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Foreword

This Technical Report (TR) has been produced by the Joint Technical Committee (JTC) Broadcast 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.

1 Scope

The present document describes the architectural framework for the delivery of DVB-services over IP-based networks. It is the baseline document introducing the reference model and basic service class descriptions. The DVB Commercial Requirements as developed in DVB phase II form the guiding principles for this architecture [1].

A wide range of specifications will be built upon this basic architecture document in order to define the usage and implementation of IP-based DVB-services. Taking into account that DVB will specify only the necessary interfaces, leaving implementation of the system and system components to the industry, this architectural framework aims to explain how various sets of interfaces work together to enable the different service classes.

The DVB-IP architecture is applicable to all system and service implementations, using Integrated Receiver Decoders, TV sets and multimedia PCs as well as clusters of such devices, connected to Home Networks. It is intended for use by implementers of both systems and services. It is also intended for use within DVB by other groups, where appropriate.

Clause 5 explains the overall system architecture and the related concepts with an abstract layer model, furthermore a detailed description of the home network architecture is given. This greater detail is provided because the interfaces on the home network and especially the network interface of the home network end devices are the prime targets for standardization, to enable high-volume production of interoperable devices.

A description of the services enabled by this architecture is provided in annex A.

2 References

For the purposes of this Technical Report (TR) the following reference applies:

[1] TM2456: "Commercial Requirements for Multimedia Services over Broadband IP in a DVB Context", (CM255r4), March 2001".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

bridge component: OSI layer 2 connecting component, that connects two or more link layer components, not necessarily using different technologies

NOTE: A bridge is usually called either a hub or a (layer 2) switch, where a hub typically forwards all the data coming in on one of the ports to all the other ports and a switch provides some additionally functionality such as forwarding packets only to a specific port.

component: Consists of functionality as described/defined for that particular component. It can offer this functionality to other components in the same device.

connecting component: component which is used to connect link layer components with each other

Content Service Provider (CSP): party offering the end-user some kind of "content service", e.g. an IP based broadcast TV service or a Video on Demand service

gateway component: connecting component that connects two or more link layer components of typically different technologies together

NOTE: It can function at OSI layers 4 through 7.

Internet Service Provider (ISP): party offering an Internet access service to the end-user

link layer component: OSI layer 2 component existing of link layer technology and which is used to provide connectivity between devices

EXAMPLE: Ethernet, DVB-RC, IEEE802.11.

router component: OSI layer 3 connecting component which connects two or more link layer components to each other, not necessarily of the same type. A router is able to select among multiple paths to route packets through the network based on a destination address available in the packet. The only OSI layer 3 type considered is IP.

3.2 Abbreviations

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

A/V	Audio/Video
AAA	Authentication, Authorization and Accounting
API	Application Programming Interface
CPE	Customer Premises Equipment
CPU	Central Processing Unit
CSP	Content Service Provider
DNG	Delivery Network Gateway
DNS	Domain Name System
DVB	Digital Video Broadcasting
DVB-RC	Digital Video Broadcasting - Return Channel
DVB-S	Digital Video Broadcasting - Satellite
EPG	Electronic Program Guide
HN	Home Network
HNCD	Home Network Connecting Device
HNED	Home Network End Device
HNS	Home Network Segment
ID	Identifier
IP	Internet Protocol
IPI	Internet Protocol Infrastructure
ISP	Internet Service Provider
MHP	Multimedia Home Platform
OSI	Open Systems Interconnection
PC	Personal Computer
PPP	Point-to-Point Protocol
QoS	Quality of Service
SDP	Session Description Protocol
SI	Service Information
SOHO	Small Office / Home Office
SP	Service Provider
STB	Set-Top Box
TCP	Transfer Control Protocol
TV	Television
UDP	User Datagram Protocol
VOD	Video On Demand
XML	Extensible Markup Language

4 System structure

In order to describe the complex system that is necessary for the delivery of DVB-services over IP-based networks, the three following clauses describe the inherent functionality from different points of view (Layer model, Home Reference Model, Modules for the Home Network Elements). By using these descriptions all elements and interfaces are explained including their interaction in the system.

The Layer Model shows a number of interfaces between the domains whereas the Home Reference Model shows interfaces between elements. However, the prime target for standardization by DVB is the interface to the home network end devices, to enable high-volume low-cost equipment. The suite of standards should be complete from layer 1 up to and including the application layer. The principle of one tool per function should be employed to simplify the architecture and to keep cost low.

