

# Delivery of Interactive Services Via Digital TV Networks

## Introduction :

In addition to digital video/audio signals digital TV broadcast networks could also be used for the carriage of data originating.

From a number of different sources thus ushering in the era of digital multimedia broadcasting. A key feature of the technology which is expected to function as a key driver of the analogue to digital transition process, i.e.

The possibility of using those networks for the delivery of several new enhanced interactive services including access to the internet.

## Digital Television Interactivity

Before proceeding further it is necessary to distinguish between different types of interactivity. The interactivity services currently under development can be divided into two major categories – those relating to fully interactive television services e.g. Video on Demand (VOD) and those relating to interactive data services (which may include programme related services such as voting or home shopping). It is the interactive services of the latter type, that we will be discussing in this paper. There are two principal types of interactivity namely, local interactivity and two way interactivity.

An interactive TV application that is based on local interactivity is one which does not require a return path from the services consumer to the service provider. Consider for example a situation in which a broadcaster is transmitting pictures of a hockey match as a video data stream in parallel with another stream carrying additional but related material such as graphics containing player profiles, goal scoring averages, video clips of past goals or player interviews and so on. Using relatively simple technology it would be possible for a viewer to call up this extra information on demand, say,, when a goal was scored or at half time either as an overlay or in a 'Window'.

As far as the viewer was concerned, this experience would be unique to him or her, but it would involve no signal being sent back to the broadcaster to obtain the extra data, the information would already be 'there' being broadcast in a linear fashion in much the same way as the video signal is. The viewer is simply dipping in and out of that data stream to pick up supplemental information as required. Services of this type are also known as 'enhanced' services.

Let us now see how two-way interactivity differs from local interactivity. In this case the viewer issues a request for extra information to the services provider which travels along a return-path, and the service provider sends that requested data back either via the return path itself or 'over-the-air'. What might be termed 'low-level' two way interactivity is demonstrated by a pay-per-view service. 'High level' two way interactivity is characterized by a continuing two-way exchange of data between the user and the service producer, an exchange which is fundamental to the service. A good example would be calling up a home shopping application via the TV screen.

## Online Access Via DTC

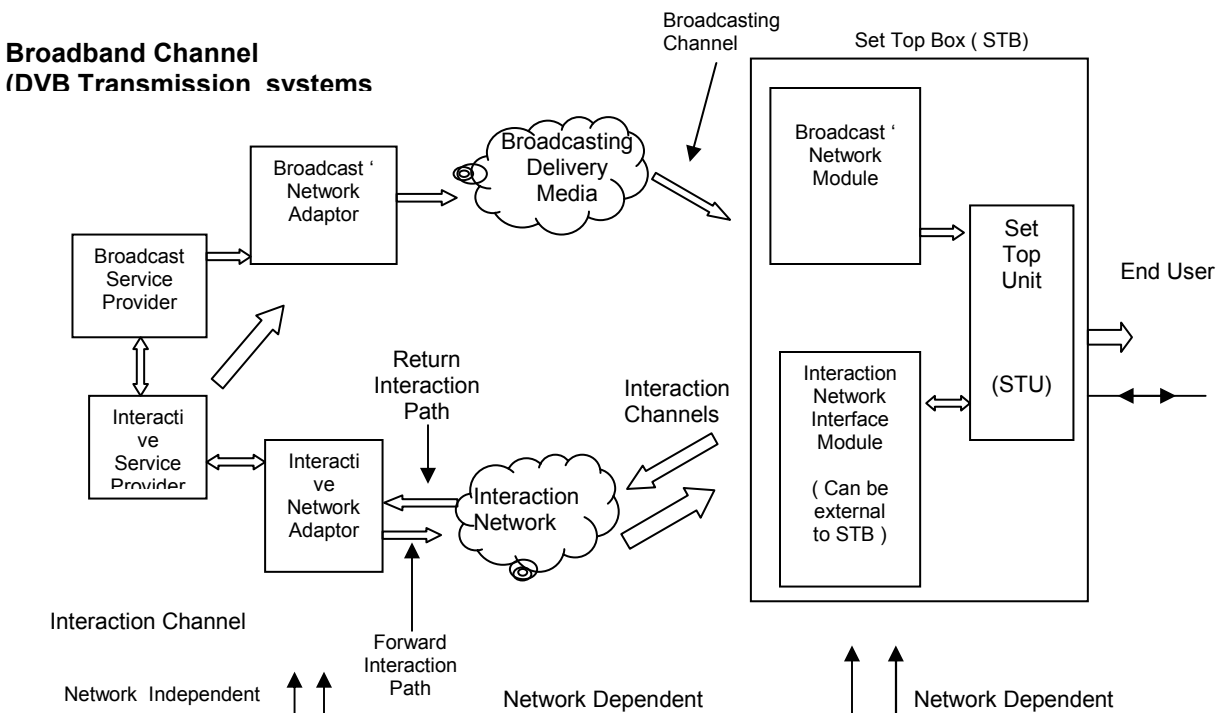
Just as there are different type of interactivity there are different types of online access.

