.419 Release 4)".

[i.19] ETSI TS 129 016: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Serving GPRS Support Node SGSN - Visitors Location Register (VLR); Gs Interface Network Service Specification (3GPP TS 29.016 Release 4)".

[i.20] ETSI TS 129 018: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); General Packet Radio Service (GPRS); Serving GPRS Support Node (SGSN) - Visitors Location Register (VLR); Gs interface layer 3 specification (3GPP TS 29.018 Release 4)".

[i.21] ETSI TS 125 323: "Universal Mobile Telecommunications System (UMTS); Packet Data Convergence Protocol (PDCP) specification (3GPP TS 25.323 Release 4)".

[i.22] 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".

[i.23] 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".

[i.24] 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".

[i.25]   ETSI TS 124 008: "Digital cellular telecommunications system (Phase 2+) (GSM); Universal
             Mobile Telecommunications System (UMTS); Mobile radio interface Layer 3 specification; Core
             network protocols; Stage 3 (3GPP TS 24.008 Release 4)".

[i.26]   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.27]   IETF RFC 1661: "The Point-to-Point Protocol (PPP)".

3   Abbreviations

For the purposes of the present document, the abbreviations given in ETSI TS 102 744-1-4 [i.23], clause 3 apply.

4   User services

4.1   General service assumptions

The User Equipment (UE) will typically be realized as a separate satellite mobile terminal, which may be connected to
other user devices such as an external telephone and/or computer, as shown in Figure 4.1. To make use of the network
services, users insert their GSM/GPRS/UMTS subscriber identity module (SIM/USIM) into the UE and connect an
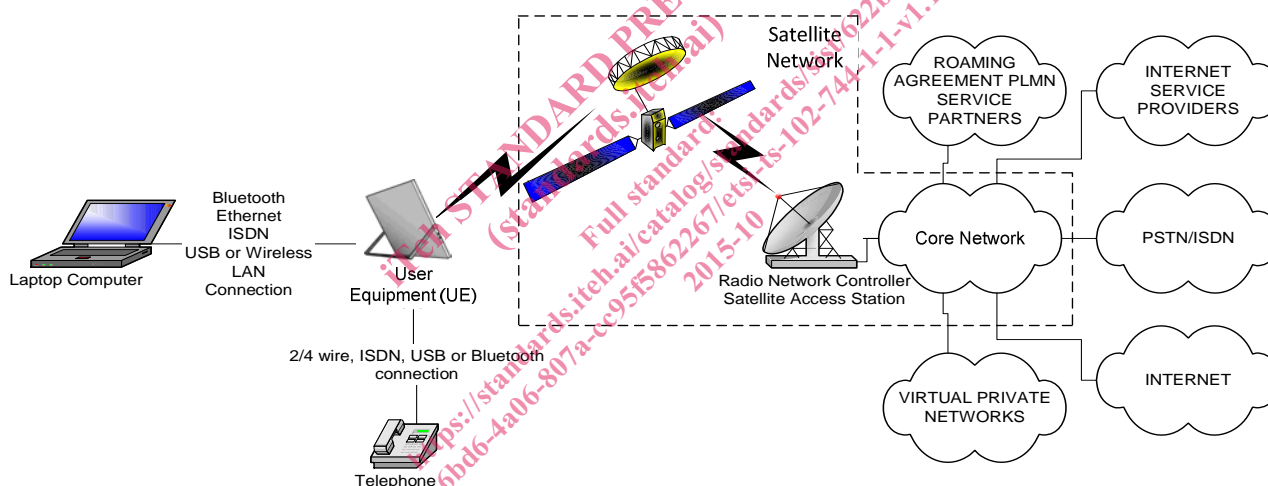external telephone handset and/or computer/PDA to the UE via a wireless or cabled connection.

Figure 4.1: Typical Satellite Network Set-up and Services

The satellite network will offer users the ability to make and receive telephony and ISDN calls via the directory
telephone number(s) associated with their subscriber identity module (SIM) issued by their home network. Users may
also be offered an "always-on" Internet/Intranet connection with fixed or dynamically assigned IP addresses (depending
on their subscription).

