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Technical Specification

Digital Video Broadcasting (DVB); Home Access Network (HAN) with an active Network Termination (NT)

European Broadcasting Union



Union Européenne de Radio-Télévision

DVB
Digital Video
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Reference

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Foreword

This Technical Specification (TS) has been produced by the Joint Technical Committee (JTC) Broadcast of the European Broadcasting Union (EBU), Comité Européen de Normalization 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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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.

1 Scope

The DVB In-Home Digital Network (IHDN) can be subdivided into a Home Access Network (HAN) for the connection to external networks and a Home Local Network (HLN) for interconnections of user equipment to clusters and between rooms.

In addition to the DVB access technologies (satellite, cable, terrestrial, SMATV, MMDS) with the interaction channels for interactive broadcast services, the present document defines interfaces and Network Terminations (NT), such as an xDSL modem or an external cable modem.

The existing DVB transmission systems form part of the HAN architecture, but access the IRD without any influence from other sections of the HAN.

The HAN for use with an active NT is based on an ATM interface operating at 25 Mbit/s or 51 Mbit/s.

The IEEE 1394 interface with the long reach extension has been selected for the HLN.

The broadband access network enables broadband multimedia services, such as video on demand and switched digital broadcast, over twisted pair lines with an xDSL modem. It may also be used for interaction purposes in combination with any broadcast delivery network.

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.

- [1] DVB Interactive Services Commercial Module User and Market Requirements for In-Home Digital Networks - DVB-ISCM-004 (Rev 7).
- [2] Early Draft TR 101 226: "Digital Video Broadcasting (DVB); In-Home Digital Network (IHDN) guidelines". In preparation by the DVB Project; to be based on DVB-TM 2003 DVB- IHDN - 012.
- [3] Early Draft TS 101 225: "Digital Video Broadcasting (DVB); In-Home Digital Network (IHDN) Home Local Network (HLN)". In preparation by the DVB Project
- [4] ATM Forum "Residential Broadband Physical Interfaces Specification".
- [5] ATM Forum: "Physical Interface Specification for 25,6 Mbit/s over Twisted Pair Cable" af-phy-0040.000.
- [6] ITU-T Recommendation I.610: "B-ISDN Operations & Maintenance Principles & Functions".
- [7] IEC 603-7: "Connectors for frequencies below 3 MHz for use with printed boards, Part 7: Detail specification for connectors, 8-way, including fixed and free connectors with common mating features".
- [8] DAVIC 1.3 Specification Part 7: "High and Mid Layer Protocols (Rev 6.3 - 29/10/97)".
- [9] EN 301 192: "Digital Video Broadcasting (DVB); DVB specification for data broadcasting".
- [10] ISO/IEC 13818-1: "Information Technology - Generic Coding of Moving Pictures and Associated Audio Recommendation H.222.0 (systems)".

- [11] ITU-T Recommendation J.110 "Basic principles for a worldwide common family of systems for the provision of interactive television services".

3 Abbreviations

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

ADSL	Asynchronous Digital Subscriber Loop
ATM	Asynchronous Transfer Mode
CPE	Customer Premises Equipment
DAVIC	Digital Audio Visual Council
DVB	Digital Video Broadcasting
DVB-C	DVB cable transmission standard (EN 300 429)
DVB-MC	DVB Microwave Multipoint Distribution Systems (MMDS) below 10 GHz (EN 300 749)
DVB-MS	DVB Multipoint Video Distribution Systems (MVDS) at 10 GHz and above (EN 300 748)
DVB-S	DVB satellite transmission standard (EN 300 421)
DVB-SMATV	DVB satellite master antenna television delivery standard (EN 300 473)
DVB-T	DVB terrestrial transmission standard (EN 300 744)
DVCR	Digital Video Cassette Recorder
DVD	Digital Versatile Disk
EMC	Electromagnetic Compatibility
HAN	Home Access Network
HLN	Home Local Network
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronic Engineers
IHDN	In-Home Digital Network
IRD	Integrated Receiver Decoder
LLC	Logical Link Control
MMDS	Microwave Multipoint Distribution Systems
MVDS	Multipoint Video Distribution Systems
MPEG	Moving Pictures Experts Group
NT	Network Termination
OAM	Operations And Maintenance
PID	Packet IDentifier
PHY	Physical layer
PC	Personal Computer
POF	Plastic Optical Fibre
POTS	Plain Old Telephone System
PPP	Point of Presence Protocol
RBB	Residential Broadband
RF	Radio Frequency
RFI	Radio Frequency Interference
SDH	Synchronous Digital Hierarchy
SMATV	Satellite Master Antenna Television
SNAP	SubNetwork Attachment Point
SONET	Synchronous Optical Network
TS	Transport Stream
TV	TeleVision
UTP	Unscreened Twisted Pair
VC	Virtual Container
xDSL	generic Digital Subscriber Loop technology, e.g. ADSL

