



**Satellite Earth Stations and Systems (SES);  
Family SL Satellite Radio Interface (Release 1);  
Part 3: Control Plane and User Plane Specifications;  
Sub-part 9: Initiation and Operation of User Plane**

*ITeH STANDARD PREVIEW  
(standards.iteh.ai/catalog/standards/sist/102-744-3-9/v1.1.1/2015-10)  
https://standards.iteh.ai/catalog/standards/sist/102-744-3-9/v1.1.1/2015-10  
498a-b499-0b4dce058be4/etsi-ts-102-744-3-9-v1.1.1-2015-10*

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**Reference**

DTS/SES-00299-3-9

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**Keywords**3GPP, GPRS, GSM, GSO, interface, MSS,  
radio, satellite, TDM, TDMA, UMTS**ETSI**650 Route des Lucioles  
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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 9 of a multi-part deliverable. Full details of the entire series can be found in ETSI TS 102 744-1-1 [10].

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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).

# 1 Scope

The present document defines the necessary control plane behaviour for instantiation and initiation of the User Plane entities, and also describes the operation of the User Plane entities for the Family SL satellite radio interface between the Radio Network Controller (RNC) and the User Equipment (UE) used in the satellite network.

## 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>.

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

- [1] 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)".
- [2] ETSI TS 126 103: "Universal Mobile Telecommunications System (UMTS); Speech Codec List for GSM and UMTS (3GPP TS 26.103 Release 4)".
- [3] ETSI TS 123 014: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Support of Dual Tone Multi Frequency (DTMF) signalling (3GPP TS 23.014 Release 4)".
- [4] ETSI TS 125 415: "Universal Mobile Telecommunications System (UMTS); UTRAN Iu Interface User Plane Protocols (3GPP TS 25.415 Release 4)".
- [5] 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)".
- [6] ETSI TS 125 323: "Universal Mobile Telecommunications System (UMTS); Packet Data Convergence Protocol (PDCP) specification (3GPP TS 25.323 Release 4)".
- [7] ETSI TS 127 007: "Digital cellular telecommunications system (Phase 2+) (GSM); Universal Mobile Telecommunications System (UMTS); AT command set for User Equipment (UE) (3GPP TS 27.007 Release 4)".
- [8] ETSI TS 127 001: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); General on Terminal Adaptation Functions (TAF) for Mobile Stations (MS) (3GPP TS 27.001 Release 4)".
- [9] 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)".
- [10] 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".
- [11] 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".

- [12] 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".
- [13] 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".
- [14] 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".
- [15] 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".
- [16] 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".

## 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] IETF RFC 2507: "IP Header Compression".
- [i.2] IETF RFC 3095: "RObust Header Compression (ROHC): Framework and four profiles: RTP, UDP, ESP, and uncompressed".
- [i.3] IETF RFC 2508: "Compressing IP/UDP/RTP Headers for Low-Speed Serial Links".
- [i.4] ETSI TR 123 910: "Digital cellular telecommunications system (Phase 2+) (GSM); Universal Mobile Telecommunications System (UMTS); Circuit Switched Data Bearer Services (3GPP TR 23.910 Release 4)".

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## 3 Symbols and abbreviations

### 3.1 Symbols

For the purposes of the present document, the symbols given in clause 3 of ETSI TS 102 744-1-4 [11] apply.

### 3.2 Abbreviations

For the purposes of the present document, the abbreviations given in clause 3 of ETSI TS 102 744-1-4 [11] apply.

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## 4 User Plane Operation

### 4.0 Overview

The present document specifies the behaviour of the User Plane in both the RNC and UE and covers the following:

- the provision of a circuit switched (CS) 4 kbit/s voice service using a satellite optimized low data rate voice codec;



- the provision of a circuit switched (CS) 64 kbit/s Unrestricted Digital Information (UDI)/Restricted Digital Information (RDI)/3,1 kHz audio service (BS 30); and
- the provision of a packet switched (PS) service employing the Packet Data Convergence Protocol (PDCP).

