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SIST EN 301 790 V1.2.2:2003
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Digitalna videoradiodifuzija (DVB) – Povratni kanal za satelitske distribucijske sisteme

Digital Video Broadcasting (DVB); Interaction channel for satellite distribution systems

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Contents

Intellectual Property Rights	7
Foreword	7
1 Scope.....	8
2 References	8
3 Definitions, symbols and abbreviations	9
3.1 Definitions	9
3.2 Symbols	9
3.3 Abbreviations.....	9
4 Reference Models for Satellite Interactive Networks in DVB	11
4.1 Protocol Stack Model	11
4.2 System Model	12
4.3 Reference Model of the Satellite Interactive Network.....	13
5 Forward Link.....	14
6 Return Link Base-band Physical Layer Specification and Multiple Access Definition	14
6.1 RCST synchronization.....	15
6.1.1 Timing Control	15
6.1.2 Carrier synchronization	15
6.1.3 Burst synchronization.....	15
6.1.4 Symbol clock synchronization.....	16
6.2 Burst Format	16
6.2.1 Traffic (TRF) burst formats.....	16
6.2.1.1 ATM TRF burst.....	16
6.2.1.2 Optional MPEG2-TS TRF burst.....	16
6.2.2 Synchronization and acquisition burst formats.....	17
6.2.2.1 Synchronization (SYNC) burst format.....	17
6.2.2.2 Acquisition (ACQ) burst.....	17
6.2.3 Common Signalling Channel (CSC) burst format.....	18
6.2.4 Bit Numbering and Interpretation	19
6.2.5 Transmission Order.....	19
6.3 Randomization for energy dispersal	19
6.4 Coding	20
6.4.1 CRC error detection code	20
6.4.2 Reed Solomon outer coding.....	20
6.4.3 Convolutional inner coding	20
6.4.4 Turbo code.....	21
6.4.4.1 Description of the turbo code permutation	22
6.4.4.2 Determination of the circulation states	23
6.4.4.3 Rates and puncturing map	23
6.4.4.4 Order of transmission and mapping to QPSK constellation	24
6.5 Modulation.....	25
6.5.1 Bit mapping to QPSK constellation	25
6.5.2 Baseband shaping and quadrature modulation.....	25
6.5.3 Output power control	26
6.5.4 Guard Time.....	26
6.6 MAC messages	26
6.6.1 Prefix Method.....	26
6.6.1.1 Prefix method mechanism.....	26
6.6.1.2 Satellite Access Control (SAC) field	26
6.6.2 Data unit labelling method (DULM).....	27
6.6.2.1 DULM with ATM-formatting	27
6.6.2.2 DULM with MPEG-formatting	29
6.6.3 Mini-slot Method	30
6.6.4 Contention based Mini-slot Method.....	30

6.7	Multiple Access.....	30
6.7.1	MF-TDMA	30
6.7.1.1	Fixed MF-TDMA	30
6.7.1.2	Dynamic MF-TDMA (Optional)	31
6.7.1.3	Frequency range	31
6.7.2	Segmentation of the return link capacity	32
6.7.2.1	Superframes	32
6.7.2.2	Frames	33
6.7.2.3	Timeslots.....	33
6.8	Capacity request categories.....	34
6.8.1	Continuous Rate Assignment (CRA)	34
6.8.2	Rate Based Dynamic Capacity (RBDC).....	34
6.8.3	Volume Based Dynamic Capacity (VBDC)	34
6.8.4	Absolute Volume Based Dynamic Capacity (AVBDC)	34
6.8.5	Free Capacity Assignment (FCA).....	34
7	Synchronization procedures	35
7.1	Overall Events Sequencing	35
7.2	Initial synchronization procedure	37
7.3	Logon procedure	38
7.4	Coarse synchronization procedure (Optional).....	38
7.5	Fine Synchronization Procedure (Optional).....	39
7.6	Synchronization Maintenance procedure.....	40
7.7	Logoff Procedure	41
7.7.1	General.....	41
7.7.2	Normal	41
7.7.3	Abnormal.....	41
8	iTeh STANDARD PREVIEW (standards.iteh.ai) Control and management	41
8.1	Protocol stack.....	41
8.1.1	RCST Type A (IP)	41
8.1.2	Optional RCST Type B (Native ATM)	43
8.2	RCST Addressing.....	44
8.3	Forward Link Signalling.....	44
8.3.1	General SI Tables.....	44
8.3.1.1	Superframe Composition Table (SCT)	44
8.3.1.2	Frame Composition Table (FCT)	44
8.3.1.3	Time-Slot Composition Table (TCT)	45
8.3.1.4	Satellite Position Table (SPT)	45
8.3.1.5	Correction Message Table (CMT).....	45
8.3.1.6	Terminal Burst Time Plan (TBTP)	45
8.3.2	Terminal Information Message (TIM)	45
8.3.3	PCR Insertion TS Packet.....	45
8.3.4	Summary	45
8.3.5	Repetition Rates.....	46
8.4	Return Link Signalling	46
8.4.1	RCST synchronization and Identification messages	46
8.4.2	Configuration parameters between RCST and NCC (optional)	47
8.4.3	Other Messages for Network Management (optional)	47
8.4.4	Burst Time Plan Exchange	48
8.5	Coding of SI for Forward Link Signalling.....	48
8.5.1	Introduction	48
8.5.2	SI Table Mechanism	48
8.5.3	DSM-CC Section Mechanism	48
8.5.4	Coding of PID and table_id fields.....	49
8.5.5	Table definitions	49
8.5.5.1	Standard Section Headers	49
8.5.5.1.1	SI Section Header.....	50
8.5.5.1.2	DSM-CC Private Section Header.....	51
8.5.5.2	Superframe Composition Table (SCT)	52
8.5.5.3	Frame Composition Table (FCT)	54
8.5.5.4	Timeslot Composition Table (TCT)	55

