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

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## 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).

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# 1 Scope

The present document defines the extension to the Non-Access Stratum (NAS) Layer peer-to-peer interface (defined in ETSI TS 124 007 [1] and ETSI TS 124 008 [2]) of the Family SL satellite radio interface between the Radio Network Controller (RNC) and the User Equipment (UE) used in the satellite network, that is required in order to support MBMS services.

## 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 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 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)".
- [3] ETSI TS 123 003: "Digital cellular telecommunications system (Phase 2+) (GSM); Universal Mobile Telecommunications System (UMTS); Numbering, Addressing and Identification (3GPP TS 23.003 Release 4)".
- [4] IETF RFC 1661 (1994): "The Point-to-Point Protocol (PPP)".
- [5] IETF RFC 1332 (1992): "The PPP Internet Protocol Control Protocol (IPCP)".
- [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".
- [7] 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".
- [8] 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".
- [9] 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".
- [10] 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

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

- [i.1] 3GPP TR 29.846: "3rd Generation Partnership Project (3GPP); Technical Specification Group Core Networks; Multimedia Broadcast/Multicast Service (MBMS); CN1 procedure description (Release 4)".

---

## 3 Symbols and abbreviations

### 3.1 Symbols

For the purposes of the present document, the symbols in clause 3 of ETSI TS 102 744-1-4 [7] apply.

### 3.2 Abbreviations

For the purposes of the present document, the abbreviations in clause 3 of ETSI TS 102 744-1-4 [7] apply.

---

## 4 Introduction

### 4.1 Non-Access Stratum Layer

The Non-Access Stratum (NAS) Layer provides support to the Internet Protocol (IP) Layer via the User Plane Handler (UPH), and uses the services provided by the Adaptation Layer (AL).

The IP Layer provides support to routing protocols, such as the Internet Group Management Protocol (IGMP) used by IPv4 systems to report their IP multicast group memberships to neighbouring multicast routers. The IGMP protocol (or PIM-SM) is used to trigger the supported multicast services. Session management (SM) messages are used to instantiate the MBMS contexts. The Adaptation Layer interface and operation is described in ETSI TS 102 744-3-5 [9] and ETSI TS 102 744-3-6 [10] respectively.

The present document defines the extension to the NAS Layer peer-to-peer interface (defined in ETSI TS 124 007 [1] and ETSI TS 124 008 [2]) between the RNC and the UE that is required in order to support MBMS services, as shown in Figure 4.1.

All of the messages defined in the present document to replace functionality in 3GPP are Session Management messages. All other messages not specified in the present document but that appear in 3GPP Release 4 should still be supported.