4.1 Layer model

A diagram of the high-level reference model for DVB services on IP is shown in the Layer Model, of figure 1. This model is intended to show the domains relevant to DVB services on IP, with the basic peer-to-peer information flows at the different layers. A management plane is included for management and control purposes.

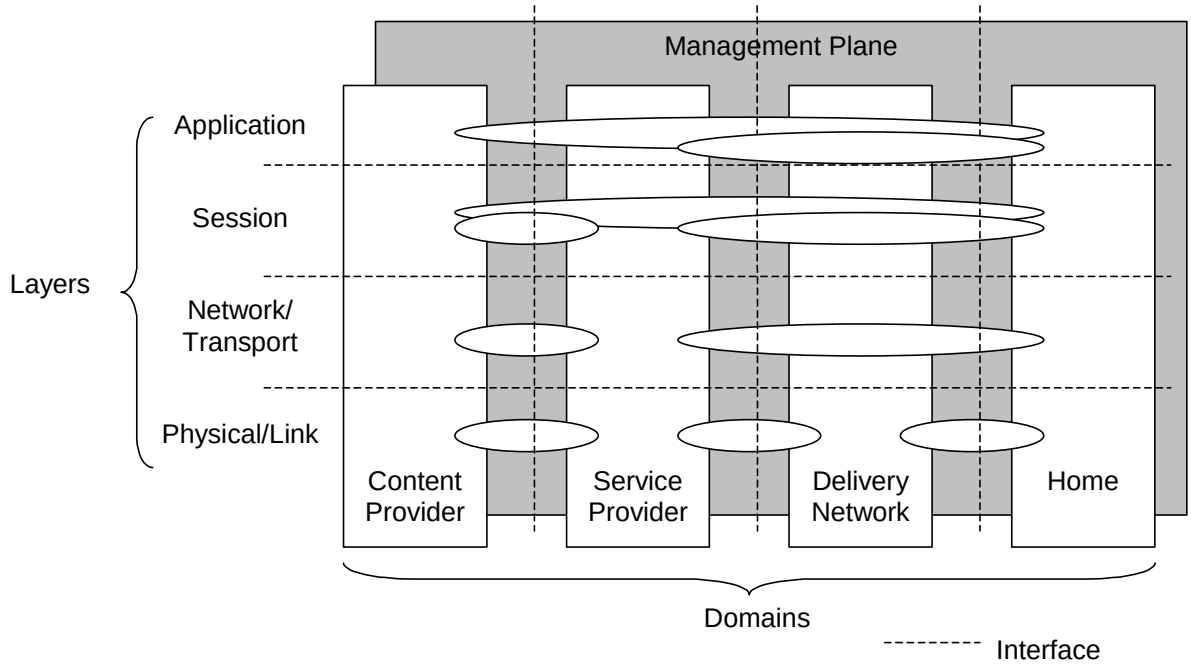


Figure 1: Layer Model

The four communicating domains are briefly described as follows:

- Content Provider: the entity who owns or is licensed to sell content or content assets. Although the Service Provider is the primary source for the client at Home, a direct logical information flow may be set up between Content Provider and Home client e.g. for rights management and protection. This flow is shown in the layered model.

- Service Provider: the entity providing a service to the client. Different types of service provider may be relevant for DVB services on IP, e.g. simple Internet Service Providers (ISPs) and Content Service Providers (CSPs). In the context of DVB services on IP, the CSP acquires/licenses content from Content Providers and packages this into a service. In this sense the service provider is not necessarily transparent to the application and content information flow.

- Delivery Network: the entity connecting clients and service providers. The delivery system usually is composed of access networks and core or backbone networks, using a variety of network technologies. The delivery network is transparent to the IP traffic, although there may be timing and packet loss issues relevant for A/V content streamed on IP.

- Home: the domain where the A/V services are consumed. In the home a single terminal may be used for service consumption, but also a network of terminals and related devices may be present for this purpose.

As mentioned above the Service Provider entity covers various kinds of Service Provider types, especially broadband ISPs and CSPs. It should be noted that although we treat these two business roles separately, a single company could very well act in both roles. In such a case the end user could be offered a single subscription covering both the ISP and the CSP service offerings.