'True' on line access is defined as a simulacrum of what is available via a PC equipped with a modem and web browser. This means that a TV user equipped with this feature is directly connected to the World Wide Web via an Internet Service Provider(ISP), and through the ISP is able to access any of the web-sites via his or her TV screen that would normally be available through a PC with the same or similar degree of functionality. This way or internet access necessitates compliance with internet protocols and web authoring languages.

In contrast to what is stated above it is possible to provide a sort of 'psudo online' access experience via DTV in two different ways. One way is by broadcasting content over the air on a 'Carousel' basis. Using the bandwidth available from a DTT channel it is possible to 'cycle' a large number of pages in this way, in a manner analogous to the system used to provide a teletext service. Alternately there is the so called 'walled garden' approach. In this approach what the user is being connected to is a server which contains a certain amount of online content which can be browed. But it is not possible to jump from the walled garden directly to the World Wide Web. Neither of these two varieties necessitates compliance with internet protocols and web authoring languages.

The DVB (Digital Video Broadcast) group has developed a standard called DVB Multi protocol encapsulation for the transmission of I.P. packets over DTT networks within the MPEG transport stream.

## System Model for Interactive Services



**Fig. 1 DVB System Model**

Fig. 1 shows the system model which is being used within the DVB project for interactive services. Two channels are established between the user and the service provider. These are:

1. The broadcast channel: A unidirectional broadband broadcast channel including video, audio and data from the service provider to the users. It may include the forward interaction path.
2. The interaction channel : This is a bidirectional channel between the user and the service provider for interaction purpose. It is formed by
  - a. The return interaction path (return channel): from the user to the service provider. This is used to make requests to the service provider or to answer questions. It is narrow band channel and is also commonly known as the return channel.
  - b. The 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. This channel may not be required in some simple implementations which may make use of the broadcast channel alone for the carriage of data to the user.

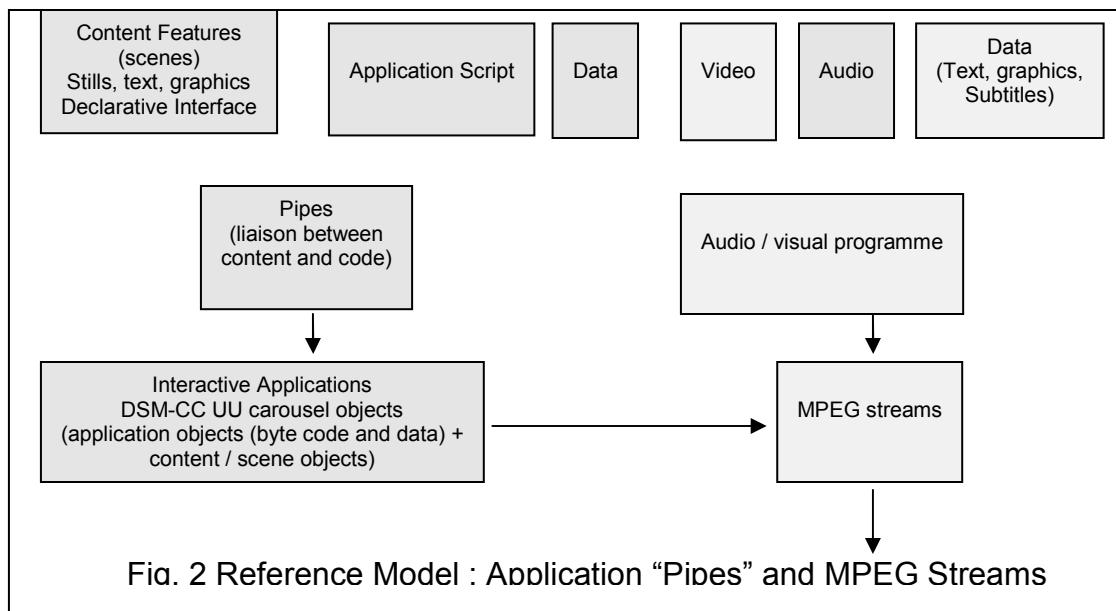
The broadcast channel can be transmitted via any of the channels specified by DVB terrestrial satellite, cable etc. For enhanced services a return channel is not required and the forward interaction path is included in the broadcast channel itself. For two way interactive services a number of different return channels have been specified, of these the most commonly used one is the PSTN/ISDN return channel. This allows for the use of a standard PSTN modem (V21 through V42) or of ISDN basic rate access.