8.5.5.5	Satellite Position Table (SPT)	58
8.5.5.6	PCR Insertion Transport Stream packet.....	58
8.5.5.6.1	TS packet format.....	58
8.5.5.6.2	Adaptation field	59
8.5.5.6.3	Optional Payload field.....	59
8.5.5.7	Terminal Burst Time Plan (TBTP)	60
8.5.5.8	Terminal Information Message (TIM)	62
8.5.5.9	Correction Message Table (CMT)	64
8.5.5.10	Descriptor coding	66
8.5.5.10.1	Descriptor Identification and location	66
8.5.5.10.2	Network Layer Info Descriptor (optional).....	66
8.5.5.10.3	Correction Message descriptor.....	67
8.5.5.10.4	Logon Initialize Descriptor	68
8.5.5.10.5	ACQ Assign Descriptor.....	70
8.5.5.10.6	SYNC Assign Descriptor.....	71
8.5.5.10.7	Encrypted Logon ID Descriptor	72
8.5.5.10.8	Echo Value Descriptor	72
8.5.5.10.9	Linkage descriptor (private data)	73
8.5.5.10.10	RCS content descriptor.....	74
8.5.5.10.11	Satellite forward link descriptor	75
8.5.5.10.12	Satellite return link descriptor.....	77
8.5.5.10.13	Table Update Descriptor.....	78
8.5.5.10.14	Contention control descriptor.....	79
8.5.5.10.15	Correction Control descriptor	79
8.5.5.11	Accessing of the forward link signalling.....	80
9	Security, Identity, Encryption	84
9.1	Authentication.....	84
9.2	Forward Link	84
9.3	Return Link.....	85
9.4	Security (optional).....	85
9.4.1	Cryptographic primitives.....	85
9.4.1.1	Public key exchange.....	86
9.4.1.2	Hashing.....	86
9.4.1.3	Encryption.....	86
9.4.1.4	Pseudo-random numbers.....	87
9.4.2	Main Key Exchange, MKE	87
9.4.3	Quick Key Exchange, QKE.....	88
9.4.4	Explicit Key Exchange, EKE.....	88
9.4.5	Key derivation	88
9.4.6	Data stream processing.....	88
9.4.6.1	Payload streams.....	89
9.4.6.2	Data encryption	89
9.4.6.3	Encryption flags	89
9.4.6.4	Chaining and initialization vector.....	90
9.4.7	Security Establishment.....	90
9.4.8	Persistent state variables.....	91
9.4.8.1	Guaranteed delivery.....	91
9.4.9	Security MAC Messages	91
9.4.9.1	<MAC>Security Sign-On	91
9.4.9.2	<MAC>Security Sign-On Response.....	92
9.4.9.3	<MAC>Main Key Exchange.....	93
9.4.9.4	<MAC>Main Key Exchange Response	93
9.4.9.5	<MAC>Quick Key Exchange	94
9.4.9.6	<MAC>Quick Key Exchange Response.....	94
9.4.9.7	<MAC>Explicit Key Exchange.....	95
9.4.9.8	<MAC>Explicit Key Exchange Response	95
9.4.9.9	<MAC>Wait	96