It is noted that today's Internet business models often involve so called virtual SPs, which means that the SP relies on some other party, typically a whole sale IP network operator, to implement and run all (or parts) of the service production platform. However, in the present document we do not distinguish any virtual SP roles - whether the SP owns the service production platform or "out-sources" the platform is irrelevant for this model since we simply look at the services and functions of each domain. It is also noted that in some countries, the access provider and the ISP may be different parties. In this context, however, those are not treated separately, but the ISP is the only party covered. (The "access provider" could for example provide the end device with the IP address. However, in order to simplify the description we cover such potential access provider services/functions under the ISP role. See below.)

The broadband ISP typically provides the following services and functions (non-exhaustive list):

- **Addressing** services. For residential customers, the ISP typically provides the IP addresses and associated configuration to the delivery network gateway and/or to the home network end devices by a dynamic mechanism.

- **Authentication** and **authorization** of the Internet (or IP) access service subscriber. The authentication may be explicit, typically based on PPP or a web login, or it may be implicit, e.g. based on some link layer ID that can be tied to the subscriber. It is noted that authentication is important for the ISP to be able to fulfil its obligations (like handling abuse) but it may also serve as the basis for various kinds of service differentiation. Such differentiation may include different access bandwidth rates, the right to receive/source prioritized traffic and value added services.

- **Naming services**, which provides for the translation between symbolic names and IP addresses, implemented by DNS.

- **IP connectivity**. This is the basic service and provides broadband access to the Internet. However, the IP connectivity could also cover a QoS enabled access to various sources of content, logically parallel to a best effort Internet access. It is noted that downstream IP multicast need to be supported to carry IP based TV services, although the access service may impose certain restrictions on the ranges of multicast addresses accessible. The address ranges may be determined by the access rights of the specific subscription.

- Termination of the **session control** protocol for multicast based services.

- **Accounting** of the services associated with the IP access subscription.

- **Value added services**. This service category could involve services like a network based firewall, network based storage for the end user, caching services and e-mail.

It is noted that an ISP may extend its service offering by the category "value added services" above. Such services may then include also content related services like VOD. In such a case, the ISP party also act as a CSP and may then make use of a common user authentication for all services. I.e. the end user does not necessarily need to have different user accounts per service, but a single user account could cover the IP access service as well as a VOD service. However, the ISP and the CSP could as well be separate parts, each one having a separate authentication process of the associated users. In this context we will assume the latter, since that could be regarded as the general case.

As described above, the CSP is a fairly generic term denoting an SP offering "content services" to the end user. The services could be multicast based, e.g. an IP based TV service, or unicast based, e.g. a VOD service. The CSP is less "standardized" compared to an ISP when it comes to service offering. So, the list below should be regarded as example services and functions:

- **Authentication** and **authorization** enabling access of the actual content service.
- A **service portal** providing the "entrance" to the range of services offered by the CSP.
- Means to provide the end device with the **service offering** of the individual services of the CSP, e.g. a Broadcast TV service list.
- **Content location** service enabling service discovery, e.g. finding the multicast address of a certain Broadcast TV service.
- Various kinds of **metadata services** providing the basis for e.g. an enhanced EPG service.
- Termination of the **session control** protocol for non-multicast based services.
- Sourcing of the **audio-visual content** forming the basis of the actual content service.
- **Accounting** of the services associated with the content service subscription.

In the Layer Model each communication protocol layer presents only a service interface to the layer above, hiding its own implementation details. This has the advantage of reducing complexity and cost and enables easy layer changes and improvements. A brief description of the protocol layers:

- The physical layer of a communication link describes the scheme that constitutes a bit on the media, the bit synchronization, the media and the connector shape and size. This level is not aware of packets or frames used for multiplexing.
- The link layer handles the media access control, with addressing and arbitration to enable end-systems to receive only the packets addressed to them. It may also provide error control, flow control and retransmission of corrupted or lost packets. This layer is very dependent on the physical media and may contain specific control and linking mechanisms.
- The IP network layer enables an elementary end-to-end logical link by provide routing, packet forwarding, segmentation and re-assembly. Only formatting of packets with IP header and IP source and destination address is needed for implementation of the end-to-end communication link. Because IP hardly makes any assumption about the link layer, it can be transported using almost any link layer technology.
- The transport layer uses the IP layer to create a flow-controlled, error-controlled end-to-end communication link, protected against corruption, duplication and packet loss. The measure of protection and the processing required for it needs to be weighed against the needs of the service. The transport layer may also provide multiplexing of services on a single IP link, using e.g. port numbers. Popular IP transport protocols are UDP and TCP. UDP provides multiplexing, but no flow or error control. TCP provides error detection and control, flow control and multiplexing.
- The session layer sets up or closes the connections needed to start or terminate an application.
- The application layer consists of two sublayers: the API and application sublayer. They provide end-to-end application control and command. For DVB services, this layer is specified as MHP.

