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**Digital Video Broadcasting (DVB);
Interaction channel through
Public Switched Telecommunications Network (PSTN) /
Integrated Services Digital Networks (ISDN)**

ETSI

European Telecommunications Standards Institute

ETSI Secretariat

Postal address: F-06921 Sophia Antipolis CEDEX - FRANCE

Office address: 650 Route des Lucioles - Sophia Antipolis - Valbonne - FRANCE

X.400: c=fr, a=atlas, p=etsi, s=secretariat - **Internet:** secretariat@etsi.fr

Tel.: +33 4 92 94 42 00 - Fax: +33 4 93 65 47 16

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Foreword

This European Telecommunication Standard (ETS) has been produced by the 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 was established in 1990 to co-ordinate the drafting of standards in the specific field of broadcasting and related fields. Since 1995 the JTC 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 *.

* European Broadcasting Union
Case Postale 67
CH-1218 GRAND SACONNEX (Geneva)
Switzerland

Tel: +41 22 717 21 11
Fax: +41 22 717 24 81

Digital Video Broadcasting (DVB) Project

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.

Transposition dates	
Date of adoption:	8 August 1997
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Date of withdrawal of any conflicting National Standard (dow):	31 May 1998

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1 Scope

This European Telecommunication Standard (ETS) is the baseline specification for the provision of Return Channel (RC) based on PSTN and ISDN to Digital Video Broadcasting (DVB) systems.

It is not intended to specify a RC solution associated to each broadcast system because the inter-operability of different delivery media to transport the RC is desirable. Therefore the PSTN/ISDN solutions for the RC apply to satellite, cable, SMATV, terrestrial, MMDS or any future DVB system.

The solutions here provided for RC through PSTN/ISDN are a part of a wider set of alternatives to implement interactive services for DVB systems.

2 Normative references

For the purposes of this ETS, the following references apply:

- [1] ETS 300 001: "Attachments to the Public Switched Telephone Network (PSTN); General technical requirements for equipment connected to an analogue subscriber interface in the PSTN".
- [2] ETS 300 011: "Integrated Services Digital Network (ISDN): Primary rate user-network interface Layer 1 specification and test principles".
- [3] ETS 300 012: "Integrated Services Digital Network (ISDN): Basic rate user-network interface Layer 1 specification and test principles".
- [4] ETS 300 402 (1994): "ISDN user-network interface - Data link layer specification". ITU-T Recommendation Q.921 Rev. 1.
- [5] ETS 300 403 (1994): "Digital subscriber Signalling System No. 1 (DSS 1) - ISDN user-network interface layer 3 specification for basic call control". ITU-T Recommendation Q.931 Rev. 1.
- [6] ITU-T Recommendations V.21, V.22, V.22bis, V.23, V.25, V.32, V.32bis, V.34 and V.42.
- [7] Official Journal of the European Communities, No. L 128, 23 May 1991: "Council Directive on the approximation of the laws of the Member States concerning telecommunications terminal equipment, including the mutual recognition of their conformity (91/263/EEC)".
- [8] EN 50201: "Interface for DVB-IRD".
- [9] ETS 300 802: "Digital Video Broadcasting (DVB); Network independent protocols for interactive services".

3 Abbreviations

For the purposes of this ETS, the following abbreviations apply:

BC	Broadcast Channel
BIM	Broadcast Interface Module
BRA	Basic Rate Access
DAVIC	Digital Audio Visual Council
DCE	Data Communication Equipment
DTE	Data Termination Equipment
DTMF	Dual-Tone Multi-Frequency (dialling mode)
DVB	Digital Video Broadcasting
GSTN	General Switched Telephone Network
IC	Interaction Channel
IIM	Interactive Interface Module
IRD	Integrated Receiver Decoder

ISDN	Integrated Services Digital Network
ISDN BRA	ISDN Basic Rate Access
MMDS	Microwave Multi-point Distribution System
MPEG	ISO/IEC Moving Pictures Experts Group
NCCD	Network Congestion Control Descriptor
NIU	Network Interface Unit
OSI	Open Systems Interconnection
PSTN	Public Switched Telephone Network
RC	Return Channel
SMATV	Satellite Master Antenna TeleVision
STB	Set Top Box
STU	Set Top Unit

4 System architecture of narrow-band Interaction Channels (IC)

This clause provides a reference model for system architecture of narrow-band IC in a broadcasting scenario (asymmetric interactive services).

4.1 Protocol stack model

For asymmetric interactive services supporting broadcast to the home with narrowband RC, 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 environments (e.g. home shopping application, script interpreter, etc.).

This ETS addresses the lower two layers (the physical and transport) leaving the application layer open to competitive market forces. It is not the role of the DVB to define a standardized application layer.

A simplified model of the OSI layers was adopted to facilitate the production of specifications for these nodes. Figure 1 points out the lower layers of the simplified model and identifies some of the key parameters for the lower two layers. Following the user requirements for interactive services, no attempt will be made to consider higher layers in this ETS.