### **Interactive Application-Delivery Mechanism**

Fig. 2 shows how an interactive application is delivered along with normal audio-visual programmes. Both are multiplexed together and carried on MPEG-2 transport stream.

An interactive application is basically built around

1. Application script
2. Content/scenes (declarative interface/media streams)



The declarative interface is the representation of man-machine interface. It can consist of graphics such as background design, selection button, still pictures, text etc. Each scene can comprise a set of other scenes, application objects and attributes. The pipes implement the interconnections between the scenes and concatenated functions.

Application script and contents are grouped together in application objects which are converted into DSM-CC Carousel objects. DSM-CC (Digital Storage Media – Command and Control) has been standardized by MPEG for the retrieval and transport of MPEG stream and has been adopted by DVB. DSM-CC UU is the interface that allows us to extract DSM-CC Carousel objects from the broadcast streams or via an interactive access to a remote server.

DSM CC carousel objects allow one or more application objects to be carried in one module of the data carousel. The principle of data carousel is that modules of data are transmitted in a cyclic manner. Along with these a download control message is also transmitted which provides a list of available modules from a particular carousel so that each set top unit can identify which modules it wishes to capture.

### **Application Programming Interface (API)**

The API is an essential element of DTV receivers meant for the reception of interactive services. The API provides a platform independent interface between applications from different service providers and the manufacturer specific hardware and software implementation. Until recently only proprietary interactive technologies were available in the market. This has resulted in a problem that applications and set top boxes using different proprietary APIs were incompatible with each other leading to a situation where an end user wanting to have access to all of the DVB services available today would have to buy several set top boxes. To remedy this situation the DVB project group has recently developed an international standard called MHP (Multimedia Home Platform).

### The Multimedia Home Platform (MHP)

Aimed squarely at achieving full convergence, the MHP comprises the home terminal (set top box, integrated TV set, multimedia PC) its peripherals and the inhome digital network.

The DVB MHP is built primarily for digital broadcast scenarios. It receives content via a DVB broadcast channel and can use as additional interaction channel. The usual display is a TV screen and the MHP is operated via a remote control.

Fig. 3 illustrates the three basic layers of the MHP.