4.2 Home Reference Model

The architecture of the DVB-IPI network must support the following (non-exhaustive) list of possible scenarios [1]:

1) A home network can be simultaneously connected to multiple and heterogeneous delivery networks.

   As an example, in a typical scenario ADSL and DVB-S are both available at the home. Load balancing may be possible between the different delivery networks in order to optimize the utilization and throughput of the networks and to minimize the delay.

2) End users can choose the service provider.

   As an example, the ISPs and the CSPs may be independent from each other.

3) Different end users in the same home network can select different service providers.

4) Access to the content is independent from the underlying hardware.

   As an example, terminals with different capabilities (e.g. CPU power, display size, storage capacity) may be allowed to access to the same content through the use of transcoding resources, or through the use of device specific resources.

5) Roaming of end users between delivery networks should be possible.

   As an example, the personal environment of a (SOHO) user stored on a home server should be accessible from different external locations. Adequate security aspects need to be taken into account.

Based on these scenarios a reference model for the DVB-IPI home network can be constructed. This reference model is depicted in figure 2.

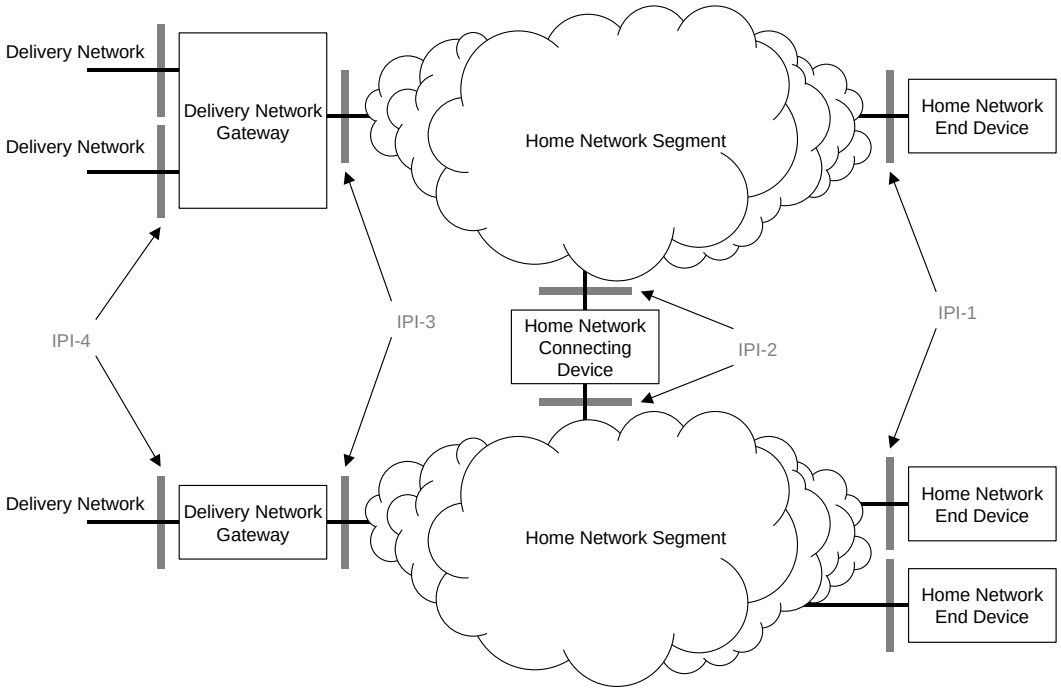


Figure 2: Home Reference Model

The Home Reference Model, as depicted in figure 2, consists of the Home domain of the Layer Model. Furthermore, it shows the interconnection with the Delivery Network domain. This Home Reference Model shows the elements that can be present in the home and their mutual relation. Based on the fact that this is just a reference model, elements can be removed or added as long as the connection between a home network end device and the delivery network is still possible. The collection of all these home network elements forms the Home Network (HN).