Layer Structure for Generic System Reference Model

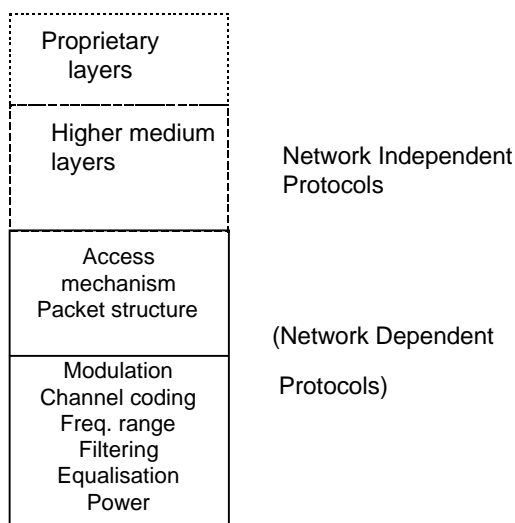


Figure 1: Layer structure for generic system reference model

This specification addresses the PSTN/ISDN network specific aspects only. The network independent protocols will be specified separately in ETS 300 802 [9].

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 user and the service provider:

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

The user terminal is formed by the Set Top Unit (STU) and the Network Interface Unit (NIU).

The NIU consisting of the Broadcast Interface Module (BIM) and the Interactive Interface Module (IIM).

The user terminal provides interface for both broadcast and interaction channels.

The interface between the user terminal and the interaction network is via the IIM.

The interface between the broadcast channels and the user terminal is via the BIM.