The present document also covers the elements of the Call Control signalling related to the provision of the above circuit switched services.

Figure 4.1 and Figure 4.2 illustrate the CS and PS User Plane stack architectures.

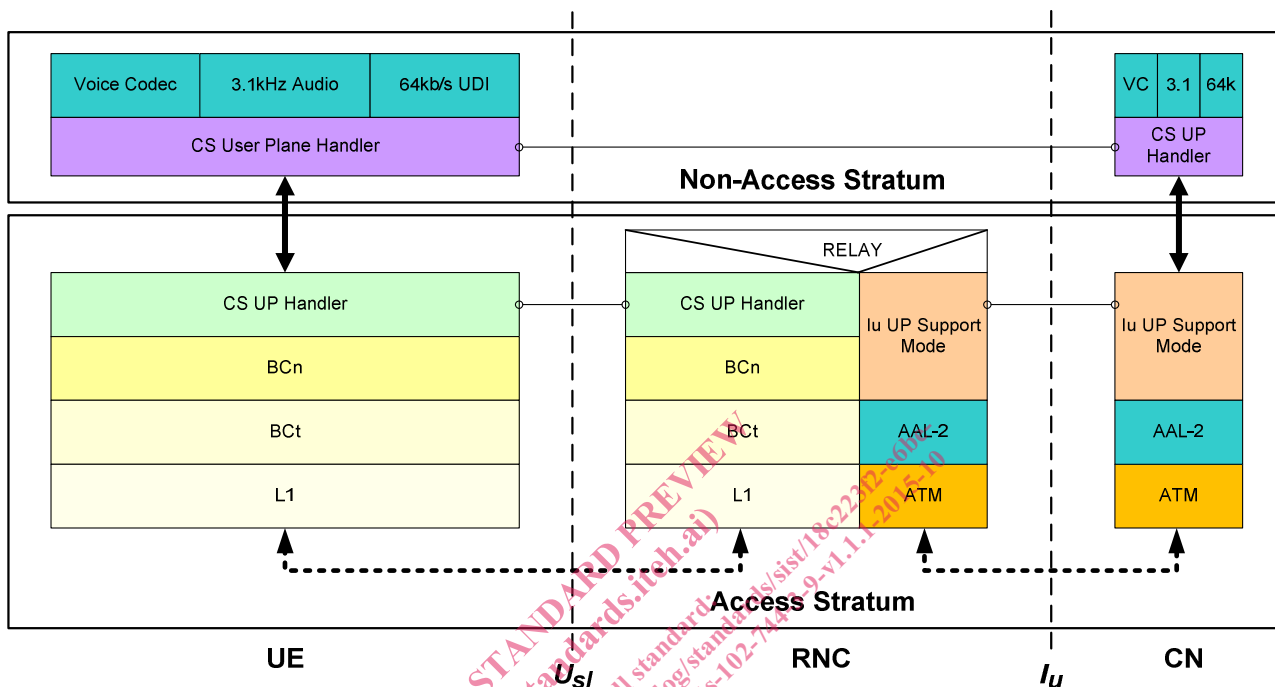


Figure 4.1: Circuit Switched User Plane Protocol Stack Layering showing NAS Layer Entities