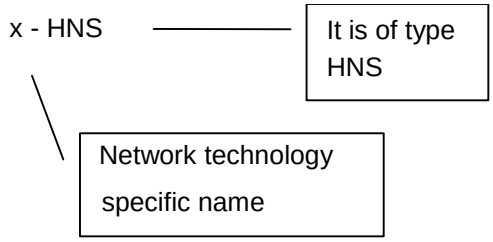
The elements present in the Home Reference Model are described as follows:

- Delivery Network Gateway (DNG): the device that is connected to one or multiple delivery networks and one or multiple home network segments. It contains one or more connecting components so that it can interconnect the delivery network(s) with the home network segment(s) on any of the OSI layers. This means, that it can be a so-called 'null' device, a wire interconnecting the networks on OSI layer 1; that it can function as a bridge or router interconnecting different link layer technologies; or that it can act as a gateway also providing functionality on the OSI layer 4 and above.

- Home Network Segment (HNS): this element consists of a single link layer technology and provides a layer 2 connection between home network end devices and/or connecting components. The connecting components are not part of a home network segment. So, each home network segment is connected to another home network segment via a connecting component. The separation of a home network into home network segments does not imply that each segment needs to be an 'IP-subnet'. A home network segment can be wired or wireless.

- Due to the fact, that various network technologies can be used by home network segments, the network technology specific name is used to distinguish between them.

Home network technology name:



Some examples: Ethernet - HNS, IEEE 1394 - HNS, HiperLAN2 - HNS.

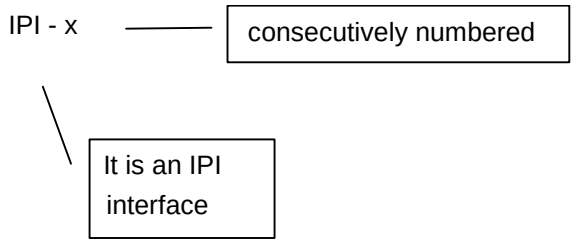
- Home Network Connecting Device (HNCD): this device, which contains one or more connecting components, connects two or more home network segments with each other and functions as a bridge, router, or gateway.

- Home Network End Device (HNED): the device that is connected to a home network and which typically terminates the IP based information flow (sender or receiver side). This does not imply, that this home network end device needs to be the end point of the non-IP based information flow. So, it can still serve as an application level gateway to other non-IP based network technologies. For instance, a DVB stream over IP can be converted to a DVB stream directly over IEEE 1394 (so without IP in between).

In case the delivery network gateway is a 'null' device, there is no actual home network. So, in that case the home network end device is directly connected to the delivery network.

The mutual relations presented in the Home Reference Model can be described by means of interfaces, which are provided in the figure by using the following naming principle:

Interface name:



Currently, four interfaces have been defined. Of these interfaces, the IPI-1 interface, as depicted in figure 2, is the primary interface that will be specified by the DVB-IPI ad hoc group. It will describe the necessary protocols required for the delivery of DVB services over IP-based networks. However, the interface description will be independent from the physical layer and link layer technologies used in the home network. The other three interfaces will contain a subset of the IPI-1 interface and possibly contain some extra protocols.

4.3 Modules for Home Network Elements

The functionality of the various elements identified in clause 4.2 can be described with modules that take into account the layer structure of clause 4.1. These modules contain protocols for specific required functionalities. Once defined they can be re-used where needed.

The modules will be addressed in the various DVB-IPI specifications.

Annex A:
DVB Services over IP-based Networks

This annex describes the services that should be enabled by the IPI architectural framework. In addition requirements for these services are listed. The descriptions and requirements given are identified by the DVB-TM ad-hoc group for IPI, as feedback to and for verification by the DVB Commercial Module.

A.1 Services

There are several ways to describe services that will be available on DVB over IP technology framework.

Here, services will be divided in categories depending on the *users' service perception*; the starting point will be concrete services. Then, each service category will be described to better understand underlying technological implications. The analysis will point out what kind of technological framework is capable of implementing the services: if interactive channels are needed or not, what delivery methods and formats will be used. DVB services, or services related with DVB, as the "New Mission" of DVB states, will be considered.

In this description, intended for discussion, we used the following guidelines:

- user requirements and needs that services aim to satisfy;
- main functionalities provided (audio and video delivery, download, file transfer and so on);
- technology (the most suitable network or device and so on).