Annex A (informative):	Compliance table	97
Bibliography.....		98
History		99

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Foreword

This European Standard (Telecommunications series) has been produced by Joint Technical Committee (JTC) of the European Broadcasting Union (EBU), Comité Européen de Normalisation Electrotechnique (CENELEC) and the European Telecommunications Standards Institute (ETSI).

NOTE: The EBU/ETSI JTC Broadcast was established in 1990 to co-ordinate the drafting of standards in the specific field of broadcasting and related fields. Since 1995 the JTC Broadcast became a tripartite body by including in the Memorandum of Understanding also CENELEC, which is responsible for the standardization of radio and television receivers. The EBU is a professional association of broadcasting organizations whose work includes the co-ordination of its members' activities in the technical, legal, programme-making and programme-exchange domains. The EBU has active members in about 60 countries in the European broadcasting area; its headquarters is in Geneva.

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Founded in September 1993, the DVB Project is a market-led consortium of public and private sector organizations in the television industry. Its aim is to establish the framework for the introduction of MPEG-2 based digital television services. Now comprising over 200 organizations from more than 25 countries around the world, DVB fosters market-led systems, which meet the real needs, and economic circumstances, of the consumer electronics and the broadcast industry.

National transposition dates

Date of adoption of this EN:	24 November 2000
Date of latest announcement of this EN (doa):	28 February 2001
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 August 2001
Date of withdrawal of any conflicting National Standard (dow):	31 August 2001

1 Scope

The present document is the baseline specification for the provision of the interaction channel for GEO satellite interactive networks with fixed return channel satellite terminals (RCST). The present document facilitates the use of RCSTs for individual or collective installation (e.g. SMATV) in a domestic environment. It also supports the connection of such terminals with in-house data networks. The present document may be applied to all frequency bands allocated to GEO satellite services.

The solutions provided in the present document for interaction channel for satellite interactive networks are a part of a wider set of alternatives to implement interactive services for Digital Video Broadcasting (DVB) systems.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

- It is STANDARD PREVIEW (standards.iteh.ai)**
- [1] ETSI EN 300 421: "Digital Video Broadcasting (DVB); Framing structure, channel coding and modulation for 11/12 GHz satellite services".
 - [2] ETSI TR 101 202: "Digital Video Broadcasting (DVB); Implementation guidelines for Data Broadcasting". <https://standards.iteh.ai/catalog/standards/sist/9918d1c72d8-4cla-ac4d-83bebb0faa7f/sist-en-301-790-v1-2-2-2003>
 - [3] ETSI ETS 300 802: "Digital Video Broadcasting (DVB); Network-independent protocols for DVB interactive services".
 - [4] ETSI EN 300 468: "Digital Video Broadcasting (DVB); Specification for Service Information (SI) in DVB systems".
 - [5] ETSI EN 301 192: "Digital Video Broadcasting (DVB); DVB specification for data broadcasting".
 - [6] ETSI EN 301 459: "Satellite Earth Stations and Systems (SES); Harmonized EN for Satellite Interactive Terminals (SIT) and Satellite User Terminals (SUT) transmitting towards satellites in geostationary orbit in the 29,5 GHz to 30 GHz frequency bands covering essential requirements under article 3.2 of the R&TTE Directive".
 - [7] IETF RFC 1483 (1993): "Multiprotocol Encapsulation over ATM Adaptation Layer 5".
 - [8] ETSI TR 100 815: "Digital Video Broadcasting (DVB); Guidelines for the handling of Asynchronous Transfer Mode (ATM) signals in DVB systems".
 - [9] ISO/IEC 13818-1 (1996): "Information technology - Generic coding of moving pictures and associated audio information; Part 1: Systems".
 - [10] ETSI ETR 154: "Digital Video Broadcasting (DVB); Implementation guidelines for the use of MPEG-2 Systems, Video and Audio in satellite, cable and terrestrial broadcasting applications".
 - [11] ITU-T Recommendation Q.2931 (1995): "Broadband Integrated Services Digital Network (B-ISDN) - Digital Subscriber Signalling System No. 2 (DSS 2) - User-Network Interface (UNI) - Layer 3 specification for basic call/connection control".