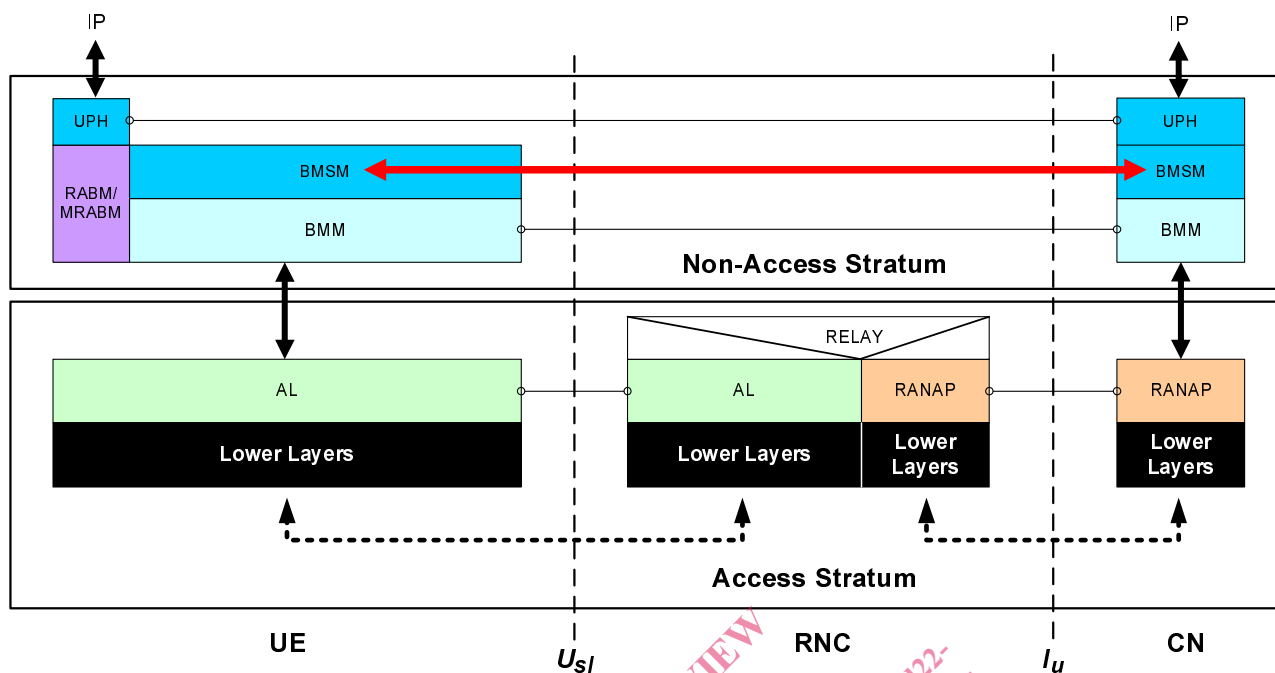


Figure 4.1: Satellite Network Higher Layers (NAS and IP)

The NAS Layer is responsible for the following:

- **Multicast Radio Access Bearer Manager (MRABM):** is responsible for controlling establishment, modification and termination of Access Stratum Unicast Radio Access Bearers (RABs) and Multicast Radio Access Bearers (MRABs) on the In-Broadcast Multicast (BM) interface towards the RAN.
- **Broadcast/Multicast Mobility Management (BMM):** is responsible for mobility management for a UE which is operating with the BM domain. The BMM entity replicates the functionality of the GPRS Mobility Management (GMM) entity towards the Broadcast Multicast Service Node (BMSN).
- **Broadcast/Multicast Session Management (BMSM):** is responsible in the for NAS signalling towards the BM domain, replicating the functionality of the Session Management (SM) entity for establishing and maintaining the Radio Access Bearer (RAB) endpoints for BM domain traffic handling. Within the BMSM entity, the state of each Packet Data Protocol (PDP) Context, and the association with activated MBMS Contexts is maintained.

It should be noted that the BMSM entity is the only entity for which a modification to the associated Packet Switched domain NAS Layer behaviour and peer-peer interface is required, the extensions to this interface being specified within the present document.

## 4.2 Conventions used in the present document

### 4.2.1 Presentation

The following conventions are applied throughout the present document:

- In the ASN.1, variable names are always in lower case letters with hyphenation used to improve readability (e.g. *message-type*). Data Types in the ASN.1 always start with an upper case letter and may contain additional upper case letters to improve readability (e.g. *MessageType*).
- In the explanatory text these variables are referred to in italics (e.g. *message-type*) while Data Types are shown in Helvetica typeface (e.g. BCnPDU).



The layout of the data structures defined in the ASN.1 is also shown in a graphical representation. In general, the variable names are presented in the same way they are presented in the ASN.1, with the following exceptions:

- insufficient space does not allow the complete variable name to be presented and is therefore abbreviated;
- only one particular value can be assigned to a variable in the particular structure that is presented. In this case the variable is replaced by the appropriate numerical value;
- additional information may be added in brackets for explanatory reasons.

#### 4.2.2 "Reserved" Fields and Values

Fields shown as **Reserved BITSTRING** (..) in the ASN.1 structures shall be set to zero by the sender and shall be ignored by the receiver.

Values not allocated in distinguished value lists shall not be used by the sender and shall be ignored by the receiver.

NOTE: Distinguished Value Lists of type Integer are being used instead of the ENUMERATED data type, where the allocated number range is larger than the number of items to be enumerated.

#### 4.2.3 Boolean Variables

BOOLEAN variables shall be encoded as follows:

```
TRUE      ::= 1
FALSE     ::= 0
```

#### 4.2.4 ASN.1 Encoding Rules

The ASN.1 presentation provided in the present document for this interface specification is normative. The encoding rules used for this interface specification are provided in clause 4.4.4 of ETSI TS 102 744-3-1 [8].

---

## 5 NAS Layer Interface

### 5.1 NAS layer use of AL service access points

Protocol entities in the NAS Layer use message transport services provided by the Adaptation Layer to communicate with their peers through two Service Access Points (SAPs):

- MMAL-SAP: MM to Adaptation Layer Service Access Point (CS domain)
- GMMAL-SAP: GMM to Adaptation Layer Service Access Point (PS domain)
- BMMAL-SAP: BMM to Adaptation Layer Service Access Point (BM domain)

These service access points are described in more detail in ETSI TS 102 744-3-6 [10].