Data rates and connection options provided to users are dependent on the design and class (i.e.
pocket/notebook/briefcase size) of user equipment.

The satellite network operator (or Service Providers/Distribution Partners) will provision the suite of communication
services offered to users via the satellite network.

4.2   Circuit switched services

4.2.0   General

The Core Network provides speech telephony, 3,1 kHz audio or UDI/RDI circuit switched (CS) data services to mobile
users (UDI/RDI are the ISDN Unrestricted and Restricted Digital Information services, respectively).

Due to constraints within the core network, the satellite network can support the operation of a maximum of one circuit switched call per subscriber (IMSI) at any time. The operation of one or more Internet/GPRS sessions operating concurrently with a single circuit switched call (such as telephony or CS data) to a single subscriber is supported.

The directory telephone number(s) of the user will be those associated with their SIM/USIM subscription in their home network.

4.2.1 Circuit Switched Speech - Basic Telephony Service

The satellite network shall offer speech telephony services. A user may make outgoing and receive incoming speech telephone calls and may make use of a wide range of supplementary services (e.g. calling line ID, call waiting, etc.).

To make use of the service, a user connects an external telephone handset to the UE. The means of connecting the handset (e.g. 2/4 wire socket, Bluetooth, ISDN socket, etc.) is dependent on the features of the UE.

Telephone keypad and display capability depends on the features of the chosen UE type and connected equipment.

Initial user equipment does not use the voice coding technique specified by 3GPP (the Advanced Multi Rate codec, AMR). User equipment instead transmits and receives speech via a satellite optimized low data-rate codec that makes efficient use of satellite capacity whilst maintaining toll level speech quality. Conversion is carried out in the Core Network to ensure interoperability with other networks.

The satellite network incorporates the capability of supporting other codecs (including AMR) to ensure compatibility for future UE types.

4.2.2 Circuit Switched Voice - Emergency Calls

The satellite network shall support mobile originated emergency voice calls to designated Public Service Access Points (PSAPs). The Core Network may be configured by the operator/service provider to enable emergency calls to be made without a USIM/SIM card in the user equipment as described in ETSI TS 124 008 [i.25], clause 4.5.1.5. In addition the RNS may be configured by the operator to transmit a control flag broadcast in the system information which affects the UE behaviour (i.e. whether or not it may register without USIM). This feature is further described in ETSI TS 102 744-3-6 [i.24].

The user equipment (or the Core Network) shall recognize the dialled number as a designated "emergency number" and indicate to the network that an emergency call is required. The network shall route the Emergency Call to the PSAP appropriate to the geographical position reported by the user equipment. The core network incorporates the capability to report the GPS coordinates of the calling user to the called PSAP.

4.2.3 Circuit Switched Data - ISDN UDI/RDI (Unrestricted/Restricted Digital Information)

Selected UE types may offer the capability to initiate and receive ISDN UDI/RDI circuit switched data calls using a single 64 kbit/s channel per subscriber for user plane traffic.

In order to make use of this service some UE designs may feature an integrated or peripheral "basic-rate" ISDN socket with an S/T bus (allowing the UE to act as the network terminating device, NT-1). The socket allows users to connect standard ISDN end-user equipment conformant to the Euro-ISDN Basic Rate standard and make outgoing and incoming ISDN UDI/RDI data calls through the satellite network.

The satellite network may support the ISDN UDI/RDI service by providing one 64 kbit/s "B Channel" per user and may prohibit a user operating other circuit switched services at the same time as ISDN.

RDI user plane transmission is handled in the satellite network as per UDI, i.e. with a guaranteed bit rate of 64 kbit/s.

A potential additional application for the UDI/RDI service is for transporting circuit-switched video conferencing traffic encoded using the 3G-H324M suite of encoding standards (the standards proposed for real-time mixed media circuit-switched calls over 3G mobile networks), as described in ETSI TS 126 110 [i.6]. In cases where the User Equipment does not have built in audio/video capability, the software/hardware for encoding, decoding and presenting these transmissions is assumed to be provided in the equipment attached to the UE.