4 Introduction

The DVB In-Home Digital Network (IHDN) can be subdivided into a Home Access Network (HAN) for the connection to external networks and a Home Local Network (HLN) for interconnections of user equipment to clusters and between rooms [1] [2].

In addition to the DVB access technologies (satellite, cable, terrestrial, SMATV, MMDS) with the interaction channels for interactive broadcast services, the present document defines interfaces and Network Terminations (NT), such as an xDSL modem or an external cable modem. The existing DVB transmission systems form part of the HAN architecture, but access the IRD without any influence from other sections of the HAN.

Different versions of HAN are possible. The HAN for use with an active NT is based on an ATM interface operating at 25 Mbit/s or 51 Mbit/s. The IEEE 1394 interface with the long reach extension has been selected for the HLN.

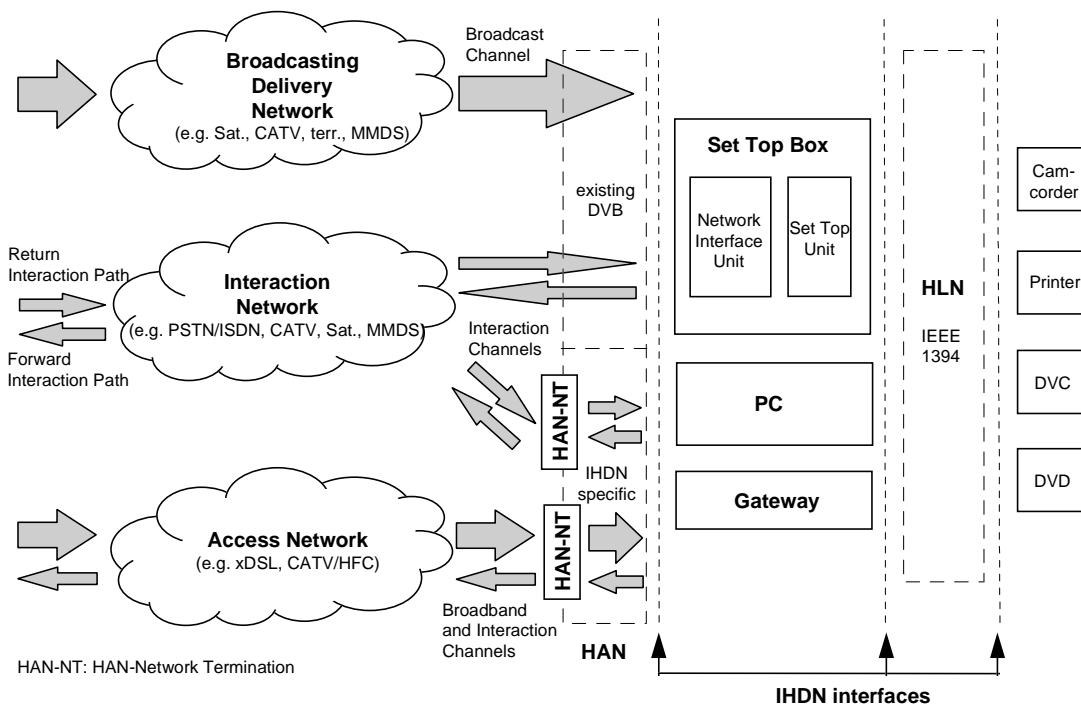


Figure 1: Elements of the IHDN

Figure 1 shows the extension of the DVB interactive systems reference model with the IHDN. The network clouds on the left hand side show logically the association to corresponding services (broadcast, interactive broadcast, interactive multimedia services). Physically they may overlap and not all of them may be used in parallel. The broadband access network is new; which enables broadband multimedia services, such as video on demand and switched digital broadcast, over twisted pair lines with an xDSL modem. It may also be used for interaction purposes in combination with any broadcast delivery network.