A.2 Services general description

Services are divided in categories to aggregate similar functionalities.

The categories we found are the following ones:

- Entertainment Services; general leisure and spare time services; e.g. sport news, on-line gaming.
- General Information Services; main purpose of these service is to provide users with up-to-date information.
- Educational Services; they provide educational content, distance learning functionalities.
- Messaging Services; users can use them to exchange information, like mail messages.
- Communication Services; they provide real time connection between users, like video conferencing (video telephony? Voice over IP?).
- Service Information; these services provide to users information about other services, they make it easy for the user to connect to a service and to use it.

A short description of each service will clarify the use of the service and technological assumptions.

A.3 Detailed service description

A.3.1 Entertainment

"Entertainment" services are:

- Pay TV (Audio/Video).
- Video On Demand (Audio/Video).
- Music (Audio).
- Pictures download.
- Games.

Short description: general leisure and spare time services; e.g. sport news, on-line gaming.

Interaction: in their basic version, these services require no interaction.

Video On Demand requires interaction.

Games can be divided in different types. Some games require a network for interaction with other players. Other games (e.g. gambling) require an interaction with the provider.

More evolved scenarios include possibility of interaction for the user, requiring a full bi-directional connection with the provider and the possibility to download useful software, presentations, and so on, service related.

Possible delivery method: in their basic version, they are push, point-to-multipoint services. Point-to-point connection is needed for Video On Demand and some types of games.

Considering IP encapsulated DVB, at Network Layer, IP Multicast is suitable to convey PayTV, Music, Pictures download, Games. IP Unicast is suitable for Video (and Audio) On Demand.

Possible format: MPEG-2 audio and video. Other formats could be jpeg/png for pictures, java applications for games.

End devices: these services are well suited to STBs and PCs. Powerful handheld devices could also be a target.

A.3.2 General Information

In category "General Information" we can think of services like:

- Advertising.
- Sport news.
- Entertainment news.
- Emergency Information.
- General news.
- Travel information.
- Stock exchange Information.

Short description: main purpose of these services is to provide users with up-to-date information on different subjects (Sport, Entertainment, and Travel). Also Advertising is considered here an Information service.

Interaction: in their basic version, these services require no interaction.

Possible delivery method: in their basic version, they are push, point-to-multipoint services. They basically need one-way transport functionalities.

Considering IP encapsulated DVB, IP Multicast is suitable to convey them.

Possible format: MPEG-2 audio and video for Advertising, Sport news, Entertainment news, General news, Emergency information.

Travel information could be integrated with text information too.

Stock exchange is text based (for example, html or xml pages).

End devices: these services are well suited to STBs and PCs. Powerful handheld devices could also be a target.

A.3.3 Educational

In category "Educational" we can put these services:

- Computer/STB based training.
- Distance learning.

Short description: they provide educational content, distance learning functionalities. Distinct from general information services because of their specificity.

Interaction: in their basic version, these services require no interaction (distance learning without interaction).

More evolved scenarios include possibility of interaction for the user, requiring a full bi-directional connection with the provider and the possibility to download useful software, presentations, and so on. In this case the consumer machine (PC or STB) has to support all the involved formats.

Possible delivery method: in their basic version, they are push, point-to-multipoint services. They can be conveyed on both one-way and bi-directional channels.

Considering IP encapsulated DVB, IP Multicast is suitable to convey them. Interactivity is obtained by adding a bi-directional channel (e.g. TCP based).

Possible format: MPEG-2 audio and video. Other formats for support material download (jpeg/png/gif for pictures, java applications …).

End devices: these services are well suited to STBs and PCs. Handheld devices could be considered for very basic services.

A.3.4 Messaging

"Messaging" services are:

- e-Mail.
- Multimedia Messaging.

Short description: users can use them to exchange information, like mail messages. Messages could be as simple as chat transactions and as complex as video messages. Messages could be addressed to a single user or to the listeners of a program.

Interaction: these services require interaction.

Possible delivery method: They need bi-directional channels. Messaging can be both a point-to-point and a point-to-multipoint service.

Considering IP encapsulated DVB, at Network Layer, IP Unicast is convenient for e-Mail. For Messaging addressed to many users, IP Multicast is convenient for forward channel, IP Unicast for interaction with the provider.

Possible format: text, html. Other supported formats could be jpeg/png/gif for pictures, video clips and attachments in general.