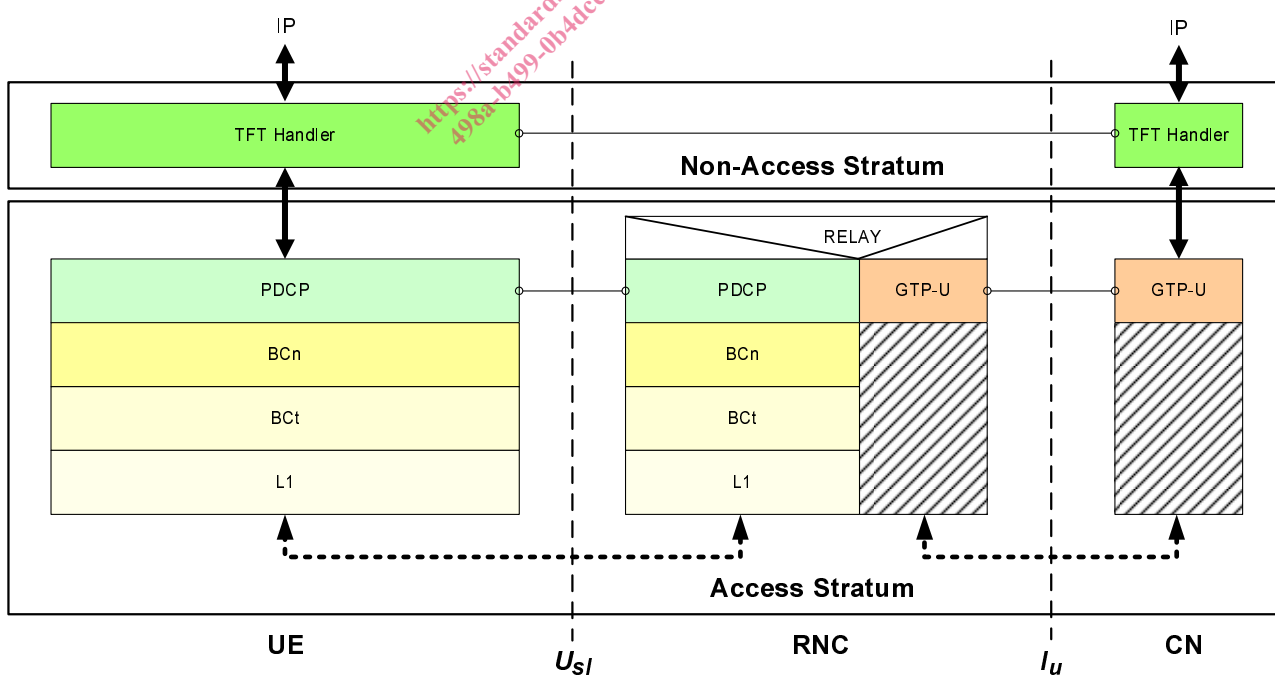


Figure 4.2: Packet Switched User Plane Protocol Stack Layering

## 4.1 Outline of Circuit Switched User Plane

### 4.1.0 General

The circuit switched user plane makes use of the CSH (Circuit Switched Handler) to provide services to the Non Access Stratum at the UE or the Relay function at the RNC. CSH is a satellite network specific sublayer and is specified in this and following clauses.

### 4.1.1 Architecture

Figure 4.3 shows the architecture of the CSH layer at the UE side. Figure 4.4 shows the architecture of the CSH at the RNC side. The CSH layer consists of a CSH Manager and one data handler per CS connection. Two types of data handler are defined.

The Adaptation Layer, a Radio Bearer Control (RBC) entity, configures the CSH sublayer through the CSH-RBC-SAP. The CSH Manager retrieves the information required to select the appropriate data handler and DTX (discontinuous transmission) type from the Call Control layer via the CSH-CC-SAP.

The data handlers supported by the CSH layer are:

- 4 kbit/s voice circuit switched handler (VCSH)
- 64 kbit/s circuit switched handler (BCSH)

The CSH Manager, based on the requests received from RBC and information provided from the Call Control Layer, shall create a data handler.

The 4 kbit/s voice circuit switched data handler is described in clause 5.1 of the present document. The 64 kbit/s circuit switched data handler is described in clause 6.1 of the present document.

