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SERIES J: CABLE NETWORKS AND TRANSMISSION OF TELEVISION, SOUND PROGRAMME AND OTHER MULTIMEDIA SIGNALS

IP Video Broadcast

Requirements of IP video broadcast (IPVB) for cable TV networks

Recommendation ITU-T J.1210

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Summary

In recent years, IP-based video services have been developed rapidly in cable television (CATV) networks, especially the highly asymmetric IP-based services with large bandwidth, such as 4K, 8K and virtual reality (VR), whose single programme bandwidth might easily exceed 35 Mbps or even go up to 100 Mbps. This requires huge downlink bandwidth of transmission channels and poses challenges to the existing CATV technologies. For this scenario, it is necessary to propose a solution with lower cost and less complexity for meeting the bandwidth requirements of the current asymmetric IP-based video service.

Recommendation ITU-T J.1210 specifies an IP video broadcast (IPVB) technology, which simply adds a one-way IP-based video broadcast system to the existing low-cost bidirectional CATV networks, including both hybrid fibre coax (HFC) and optical networks. The IPVB can greatly increase the bandwidth of downlink programs when using an optical network and at the same time, have the characteristics of low cost and low complexity. The IPVB in downlink transmits IP-based video streams through broadcast channels which are identified by multicast IP addresses and user datagram protocol (UDP) port numbers and broadcasts all the IP-based video streams through the CATV networks to all subscribers. By cooperating with the uplink channel provided by the existing bidirectional access networks, it is capable of providing varieties of IP-based high bitrate video services in CATV networks.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
1.0	ITU-T J.1210	2019-07-29	9	11.1002/1000/13976

Keywords

Broadcast, CATV, IP video broadcast, IPVB.

* To access the Recommendation, type the URL http://handle.itu.int/ in the address field of your web browser, followed by the Recommendation's unique ID. For example, http://handle.itu.int/11.1002/1000/11830-en.

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1 Scope

This Recommendation describes the functional and performance requirements of the IP video broadcast (IPVB) for cable television (CATV) networks. The IPVB is a delivery scheme to support IP-based video services for CATV networks. The purpose of the IPVB system is to transmit IP-based video streams through broadcast channels identified by multicast IP addresses and user datagram protocol (UDP) port numbers over CATV networks.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

[ETSI TR 101 290] ETSI TR 101 290 V1.3.1 (2014), *Digital Video Broadcasting (DVB) – Measurement guidelines for DVB systems*.

3 Definitions

3.1 Terms defined elsewhere

None.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 area code table (ACT): The basic table in an IP video broadcast (IPVB) headend that is used to describe the regional identification of centre offices.

3.2.2 multicast information table (MIT): The basic table in an IP video broadcast (IPVB) headend that is used to describe the information of multicast IP addresses and UDP destination port numbers of each service in the broadcast transmission network.

3.2.3 service name list table (SNLT): The basic table in an IP video broadcast (IPVB) headend that is used to describe the name information and other information (such as programme provider information, etc.) of each video programme.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

CATV Cable Television

HFC Hybrid Fibre Coax

IP Internet Protocol

IPVB IP Video Broadcast

LAN Local Area Network

OTT	Over The Top
STB	Set-Top Box
TS	Transport Stream
TV	Television
UDP	User Datagram Protocol
VOD	Video On Demand
VR	Virtual Reality

5 Conventions

In this Recommendation:

The keywords "is required to" indicate a requirement which must be strictly followed and from which no deviation is permitted if conformance to this document is to be claimed.

The keywords "is recommended" indicate a requirement which is recommended but which is not absolutely required. Thus this requirement need not be present to claim conformance.

The keywords "is prohibited from" indicate a requirement which must be strictly followed and from which no deviation is permitted if conformance to this Recommendation is to be claimed.

The keywords "can optionally" indicate an optional requirement which is permissible, without implying any sense of being recommended. This term is not intended to imply that the vendor's implementation must provide the option and the feature can be optionally enabled by the network operator/service provider. Rather, it means the vendor may optionally provide the feature and still claim conformance with the specification.

In the body of this Recommendation, the words shall, shall not, should, and may sometimes appear, in which case they are to be interpreted, respectively, as is required to, is prohibited from, is recommended, and can optionally. The appearance of such phrases or keywords in an appendix or in material explicitly marked as informative are to be interpreted as having no normative intent.

6 Overview

Combined with the characteristics of the broadcast network and IP technology, the IPVB system realizes the end-to-end full IP carrying of video streams, data and other services. The logical architecture model of IPVB is shown in Figure 1. The IPVB system mainly consists of two parts: The IPVB headend and the IPVB terminal.