End devices: these services are well suited to STBs and PCs. Handheld devices are well suited for these services.

A.3.5 Communication

"Communication" services are:

- Video Conferencing.
- Video telephony? (to be discussed).
- Voice over IP? (to be discussed).

Short description: they provide real time connection between users, like video conferencing. Content is generated by one or some users and it is sent to other users in real time.

Interaction: these services require *real time* interaction.

Possible delivery method: They need bi-directional channels; they can be both point-to-point and point-to-multipoint services.

Considering IP encapsulated DVB, at Network Layer, IP Multicast is convenient to forward the streams to the subscribers. IP Unicast or Multicast could be used to send the streams to the provider.

Possible format: mainly MPEG-2 audio and video. Text, html enriches the communication when convenient and useful. The service offers to the user the possibility of sending support material (jpeg/png/gif pictures, documents, applications, etc.).

End devices: these services are well suited to STBs and PCs. Handheld devices are well suited for the basic functionalities of these services.

A.3.6 Service Information

"Service Information"

- Electronic Program Guide (with detailed content description).
- Service Discovery and Selection.

Short description: these services provide to the users information about other services, they make it easy for the user to connect to a service and to use it.

Interaction: in their basic version, these services require no interaction.

Traditional DVB EPG and SI information is a pure push service. Service Discovery, Selection and Description for DVB services over IP can be a push or a pull service.

Possible delivery method: they are push or pull services.

They can be conveyed on both one-way and bi-directional channels.

Considering IP encapsulated DVB, at Network Layer, IP Multicast is suitable to convey Service Information.

Possible format: DVB specified format for traditional DVB EPG. XML, SDP specified format (and other formats?) for Service Discovery, Selection and Description over IP.

End devices: these services are well suited to STBs, PCs and handheld devices.

A.4 Requirements for service authentication, authorization and accounting

Service providers need methods for authentication, authorization and subsequently billing of users for using their networks and services. The following lists some requirements for *Authentication*, *Authorization* and *Accounting* (AAA) in DVB services on IP networks.

The technologies used should:

- be based on standards used within the Internet community, such as the AAA Framework described in RFC 2904 and RFC 2905;
- offer authentication, authorization and accounting on a per service basis;
- support multiple services running simultaneously on/over the same customer premises equipment (CPE);
- allow the use of different accounting policies e.g. one for Video-Audio, one for Internet Access (e.g. web-browsing) and another for IP-telephony;
- allow each Service Provider to do its own authentication, authorization and accounting;
- prevent CPE, which does not contain AAA functionality, to enter the broadband access network and;
- be secure, i.e. users cannot circumvent authentication, authorization and accounting e.g. by "hacking" the CPE.

Annex B:
IPI Specifications

The set of specifications consists of:

- **Architectural Framework for the Delivery of DVB-Services over IP-based Networks**

  It is the baseline document that introduces the reference model of the system and all involved elements. All other documents are built upon this overview document.

  Editor: TUBS (Piastowski).

  Document: IPI2001-012.

- **Transport of DVB Services over IP-based Networks**

  This specification describes how DVB services are transported over IP. It defines how the service is initiated, how the service is encapsulated in IP, and the requirements on the network for correct and timely delivery of the service.

  Editor: Tandberg Television (Stallard).

  Document: IPI2001-016.

- **Service Discovery and Service Selection**

  The specification describes the discovery of available television service providers, which DVB-IP services they provide and the mechanism to select those services.

  Editor: Telia (Hedin).

  Document: IPI2001-059.

- **Network Provisioning and IP Addressing**

  The specification includes how the device obtains the IP address, DNS and other basic IP services, and how on-going management of the device over IP is handled.

  Editor: Cisco (Goldberg).

  Document: IPI2001-071.

  IEEE1394 Home Network Segment.

- **Integration of the existing DVB Specification**

  Editor: Philips (Berkvens).

  Document: IPI2001-079.

- **Ethernet Home Network Segment**

  This specification defines a wired Home Network Segment based on Ethernet 100baseT, defines how IP services will be carried over the network and makes recommendations foe how IP QoS can be mapped to the Ethernet layer.

  Editor: British Telecom (Galbraith).

  Document: IPI2001-072.

- **Security**

  Tbd.

  Editor: Nokia (Schnell).

  Document: IPI2001-073.

History

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