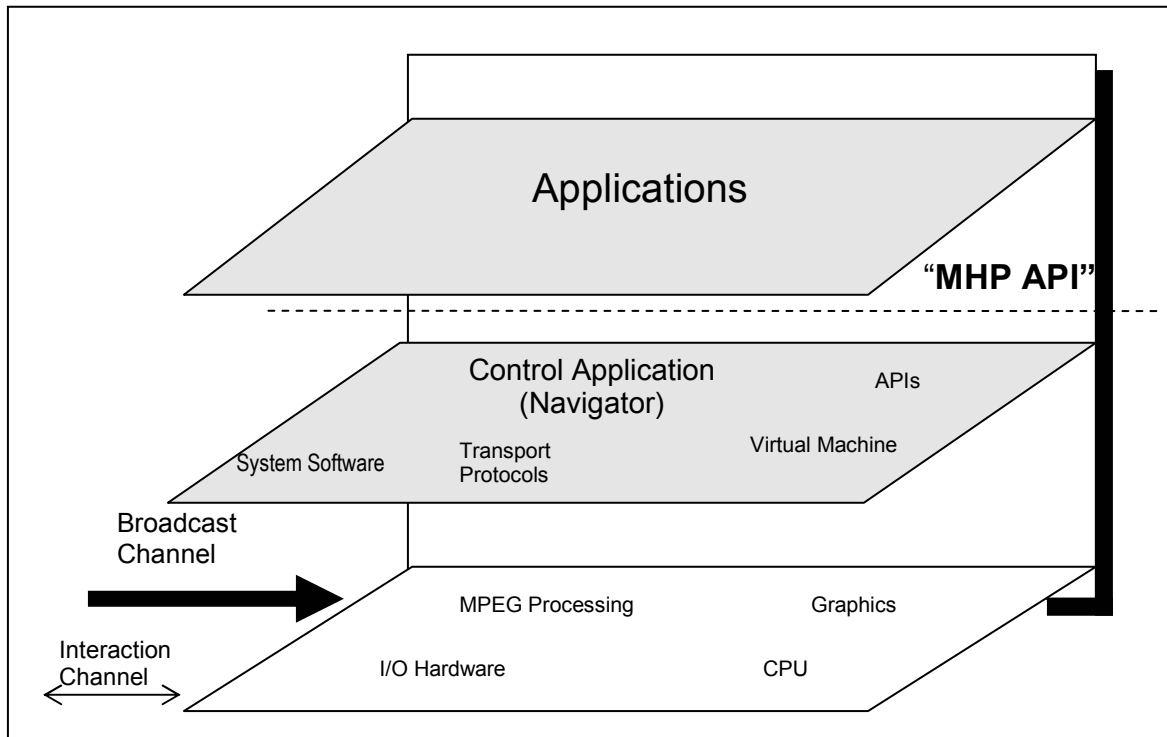


Fig. 3 The three Basic layers of the MHP elements of the DVB MHP solution

MPEG processing, I/O devices, CPU, graphics processing and other resources provide access to the available interfaces. The system software includes an application manager and support for basic transport protocols. It also implements a virtual machine (Java VM) which decouples the manufacturer specific hardware and software from the standardized APIs.

### **The MHP API shall**

- Allow to support real time streaming applications, downloaded and locally stored applications.
- Allow any broadcaster or any application provider to write and supply applications.
- Allow the look and feel of all applications to be under the control of the broadcaster.
- Provide access to the DVB SI (Service Information).
- Allow any manufacturer to implement the API in his own way.

DVB-J Platform: The DVB MHP uses a Virtual Machine (VM) concept which provides a common interface to different hardware and software implementations. The VM is based on JAVA specifications from Sun Microsystems and has been named DVB-J platform. Fig. 4 shows the structure of DVB-J platform. The systems software consists of all implementation specific parts such as the real time operating system, drivers and firmware. The application manager is also implementation specific and controls and the operation and the configuration of the MHP. The application manager includes a navigator which enables a neutral access to all services.

The DVB-J platform also provides support for existing systems. As there are already many DVB systems with different APIs in operation, support for such existing systems is essential to enable the migration to a future common API. The platform therefore provides support for plug-ins to implement legacy APIs.

Plug-ins can be implemented in DVB-J (Type A in Fig.4). Such an interoperable plug in can be used on all DVB-J platforms. Another way is the direct implementation in the system software (Type B) which requires a platform specific plug in.

The wide range of possible MHP applications cannot be covered with a single MHP applications cannot be covered with a single MHP variant. Therefore, different MHP profiles have been defined that combine a set of functionalities as shown in Fig. 5. In this way it is ensured that applications developed for a certain profile will run on an MHP of that profile.