### 5.2 NAS Layer MBMS Service Management Messages

The NAS Layer MBMS Service Management messages shown in Table 5.1 are supported between the UE and BMSN. The interfaces between the UE and the BMSN are shown in Figure 7.1 in ETSI TS 102 744-1-1 [6].

Table 5.1: Multicast NAS messages

NAS Message	Direction	Key Parameters
Activate_PDPContext_Request	UE→BMSN	TI, Requested NSAPI, Requested QoS, Requested PDPAddress, APN, Protocol Config Options
Activate_PDPContext_Accept	UE←BMSN	TI, Negotiated QoS, PDPAddress, Protocol Config Options
Activate_PDPContext_Reject	UE←BMSN	TI, SMCause
Deactivate_PDPContext_Request	UE→BMSN UE←BMSN	TI, SMCause
Deactivate_PDPContext_Accept	UE←BMSN UE→BMSN	TI
Request_MBMSContext_Activation	UE←BMSN	TI, Linked NSAPI, Offered MulticastAddress, APN, TFT, TMGI
Request_MBMSContext_Activation_Reject	UE→BMSN	TI, SMCause
Activate_MBMSContext_Request	UE→BMSN	TI, Requested MBMS NSAPI, Supported MBMS Bearer Capabilities, Requested Multicast address, APN, Linked TI, TMGI, MBMS Protocol Config Options
Activate_MBMSContext_Accept	UE←BMSN	TI, TMGI
Activate_MBMSContext_Reject	UE←BMSN	TI, SMCause
Activate_SecPDPContext_Request	UE→BMSN	TI, Requested NSAPI, Requested QoS, Linked TI, TFT, Protocol Config Options
Activate_SecPDPContext_Accept	UE←BMSN	TI, Negotiated QoS, Protocol Config Options
Activate_SecPDPContext_Reject	UE←BMSN	TI, SMCause

## 6 NAS Layer Protocol Data Units

### 6.1 General NAS PDU Structure

#### 6.1.0 General

The following sections define the format of the Protocol Data Units (PDUs) which are used by the NAS Layer to signal its peer (NAS-PDUs). The proposed format is similar to the 3GPP L3 messages as defined in ETSI TS 124 007 [1]. This means that the message consists of the following parts:

- protocol discriminator;
- transaction identifier;
- message type;
- other information elements, as required.

The general NAS message format is shown in Figure 6.1.

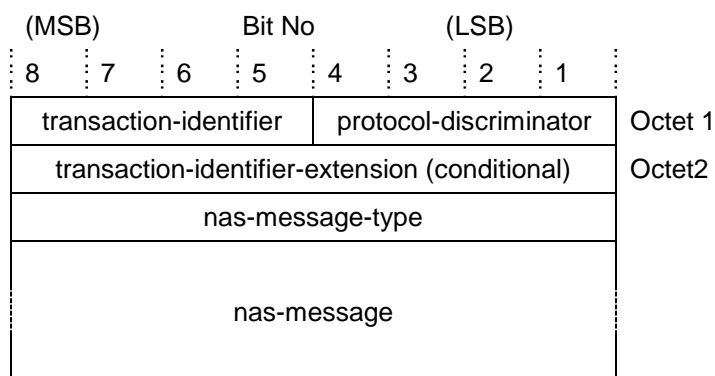


Figure 6.1: General NAS PDU format

The general format of a NAS PDU can be considered as follows:

```
NasPDU ::= SEQUENCE {
    nas-header NasHeader,
    nas-message-type NasMessageType,
    nas-message NasMessage
}
```

Where the NAS Header consists of the following:

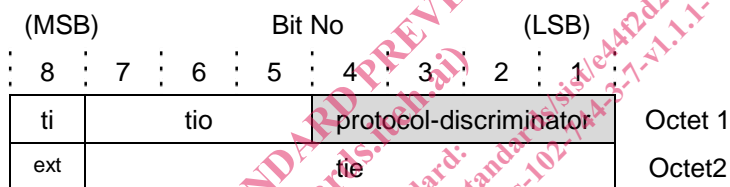
```
NasHeader ::= SEQUENCE {
    transaction-identifier TransactionIdentifier,
    protocol-discriminator ProtocolDiscriminator,
    transaction-identifier-extension TIE OPTIONAL
}
```

## 6.1.1 NAS PDU Header Common Elements

### 6.1.1.1 TransactionIdentifier (TI)

The transaction identifier and its use are defined in ETSI TS 124 007 [1].