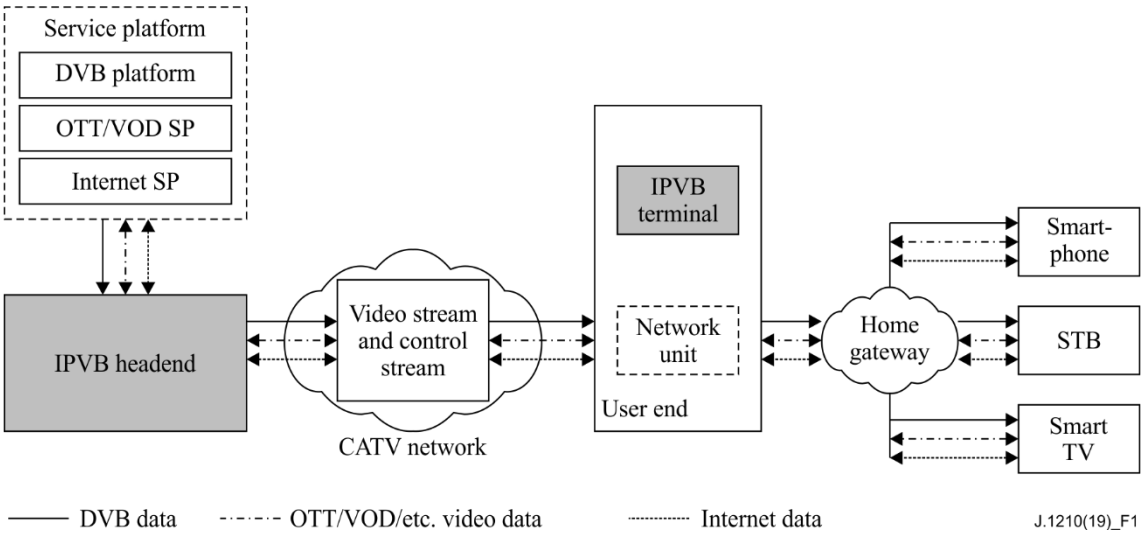

Figure 1 – IPVB architecture

The IPVB headend is located at the entry edge of a CATV distribution network. It has the functions of convergence, distribution and delivery of various video streams. First, it receives IP packets such as video streams from the service platform in the IPVB system, converts unicast to multicast if needed and identifies the different programs of the video streams according to the multicast IP addresses and UDP port numbers. Then, it broadcasts the converged IP data through the infrastructure of CATV networks to IPVB terminals.

The IPVB terminal is located at the user ends of the CATV networks. It receives the UDP multicast packets from the broadcast transmission network and implements data transfer between the CATV access network and the home local area network (LAN). It filters the locally requested programs according to the multicast IP addresses and UDP port numbers and forwards them to one or more requesting service clients, such as IP STB, smart phone, computer, smart TV, etc., through Ethernet within the home LAN.

The IPVB system consists of two subsystems, namely the IPVB headend and the IPVB terminal.

The functions of the IPVB headend subsystem are as follows:

– Services information generator is used to send fundamental tables including multicast information table (MIT), service name list table (SNLT) and area code table (ACT);
– The MIT describes the information of multicast IP addresses and UDP destination port numbers of each service in the broadcast transmission network. These items of information are used for the service clients to search programs;
– The SNLT describes the name information and other information (such as program provider information, etc.) of each video program;
– The ACT describes the regional identification of centre offices;
– Encapsulating the MIT, SNLT and ACT into TS packets and transferring them over IP packets;
– In the IP layer, converging various video streams, and converting unicast addresses into multicast addresses when the streams (including VOD, OTT and other on-demand streams) have unicast addresses;
– Identifying different video streams by multicast IP addresses and UDP port numbers;
– Transmission of the converged IP data over CATV networks.

The functions of the IPVB terminal subsystem are as follows:

– Receiving IP broadcast data;

– Supporting requests and video services from multiple service clients (such as STB, PAD, etc.) at the same time.
– According to the request information of service clients, selecting and filtering UDP packets by identifying multicast IP addresses and UDP port numbers according to the MIT;
– According to the IP addresses of service clients, converting the multicast IP addresses of the selected IP data into the IP addresses of the service clients;
– Forwarding the selected UDP packets to the requesting service clients through Ethernet within the home LAN.

7 Requirements

7.1 Functional requirements

7.1.1 IPVB headend

IPVB-Headend-FR-01: The IPVB headend subsystem is required to use the MIT to describe the multicast IP addresses and UDP destination port numbers information of each program or service in CATV networks. The MIT is used for the terminals to select programs.

IPVB-Headend-FR-02: The IPVB headend subsystem is required to use the SNLT to describe the name information and program provider information of each video program.