- [12] IEEE 802.3 (1996): "Information technology - Telecommunications and information exchange between systems - Local and metropolitan area networks - Specific requirements - Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications".
- [13] ITU-T Recommendation I.432 (1999): "B-ISDN user-network interface - Physical layer specification".
- [14] ETSI ES 200 800: "Digital Video Broadcasting (DVB); DVB interaction channel for Cable TV distribution System (CATV); DVB document A023 Rev. 1, June 1999.
- [15] IETF RFC 2104 (1997): "HMAC: Keyed-Hashing for Message Authentication".
- [16] ANSI/IEEE 754 (1985): "IEEE Standard for Binary Floating-Point Arithmetic".
- [17] ISO/IEC 13818-6 (1998): "Information technology - Generic coding of moving pictures and associated audio information - Part 6: Extensions for DSM-CC".
- [18] ITU-T Recommendation I.363-5 (1996): "B-ISDN ATM Adaptation Layer specification: Type 5 AAL".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the following term and definition applies:

reserved: term "reserved", when used in the clauses defining the coded bit stream, indicates that the value may be used for future extensions. Unless otherwise specified within the present document, all reserved bits shall be set to '1'.

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3.2 Symbols

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For the purposes of the present document, the following symbols apply:

*	multiplication
^	power
~	concatenation
mod	modulo division
(unsigned char)x	ANSI C cast operator: converts value x to unsigned char
""	empty string (zero length)
nonce1	random string (NCC)
nonce2	random string (RCST)
N _{atm}	Number of ATM cells in an ATM TRF burst (1, 2 or 4).
N _{mpeg}	Number of MPEG packets in an optional MPEG2-TS TRF burst (1 and 2*n for n=1 to 12).
N _{p,atm}	Number of bytes of the prefix used on ATM TRF bursts (0, 2 or 4).
N _{p,sync}	Number of bytes of the optional prefix used on SYNC bursts: 0, 2...31 for concatenated code, 0, 12 or 16 for the Turbo code (see subclause 6.4).

3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

AAL	ATM Adaptation Layer
ACQ	Acquisition burst
ATM	Asynchronous Transfer Mode
AVBDC	Absolute Volume-Based Dynamic Capacity
BCD	Binary Coded Decimal
BTP	Burst Time Plan
CBC	Cipher Block Chaining

CMF	Control & Monitoring Functions
CMT	Correction Message Table
CR	Capacity Requests
CRA	Constant-Rate Assignment
CRC	Cyclic Redundancy Check
CRSC	Circular Recursive Systematic Convolutional
CSC	Common Signalling Channel
CTRL/MNGM	Control/Management virtual channel used in DULM
DES	Data Encryption Standard
DSM-CC	Digital Storage Medium - Command and Control
DULM	Data Unit Labelling Method
DVB	Digital Video Broadcast
DVB-S	Digital Video Broadcast by Satellite
EKE	Explicit Key Exchange
EN	European Norm
ETS	European Telecommunications Standard
ETSI	European Telecommunications Standards Institute
FCA	Free Capacity Assignment
FCT	Frame Composition Table
FLS	Forward Link Signalling
GEO	Geostationary Earth Orbit
GFC	Generic Flow Control
HMAC	Hash-based Message Authentication Code
HPA	High Power Amplifier
I	In-phase
ID	Identifier
IDU	Indoor unit
IE	Information Element
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IF	Intermediate Frequency
IP	Internet Protocol SIST EN 301 790 V1.2.2:2003
ISDN	Integrated Services Digital Network
ISO	International Organization for Standardization
ITU	International Telecommunication Union
IV	Initialization Vector
LFSR	Linear Feedback Shift Register
LLC	Logical Link Control
LSB	Least Significant Bit
M&C	Monitoring and Control
MAC	Medium Access Control
MF-TDMA	Multiple-Frequency Time-Division Multiple Access
MIB	Management Information Base
MKE	Main Key Exchange
MPEG	Moving Picture Experts Group
MSB	Most Significant bit
NCC	Network Control Centre
NCR	Network Clock Reference
NIT	Network Information Table
NIU	Network Interface Unit
OBO	Output Back-Off
ODU	Outdoor unit
OSI	Open Systems Interconnection
PAT	Program Association Table
PC	Personal Computer
PCR	Program Clock Reference
PID	Packet IDentifier
PMT	Program Map Table
ppm	parts per million
PRBS	Pseudo Random Binary Sequence
PRNG	Pseudo-Random Number Generator
PSI	Program Specific Information