The TI is defined in ETSI TS 124 007 [1] to half an octet in length, with an option to extend the TI to one and half octet. The structure of TI is as shown in Figure 6.2.



**Figure 6.2: Transaction Identifier format**

Two identical TI values may be used when each value pertains to a transaction initiated by the different sides of the interface. In this case the TI flag shall avoid ambiguity. The transaction identifier flag can take the values "0" or "1". The TI flag is used to identify which side of the interface initiated the transaction. A message has a TI flag set to "0" when it belongs to transaction initiated by its sender, and to "1" otherwise. Hence the TI flag identifies who allocated the TI value for this transaction and the only purpose of the TI flag is to resolve simultaneous attempts to allocate the same TI value.

The TIE shall not be used unless TI values of 7 or greater are needed.

The transaction-identifier parameter is of type TransactionIdentifier which is defined as follows:

```
TransactionIdentifier ::=
    SEQUENCE {
        ti TI,
        tio TIO
    }
TI ::= BOOLEAN;
    --FALSE if transaction initiated by its sender,TRUE otherwise
TIO ::= INTEGER(0..7);
    --If TIO(7), the TI value is given by the TIE in octet 2
```

The extended transaction identifier parameter is of type TIE, is only present if TIO has value 7, and is defined as follows:

```
TIE ::= INTEGER(0..127);
    -- TIE(0-6) Reserved
```

### 6.1.1.2 ProtocolDiscriminator

The Protocol Discriminator (PD) and its use are defined in ETSI TS 124 007 [1]. Normally the PD is half octet length with all values reserved. All NAS messages towards the BM domain shall utilize a half-octet long PD, adopting the binary value of '1010', representing GPRS Session Management messages.

The protocol-discriminator parameter is of type ProtocolDiscriminator which is defined as follows:

```
ProtocolDiscriminator ::=
  INTEGER {
    Session Management (10)
  } (0..15)
```

### 6.1.1.3 NasMessageType

The message type Information Element (IE) and its use are defined in ETSI TS 124 007 [1]. The values used towards the BM domain are as specified for GPRS Session Management and are shown in Table 6.1.

**Table 6.1: Multicast message type values relevant to the BM domain**

Bits								
8	7	6	5	4	3	2	1	
0	1	-	-	-	-	-	-	Session management messages
0	1	0	0	0	0	0	1	Activate PDP context request
0	1	0	0	0	0	1	0	Activate PDP context accept
0	1	0	0	0	0	1	1	Activate PDP context reject
0	1	0	0	0	1	1	0	Deactivate PDP context request
0	1	0	0	0	1	1	1	Deactivate PDP context accept
0	1	0	0	1	1	0	1	Activate secondary PDP context request
0	1	0	0	1	1	1	0	Activate secondary PDP context accept
0	1	0	0	1	1	1	1	Activate secondary PDP context reject
0	1	0	1	0	1	1	0	Activate MBMS Context Request
0	1	0	1	0	1	1	1	Activate MBMS Context Accept
0	1	0	1	1	0	0	0	Activate MBMS Context Reject
0	1	0	1	1	0	0	1	Request MBMS Context Activation
0	1	0	1	1	0	1	0	Request MBMS Context Activation Reject

```
NasMessageType ::=
  INTEGER {
    ActivatePDPCContextRequest (65),
    ActivatePDPCContextAccept (66),
    ActivatePDPCContextReject (67),
    DeactivatePDPCContextRequest (70),
    DeactivatePDPCContextAccept (71),
    ActivateSecondaryPDPCContextRequest (77),
    ActivateSecondaryPDPCContextAccept (78),
    ActivateSecondaryPDPCContextReject (79),
    ActivateMBMSContextRequest (86),
    ActivateMBMSContextAccept (87),
    ActivateMBMSContextReject (88),
    RequestMBMSContextActivation (89),
    RequestMBMSContextActivationReject (90),
  } (0..255)
```

## 6.2 Format of standard information elements

Standard IE and its use are defined in ETSI TS 124 007 [1] and may have the following parts, in that order:

- an information element identifier (IEI) ;
- a length indicator (LI);
- a value part.