The In-Home Digital Network (IHDN), which is being implemented to meet a set of commercial requirements listed in [1] is described in reference [2]. It consists of two distinct sections, the Home Access Network (HAN) and the Home Local Network (HLN). The main purpose of the HAN is the connection of Access Network delivered services from a Network Termination (NT) to various items of CPE. The Home Local Network (HLN) [3], based on IEEE 1394, provides interconnection among local clusters of equipment where most of the traffic will not traverse the Access Network. An example of such a configuration is shown in figure 2. The present document describes and defines the elements of an ATM HAN for use with an active NT.

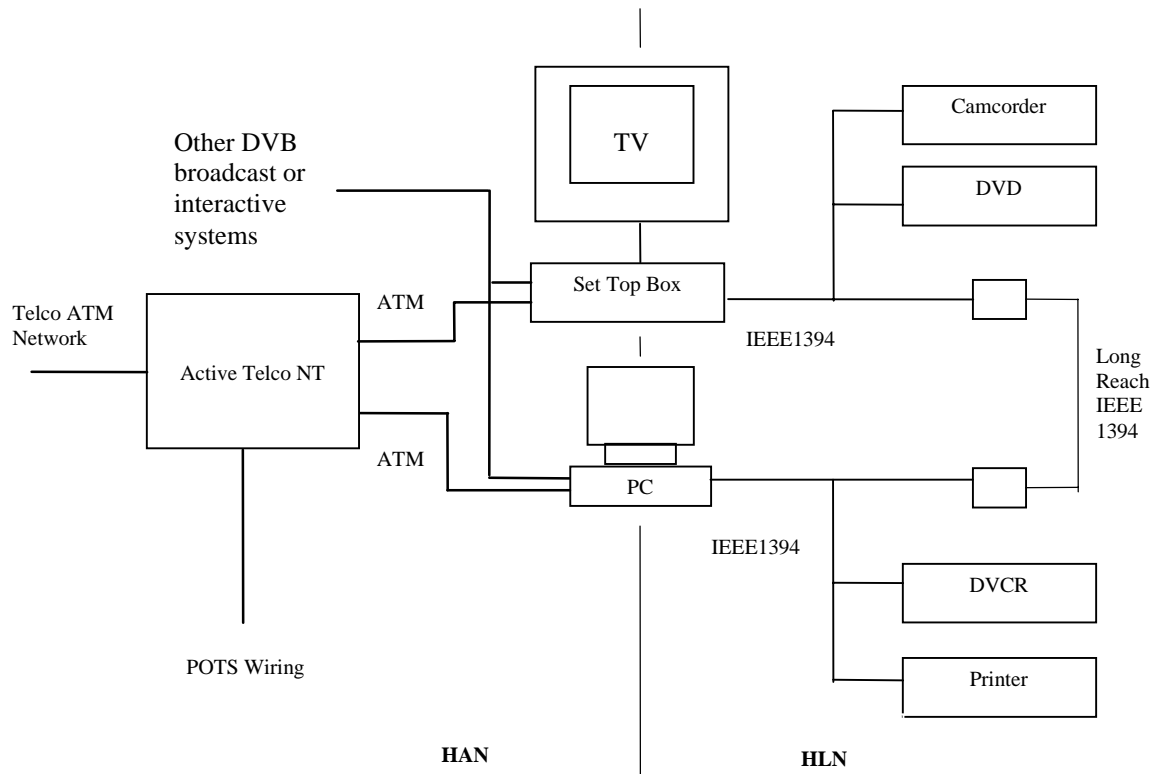


Figure 2: Elements of the IHDN

As the purpose of this ATM HAN is primarily to distribute ATM Access Network delivered services to various locations within the home, it shall provide a means of connecting multiple in-home devices to the Access Network as shown above. However, the limiting case would be a single connected device.

Depending on the implementation, it may also support intra-home communications i.e. device to device communication within the home without going via the Access Network, but local regulatory restrictions might prevent such functionality being incorporated into the NT itself.

5 Topology

The classical ATM point-to-point, star topology shall be supported.

6 Physical layer

The Physical layer (PHY) specified for the DVB HAN is a subset of the Residential Broadband (RBB) PHY defined by the ATM Forum in [4].