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PSTN	Public Switched Telephone Network
PVC	Permanent Virtual Circuit
Q	Quadrature
QKE	Quick Key Exchange
QPSK	Quadrature Phase-Shift Keying
RBDC	Rate-Based Dynamic Capacity
RCST	Return Channel Satellite Terminal
RF	Radio Frequency
RMT	RCS Map Table
RS	Reed-Solomon
SAC	Satellite Access Control
SAR	Segmentation And Re-assembly
SCT	Superframe Composition Table
SDT	Service Description Table
SI	Service Information
SIT	Satellite Interactive Terminal
SMATV	Satellite Master Antenna Television
SNAP	Sub Network Access Protocol
SNMP	Simple Network Management Protocol
SPT	Satellite Position Table
SUT	Satellite User Terminal
SVC	Switched Virtual Circuit
SYNC	Synchronization burst type
TBTP	Terminal Burst Time Plan
TCT	Time-slot Composition Table
TDMA	Time-Division Multiple Access
TG	Traffic Gateway
TIM	Terminal Information Message
TRF	Traffic (burst type)
TS	Transport Stream
Tx	Transmitter
UNI	User Network Interface SIST EN 301 790 V1.2.2:2003
VBDC	Volume-Based Dynamic Capacity standards/sist/499f8d18-7268-4efa-ac4d-50faa7f/sist-en-301-790-v1-2-2-2-2003
VCI	Virtual Circuit Identifier
VPI	Virtual Path Identifier

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4 Reference Models for Satellite Interactive Networks in DVB

4.1 Protocol Stack Model

For interactive services supporting broadcast to the end user with return channel, a simple communications model consists of the following layers:

physical layer: where all the physical (electrical) transmission parameters are defined.

transport layer: defines all the relevant data structures and communication protocols like data containers, etc.

application layer: is the interactive application software and runtime environment (e.g. home shopping application, script interpreter, etc.).

A simplified model of the OSI layers was adopted to facilitate the production of specifications for these layers. Figure 1 points out the lower layers of the simplified model and identifies some of the key parameters for the lower two layers.

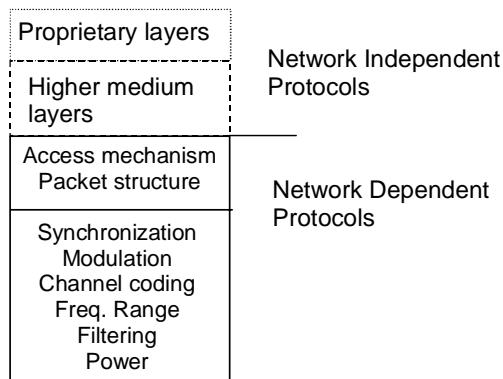


Figure 1: Layer structure for generic system reference model

The present document addresses the satellite interactive network dependent aspects only.

4.2 System Model

Figure 2 shows the system model which is to be used within DVB for interactive services.

In the system model, two channels are established between the service provider and the user:

- **Broadcast Channel:** a unidirectional broadband Broadcast Channel including video, audio and data is established from the service provider to the users. It may include the Forward Interaction Path.
- **Interaction Channel:** a bi-directional Interaction Channel is established between the service provider and the user for interaction purposes. It is formed by:
 - **Return Interaction Path** (Return Channel): from the user to the service provider. It is used to make requests to the service provider, to answer questions or to transfer data.
 - **Forward Interaction Path:** from the service provider to the user. It is used to provide information from the service provider to the user and any other required communication for the interactive service provision. It may be embedded into the Broadcast Channel. It is possible that this channel is not required in some simple implementations which make use of the Broadcast Channel for the carriage of data to the user.

The RCST is formed by the Network Interface Unit (consisting of the Broadcast Interface Module and the Interactive Interface Module) and the Set Top Unit. The RCST provides interface for both Broadcast and Interaction Channels. The interface between the RCST and the interaction network is via the Interactive Interface Module.