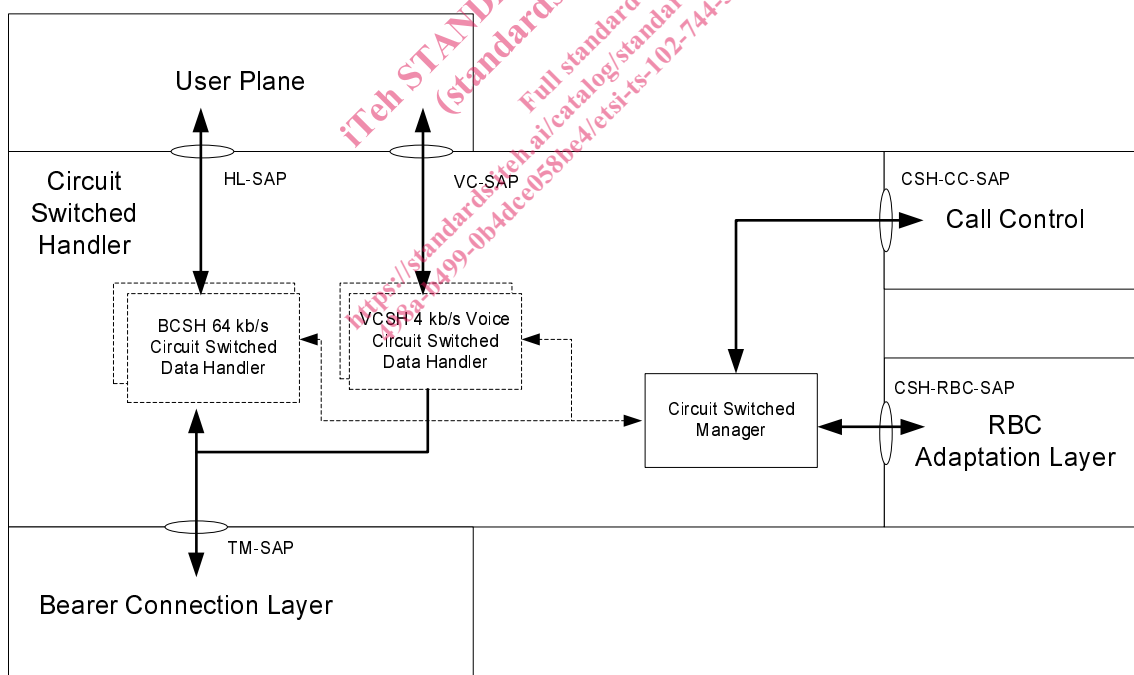


Figure 4.3: Circuit Switched Handler Layer Architecture (UE Side)