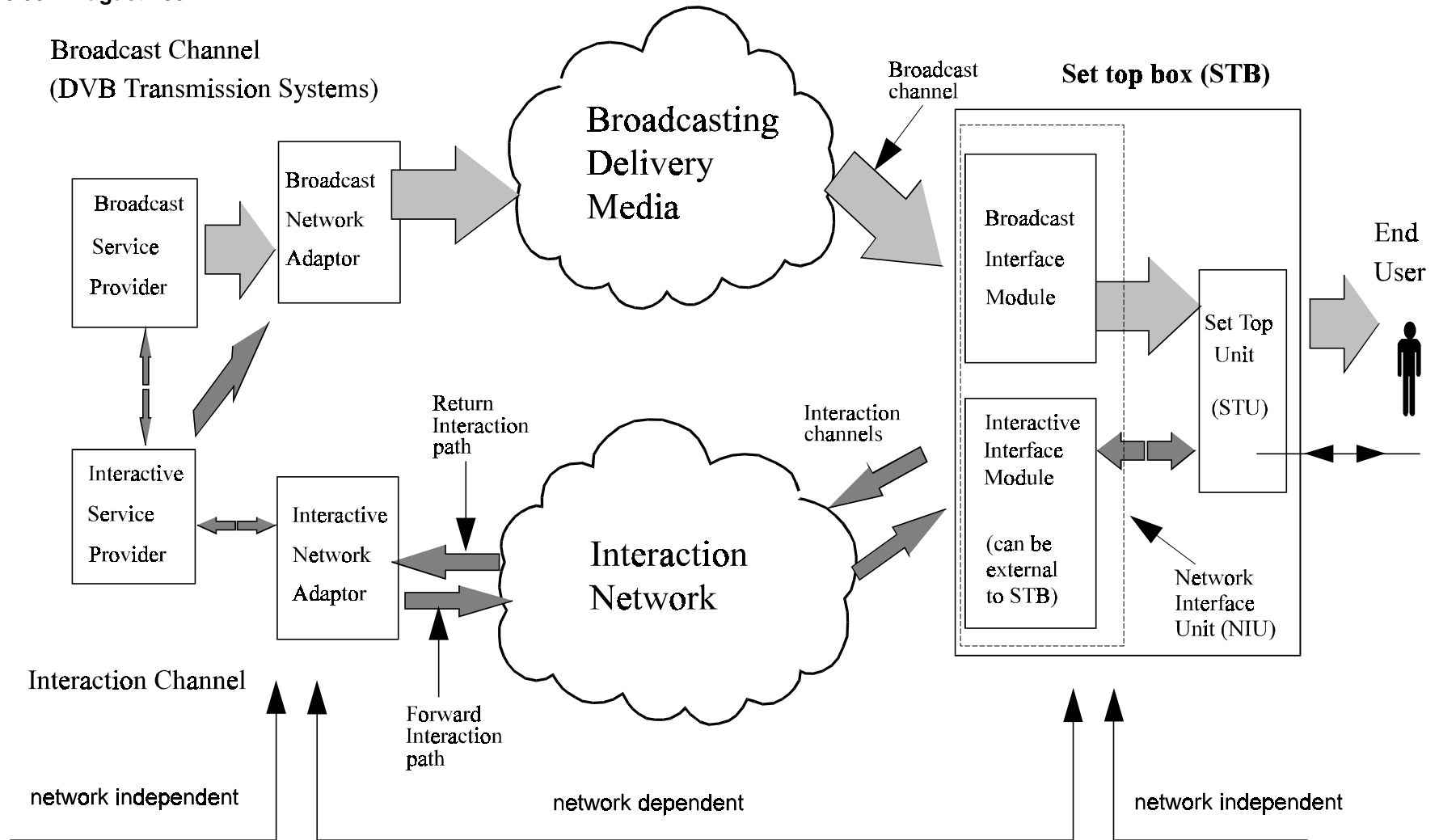


Figure 2: A generic system reference model for interactive systems

5 DVB Interaction Channel (IC) for PSTN

The PSTN infrastructures can support the implementation of the RC for interactive services suitable for DVB systems.

PSTN can be used to implement interactive services in the DVB environment, providing a bi-directional communication path between the user terminal and the service provider by means of a modem.

In order to allow the access to the PSTN, the user terminal shall be provided with a modem (internal or external to the user terminal). The modem constitutes the user Interface Module to the interaction network.

The modem will be connected to the PSTN through the existing telephone line. Therefore it will share the line with other terminals/equipment already present at the customer premises (telephones, facsimile, other modems, etc.).

The interface between modem and PSTN shall be compliant with the national requirements for the terminal equipment as reported in ETS 300 001 [1].

5.1 Physical interfaces between the modem, the user terminal and PSTN

The physical interfaces between the modem, the user terminal and PSTN are described in this subclause. It applies to user terminals with internal or external modem.

5.1.1 External modem

The external modem shall support the interfaces requirements between the user Terminal (Data Termination Equipment) and the modem (Data Communication Equipment) as described in EN 50201 [8]. The external modem shall support the PSTN link interface as described in EN 50201 [8].

5.1.2 Integrated modem

The internal modem shall meet the same requirements as the external modem.

5.2 Calling procedures

The connection to PSTN shall be established according to the rules specified in ETS 300 001 [1], with reference to the specific national requirements.

5.2.1 Dialling

The modem will use DTMF (Dual-Tone Multi-Frequency) dialling mode according to ETS 300 001 [1].

Optionally pulse dialling mode can be used according to ETS 300 001 [1].

5.2.2 Line monitoring

The modem shall be able to identify the status of the line ("on-hook" status or "off-hook" status).

When the line is engaged ("off-hook" status) the modem shall perform a call repetition procedure according to the distribution specified in ETS 300 001 [1]. Also, the call repetition process shall optionally be controlled by a procedure.

5.3 Call attempt when service provider line is busy

The modem will execute multiple call attempts in response of "busy line" signal from the service provider. If these call attempts are addressed to the same service provider number, they shall be distributed in time according to ETS 300 001 [1]. Also, the call repetition process shall optionally be controlled by the application layer using a Network Congestion Control Descriptor (NCCD) (see ETS 300 802 [9]).

5.4 Forced disconnection during dialling or data transfer

The content of this subclause is necessary only for those European countries where the users capability to interrupt an active communication at any time is not provided by the PSTN. In this case the capability of interrupting an active communication shall be provided cutting off the connection by the calling device.

It is recognized that in some European countries it shall be guaranteed that the user can interrupt the communication at any time. During dialling or data transfer phases, the modem connection shall be cut-off and the modem shall perform a forced disconnection if the user hooks off any of the other terminals connected to the same line. This functionality is requested in order to enable emergency calls.

The modem shall be able to set-up the connection when requested from the user terminal. If it is not possible for the modem to interrupt the interaction when it is the called party, the modem itself shall not accept incoming calls from any service provider (auto-answering function disabled). The call establishing the bi-directional RC is in this case always initiated by the modem towards the service provider.

As an alternative option the modem can act as the called party in user terminals where the application layer includes a means of closing down the IC from the server.

6 DVB Interaction Channel (IC) for ISDN

The ISDN infrastructures can support the implementation of the RC for interactive services suitable for DVB systems.

ISDN can be used to implement interactive services in DVB environment, providing a bi-directional communication path between the terminal and the service provider. ISDN BRA (Basic Rate Access) can be used.

6.1 Physical interface for connection to ISDN BRA

The physical interface to connect to ISDN BRA shall be as described in ETS 300 012 [3].

6.2 Calling procedures

The signalling protocols for ISDN BRA shall be as described in ETS 300 402 [4] (ITU-T Recommendation Q.921) and ETS 300 403 [5] (ITU-T Recommendation Q.931).

6.3 Forced disconnection

Disconnection for emergency calls can be implemented by the upper layer protocols using the signalling channel (D channel).

Annex A (informative): Bibliography

- DVB-A008 October 1995: "Commercial requirements for asymmetric interactive services supporting broadcast to the home with narrow-band return channels".
- DAVIC 1.0 Specification: "DAVIC System Reference Model".

History

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