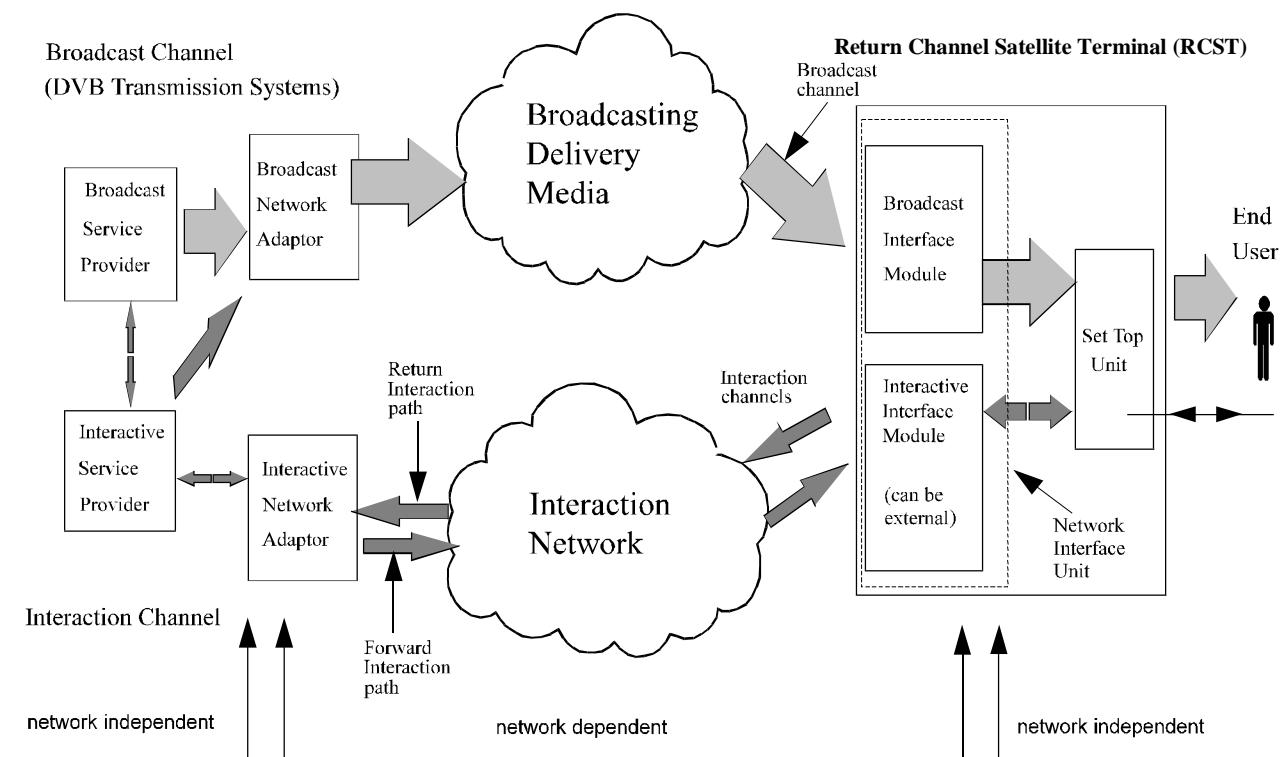


Figure 2: A generic system Reference Model for Interactive Systems
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4.3 Reference Model (of the Satellite) Interactive Network

An overall Satellite Interactive Network, within which a large number of Return Channel Satellite Terminal (RCST) will operate, will comprise the following functional blocks, as shown in figure 3: <https://standards.iteh.ai/catalog/standards/sist/49918d98-7268-4fa-ac4d-821ebbf0fa7f/sist-en-301-790-v1-2-2-2003>

- **Network Control Centre:** a NCC provides monitoring & control functions. It generates control and timing signals for the operation of the Satellite Interactive Network to be transmitted by one or several Feeder Stations.
- **Traffic Gateway:** a TG receives the RCST return signals, provides accounting functions, interactive services and/or connections to external public, proprietary and private service providers (data bases, pay-per-view TV or video sources, software download, tele-shopping, tele-banking, financial services, stock market access, interactive games etc.) and networks (Internet, ISDN, PSTN etc...).
- **Feeder:** a Feeder transmits the forward link signal, which is a standard satellite digital video broadcast (DVB-S) uplink, onto which are multiplexed the user data and/or the control and timing signals needed for the operation of the Satellite Interactive Network.

An RCST is e.g. a SIT or a SUT as described in [6].