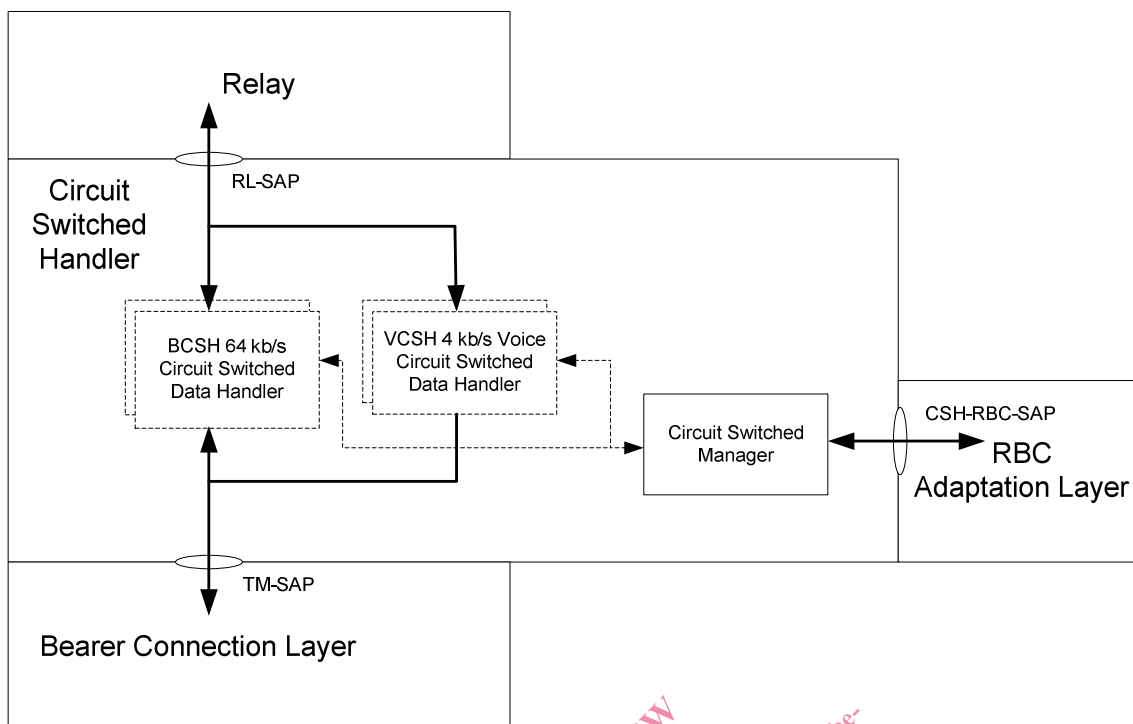


Figure 4.4: Circuit Switched Handler Layer Architecture (RNC Side)

## 4.1.2 Functions

The CSH Layer provides its services to the Non Access Stratum (NAS) at the UE or the relay at the Radio Network Controller (RNC).

The CSH Layer shall perform the following functions:

- Concatenation and separation of circuit switched data frames (satellite optimized low data rate voice codec frames or 640 bit higher layer frames for 64 kbit/s circuit switched services).
- Discontinuous transmission.
- Transfer of user data. This function is used for conveyance of data between users of CSH services.

CSH uses the services provided by the Bearer Connection sublayer.

## 4.1.3 Services

### 4.1.3.1 Services Provided to Upper Layers

The following services are provided by the CSH Layer towards the upper layers:

- Transfer of user data.

### 4.1.3.2 Services Expected from Bearer Connection Layer

The following services are expected from the Bearer Connection Layer:

- Transparent data transfer service.

## 4.1.4 Elements for layer-to-layer communication

### 4.1.4.0 General

The interaction between the CSH layer and other layers is described in terms of primitives where the primitives represent the logical exchange of information and control between CSH and other layers. The primitives shall not specify or constrain implementation.

#### 4.1.4.1 Control Plane Primitives between the CSH layer and adaptation layer

The control primitives between the CSH layer and the adaptation layer are shown in Table 4.1 for the UE side and Table 4.2 for the RNC side.

**Table 4.1: Control Plane Primitives between the CSH Layer (CSH Manager) and the adaptation layer RBC entity (UE side)**

SAP	Generic Name	Parameter			
		_REQ	_IND	_RESP	_CNF
CSH-RBC-SAP	CSH_RBC_CONFIG	BCnID(Data-SAP), ForwardCSFramesPerPDU, ReturnCSFramesPerPDU, Ret_DTX	Not Defined	Not Defined	BCnID (Data-SAP), CircuitSwitchedCallType
CSH-RBC-SAP	CSH_RBC_RELEASE	BCnID (Data-SAP)	Not Defined	Not Defined	Not Defined

**Table 4.2: Control Plane Primitives between CSH Layer (CSH Manager) and the adaptation layer RBC entity (RNC side)**

SAP	Generic Name	Parameter			
		_REQ	_IND	_RESP	_CNF
CSH-RBC-SAP	CSH_RBC_CONFIG	BCnID (Data-SAP), ForwardCSFramesPerPDU, ReturnCSFramesPerPDU, Fwd_DTX, CircuitSwitchedCallType	Not Defined	Not Defined	Not Defined
CSH-RBC-SAP	CSH_RBC_RELEASE	BCnID (Data-SAP)	Not Defined	Not Defined	Not Defined

Each Primitive is defined as follows:

1) CSH\_RBC\_CONFIG\_REQ

CSH\_RBC\_CONFIG\_REQ is used by RBC to configure a CSH entity and to assign it to the bearer connection associated with that entity.