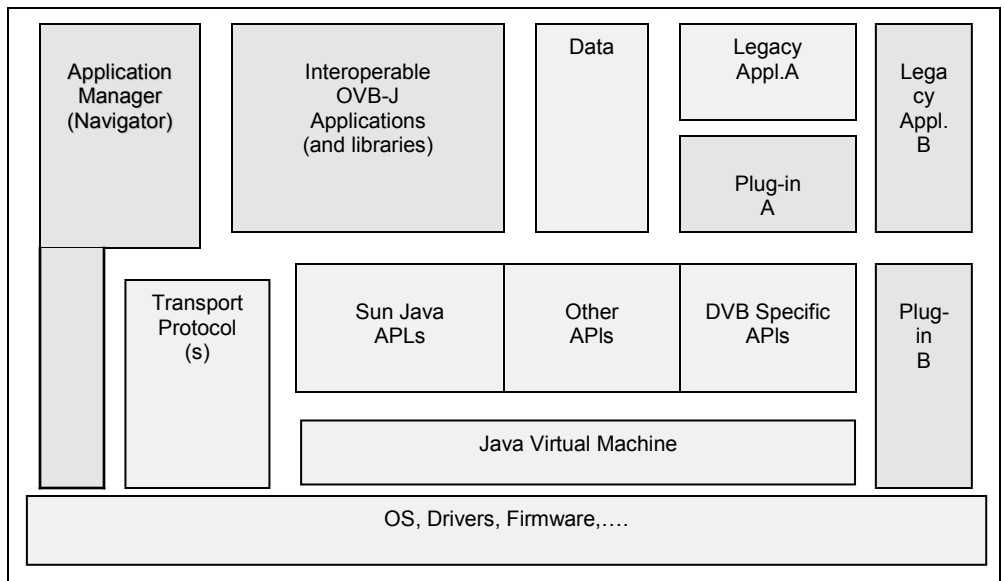


Fig. DVB-J Platform with Plug-ins

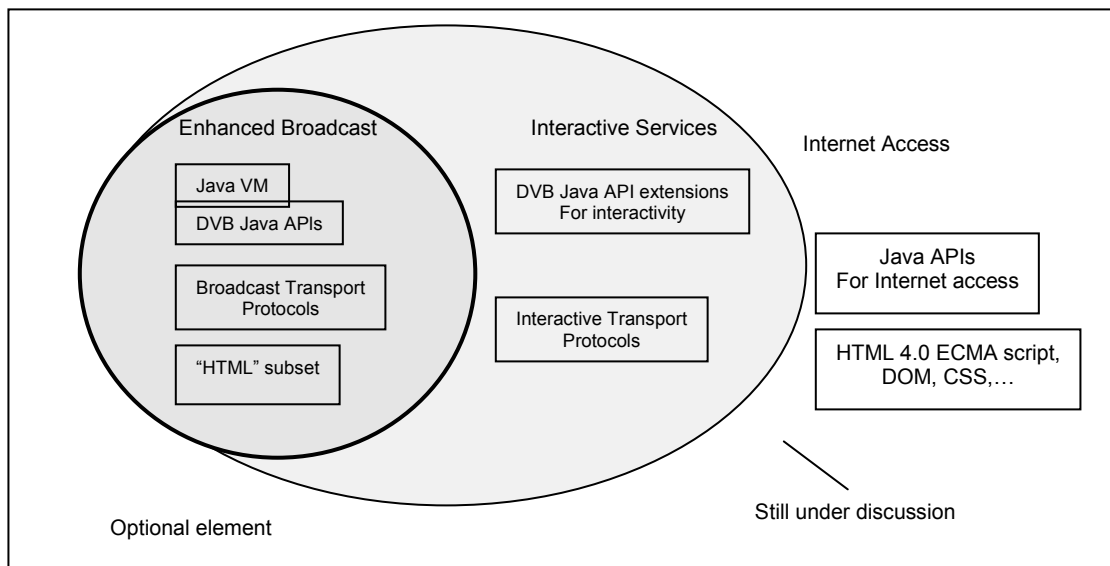


Fig. 5 Application Areas and Profiles

Currently different profiles are considered for the application areas of enhanced broadcasting, interactive broadcasting and internet access. Currently the first two are defined whereas the internet access profile is still under development.

### **Type of Applications**

1. Electronic Programme Guide
2. T-Commerce and interactive advertising
3. Interactive sports
4. Pay per view, near Video on Demand
5. Interactive games
6. Internet enabled services

### **Conclusion**

The delivery of interactive services via digital television networks will be the key feature of television broadcasting in the convergence era. This has the potential of transforming the very nature of broadcasting from a 'one to many' media into a 'one to one' media. Further DTT networks could provide internet access both to fixed and mobile users. If we could do this at an affordable cost it will help us in realizing a very desirable national goal: that of providing universal access to internet.

### **References :**

1. European Telecommunication Standards Institute (ETSI). Digital Video Broadcasting (DVB) specification for data broadcasting European standard EN 301 192 V1.2.1 (1999-01)
2. Digital Video Broadcasting (DVB) : Network Independent Protocols for DVB Interactive Services ETS 300 802. November 1997
3. J.P. Evain " The Multimedia Home Platform" EBU Technical Review Spring 1998.
4. Carsten Voigt "The DVB MHP specification: A guided tour in World Broadcast Engineering March 2000).

\*\*\*