IPVB-Headend-FR-03: The IPVB headend subsystem is required to use the ACT to describe the regional identification of centre office.

IPVB-Headend-FR-04: The IPVB headend subsystem is required to encapsulate the MIT, SNLT and ACT into TS packets.

IPVB-Headend-FR-05: The IPVB headend subsystem is required to transfer TS over IP for IP network.

IPVB-Headend-FR-06: The IPVB headend subsystem is required to converge various video streams in the IP layer.

IPVB-Headend-FR-07: The IPVB headend subsystem is required to convert unicast IP addresses into multicast IP addresses when the received streams (including VOD, OTT and other on-demand streams) have unicast IP addresses.

IPVB-Headend-FR-08: The IPVB headend subsystem is required to identify different video streams by multicast IP addresses and UDP port numbers.

IPVB-Headend-FR-09: The IPVB headend subsystem is required to have packet filtering capabilities for specific protocols (including TCP, UDP protocols).

IPVB-Headend-FR-10: The IPVB headend subsystem is required to have packet filtering capabilities for specific services (some specific destination IP addresses or destination port numbers).

IPVB-Headend-FR-11: The IPVB headend subsystem is required to send the converged IP data into the CATV networks.

IPVB-Headend-FR-12: The IPVB headend subsystem is required to support IPv4 and IPv6.

7.1.2 IPVB Terminal

IPVB-Terminal-FR-01: The IPVB terminal subsystem is required to receive the broadcast signals.

IPVB-Terminal-FR-02: The IPVB terminal subsystem is required to filter UDP packets according to multicast IP addresses and UDP destination port numbers.

IPVB-Terminal-FR-03: The IPVB terminal subsystem is required to convert the multicast IP addresses of the selected IP data into the IP addresses of the service clients.

IPVB-Terminal-FR-04: The IPVB terminal subsystem is required to forward UDP packets selected from the IP network through Ethernet within the home LAN.

7.2 Performance requirements

7.2.1 IPVB headend

IPVB-Headend-PR-01: The IPVB headend subsystem is required to broadcast the MIT, SNLT, ACT periodically at intervals no greater than 500 ms [ETSI TR 101 290].

7.2.2 IPVB terminal

IPVB-Terminal-PR-01: The IPVB terminal subsystem is required to support multi-screen interaction for more than 2 service clients.

Appendix I

Scenario for IPVB multi-screen interaction

(This appendix does not form an integral part of this Recommendation.)

In recent years mobile terminals have rapidly become popular, and can be found everywhere. In CATV networks, a typical scenario would be a TV set that can only play one program at a time, which cannot meet the different viewing needs of more than one person. At this time, if the mobile terminal and TV can realize multi-screen interaction, the viewing needs of more people can be satisfied.

The IPVB terminal subsystem supports multi-screen interaction for more than two service clients, and the multi-screen application interaction scenario is shown in Figure I.1.

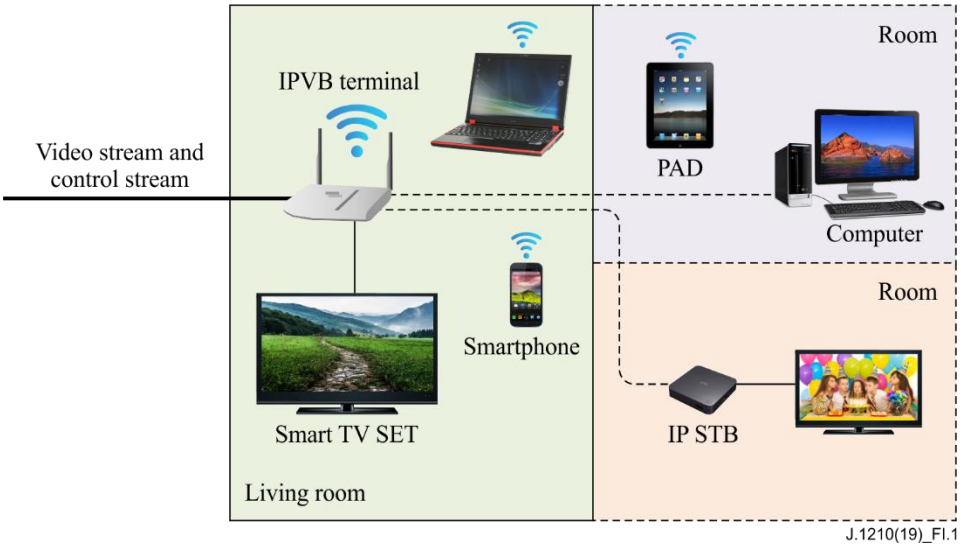

Figure I.1 – IPVB system multi-screen interactive application scenario

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