2) CSH\_RBC\_CONFIG\_CNF

CSH\_RBC\_CONFIG\_CNF is used by the CSH on the UE side to forward to RBC the CircuitSwitchedCallType (retrieved from the CC layer) which RBC shall return with the RBC:EstablishAck to configure the RNC side CSH Data Handler (i.e. select the CSH data handler/DTX Algorithm on the RNC side appropriate for 4 kbit/s voice, UDI, RDI or 3,1 kHz audio services).

3) CSH\_RBC\_RELEASE\_REQ

CSH\_RBC\_RELEASE\_REQ is used by RBC to release a CSH entity.

The following parameters are used in the primitives:

1) BCnID (Data-SAP)

The BCn-SAP (Transparent Mode) used by CSH when communicating with the Bearer Connection (BCn) Layer.

2) ForwardCSFramesPerPDU

The number of satellite optimized low data rate codec frames (80 bits) or higher layer 64 kbit/s frames (640 bits) concatenated into a single CSH Protocol Data Unit (PDU) for transmission via the Bearer Connection Layer in the forward direction.

## 3) ReturnCSFramesPerPDU

The number of satellite optimized low data rate codec frames (80 bits) or higher layer 64 kbit/s frames (640 bits) concatenated into a single CSH PDU for transmission via the Bearer Connection Layer in the return direction.

NOTE 1: The values of *ForwardCSFramesPerPDU* and *ReturnCSFramesPerPDU* are passed to the UE in the Establish message during the Radio Access Bearer (RAB) setup. They are set independently of each other and apply for the lifetime of the RAB (i.e. the duration of the call) only. *ForwardCSFramesPerPDU* and *ReturnCSFramesPerPDU* have a value range of 1 to 8 frames per PDU. The values of these two parameters are operator configurable at the RNC for the purpose of making the most efficient use of the selected bearer type.

## 4) Ret\_DTX

Boolean Indicating that DTX is or is not to be invoked for return direction transmission.

## 5) Fwd\_DTX

Boolean Indicating that DTX is or is not to be invoked for forward direction transmission.

NOTE 2: Discontinuous Transmission is operator configured at the RNC. Discontinuous transmission in the forward and return directions may be enabled independently. The DTX flags are passed from the RNC to the UE in the RBC: Establish message during the RAB setup. The invocation of DTX applies for the lifetime of the RAB (i.e. the duration of the call) only.

## 6) CircuitSwitchedCallType

The following Circuit Switched Call Types are supported:

- 4 kbit/s Speech Call using the satellite optimized low data rate voice codec (*CircuitSwitchedCallType* = "type-4kbits-speech")
- 64 kbit/s Circuit for Pulse Code Modulation (PCM) coded analog modem, analog fax or high quality speech (*CircuitSwitchedCallType* = "type-3pt1khz-audio")
- 64 kbit/s Circuit for Integrated Service Digital Network (ISDN) Data (*CircuitSwitchedCallType* = "type-udi-isdn")
- 56 kbit/s Circuit for ISDN Data (*CircuitSwitchedCallType* = "type-rdi-isdn").

The mapping of Call Control Bearer Capability Information Element to *CircuitSwitchedCallType* is presented in annex A.

The mechanism for determining the required circuit switched service at the border of the satellite network (i.e. terminal equipments attached to the satellite network UE or external networks) is discussed in annex C.

The *CircuitSwitchedCallType* = "type-4kbits-speech" triggers the Circuit Switched Manager to invoke the data handler for the 4 kbit/s voice circuit (VCSH) as described in clause 5.

The *CircuitSwitchedCallTypes* = "type-3pt1khz-audio", "type-udi-isdn" or "type-rdi-isdn" invoke the data handler for the 64 kbit/s service (BCSH) as described in clause 6.

#### 4.1.4.2 Control Plane Primitives between CSH and Call Control Layer

The control primitives between the CSH Manager and the Call Control layer at the UE are shown in Table 4.3.

NOTE: The Service Access Point interface to the Call Control layer, shown here, is only for the purpose of illustrating the requirement to pass Circuit Switched Call Type information between CC and CSH and does not specify or constrain implementation. The SAP is not specified in [1].