The ATM Forum specification defines a system that will operate at either 25,6 Mbit/s or 51,2 Mbit/s; it was derived from the existing ATM 25 specification [5], but was modified so as to provide:

- improved RFI egress properties, particularly in the spectral region below 30 MHz which is not covered by existing radiated emissions regulations, but is subject to the legally enforceable requirement not to interfere with existing services;
- an optional, higher speed (51,2 Mbit/s) mode;
- physical layer OAM functionality;
- mandatory support for 8 kHz timing;
- Category 5 TP and POF are the only supported media types.

This ATM Forum ATM 25/51 specification is backward compatible with, and will interoperate with ATM 25 as defined in [5]. When the 51,2 Mbit/s mode is implemented it shall be able to autosense the operating speed of the other end of the link and drop back to a lower rate of 25,6 Mbit/s if necessary for interoperability. A common transmit level is used at both speeds which supports operation over 50 m of Category 5 UTP cable and remains compatible with the current 25,6 Mbit/s UTP PHY over such cables.

The following options in [4] are mandatory for the DVB HAN:

- The 51,2 Mbit/s mode shall be supported;
- 100 Ω , Category 5 Unscreened Twisted Pair (UTP) copper cable shall be supported.

Formal EMC requirements are country specific and so do not form part of the DVB HAN specification. However, there is a widely applicable general requirement not to interfere with any existing licensed service. The most difficult services with which to co-exist are amateur and shortwave radio. The ATM Forum PHY specification [4] has been developed so that co-existence with such services can be achieved.

7 Timing references

Certain applications, in particular those which involve interworking with narrowband services at some point in the (external) network, may require the delivery of a network referenced (e.g. 8 kHz) clock.

The ATM HAN shall provide an 8 kHz clock reference derived from a timing reference on the access network connection. This clock reference shall be distributed by means of the timing character markers defined in [4].

The HAN is not SONET/SDH framed; there is no requirement for the PHY to support loop timing at the terminal equipment.

Timing characters will not be looped back at terminal equipment.

8 Operations And Maintenance (OAM) flows

The ATM HAN shall support F4 and F5 OAM flows, as defined in [6].

Physical layer OAM functions shall be supported, as specified in [4].

9 Infrastructure

The existing published wiring standard did not cover the home environment, and so the following subset of the infrastructure reference model developed by the RBB Working Group of the ATM Forum and used in [4] has been adopted.

9.1 Cables

100 Ω , Category 5 UTP copper cable shall be used.

The nominal maximum reach between the NT and an item of CPE is 50 m. This includes the length of any patch cords.

9.2 Connectors

The supported connector type is specified in IEC 603-7 [7] (commonly referred to as RJ45).

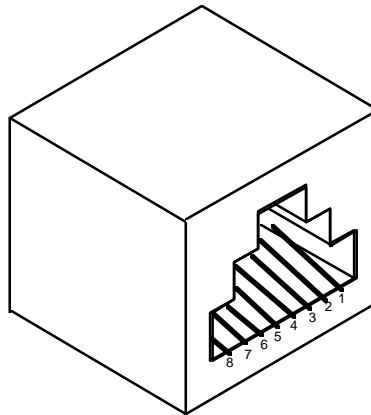


Figure 3: Example of UTP-RJ45 Jack

The contact assignments for the UTP-RJ45 receptacle (jack) shown in figure 3 shall be as listed in table 1.

Table 1: Contact Assignments for UTP-RJ45 Jack

Contact	Signal at the ATM User Device	Signal at the ATM Network Termination (NT)
1	Transmit +	Receive +
2	Transmit -	Receive -
3	Unused	Unused
4	Unused	Unused
5	Unused	Unused
6	Unused	Unused
7	Receive +	Transmit +
8	Receive -	Transmit -

A maximum of 3 mated connector pairs shall be supported in any point to point link.

10 Higher layer support

10.1 MPEG

MPEG Transport Streams (TS), as described in [10], shall be carried using AAL5, as defined in section 6.3.12.1 of [8].

10.2 IP

IP will be carried over ATM using the LLC/SNAP format with AAL5 and VC based multiplexing, as defined in section 11.3.1 of [8].

10.3 IP through MPEG

IP can also be tunnelled via MPEG-2 Transport Stream (TS) as described in [9].

History

Document history		
V1.1.1	July 1998	Publication