

European Digital Broadcast

- Migration to Multimedia Home Platform

欧州デジタル放送 マルチメディア・ホーム・プラットフォームへの移行

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Abstract

The European DVB project has developed a large toolbox of open standards for Broadcast and Interactive services on Satellite, Cable and Terrestrial.

Receivers from different operators are not interoperable, because the pay TV operators and public TV broadcasters use different Application Programme Interfaces (API's) and a consumer would require a "special set top box" for each service provider.

DVB consortium has harmonised the standards to create the Multimedia Home Platform (MHP) which defines important features for guaranteeing interoperability of features.

The paper explains the DVB standardisation process of MHP, the basic specification and it tries to draw a migration path to interoperable MHP receivers.

欧州デジタルビデオ放送 (DVB) プロジェクトは、衛星、ケーブル、地上波それぞれの放送用及びインタラクティブサービス用のオープンな標準に基づく大規模なツールボックスを開発した。有料TVの放送会社と公共放送機関は異なるアプリケーションプログラムインタフェース (API) を使用している為、各放送会社の受信装置は共通の操作性を持たず、消費者はサービス供給会社毎に異なるセットトップボックスを使用しなければならない。DVBコンソーシアムは、各機能が共通の操作性を持つことを保証するための重要な機能を定めたマルチメディアホームプラットフォーム (MHP) を作成する為、標準化を行った。本論文はMHPのDVB標準化プロセス、及び、基本的な仕様を説明するもので、共通操作が可能なMHP受信装置への移行方法について考察するものである。

Introduction

The Digital Video Broadcast project (DVB) has created many standards and Implementation guidelines. Based in such "open standards/specifications" some 20 European companies and around 10 public Broadcasters in the UK, Germany, Finland and Sweden offer mostly pay TV programmes, but also "free to air services" provided by the public TV operators.

For all the services, special set top boxes/receivers are necessary which limit the market acceptance enormously.

The newest developments had the goal to harmonise the specification for the future "Multimedia Home Platform" (MHP) which will guarantee features in the majority of DVB receivers such as Interoperability of applications, download mechanism, scalability and upgrading of receivers.

The main goal of the MHP-platform harmonisation is a change of direction from "vertical markets" (one service provider with own set top boxes) to "horizontal markets" (many service providers, many different services such as Pay-TV, Free-TV, Internet access...) in which the applications of different providers can be handled in all set top boxes, Integrated TV (idTV) and Multimedia PC's.

To realise a horizontal market, the essential "Application Program Interface" (API) plays a key role, as it creates a platform independent Interface between different applications and the manufacturer specific Hard and Software.

The main European API's and EPG's (Electronic Program Guide) presently used are: MediaHighway/France, and OPENTV/USA and d-box/Germany are preparing "Migration Paths" to MHP. These evolutions to MHP should be ready by no later than December 2000.

DigiTAG, the European digital terrestrial group, established in 1998 a special task force on API Migration and in May 2000, the MHP Implementation group was

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created with 27 members - Broadcasters, Industries, Universities ... in 1999 the DVB C&I (Conference and Interoperability group) and in July 2000 the MHP-Reference Implementation group.

All of these groups have the common goal to make MHP and migration to MHP a success.

This paper explains in brief three topics:

1. The path to European DVB Multimedia Home Platform (MHP).
2. DVB specification/standard for MHP.
3. Migration to DVB MHP.

1. The path to European DVB Multimedia Home Platform (MHP)

1•1 Priority for the DVB infrastructure

The DVB project started in September 1993 with some 100 founding members - operators, broadcasters, manufacturers ... including Sharp. The first topic being addressed was to define an infrastructure to allow a rapid implementation of digital services. In this phase, the members wanted to see their and the market interests being included into all considerations, therefore, it was felt that a Commercial Module (CM) and a Technical Module (T.M.) could create the infrastructure [1].

The TM could only develop specification based on commercial requirements agreed in the DVB-CM. In the DVB Steering Board (SB) specifications had to be approved before they were passed on to the official standardisation bodies in Europe, ETSI and CENELEC.

Based on the market and user oriented approach, it was guaranteed that the Standards created were really needed; this was the key for the real success of DVB.

There was, as said before, a strong interest of the financially strong pay TV companies and the Network operators in the satellite and cable area to provide the necessary transport capacity and that is why these two groups had a main say in the definition of the commercial requirements.

Logically, the first standards were created for satellite and cable infrastructure, and thereafter for service information (SI) data.

The work on a digital terrestrial standard had a lower priority and was only intensified in 1996 when political decisions - analogue TV switch-off scenarios - created the commercial basis for it.

An important step in the "infrastructure oriented start-up

phase" of DVB were the agreements on Conditional Access (CA). After long discussions, a "Common Scrambling Algorithm" was standardised, but only under the precondition that the pay TV operators could keep and control their proprietary CA systems.

With the agreement on multiple CA systems, a big impact on DVB receivers followed. The big European pay TV companies developed their own set top boxes with proprietary CA system mixed with own or "main open solutions for the Application Programming Interface (API)" and Operating System.

These historic facts created today's "vertical markets" under the control of each pay TV operator, resulting in a different population of set top boxes.

Examples for vertical markets are the systems of CANAL+/France, BSKYB/UK, Premier World/Germany, Boxer TV/Sweden etc.

The dominant factors for the incompatibility of receivers are the different API's. Multimedia applications such as an Electronic Program Guide (EPG) written for a specific API cannot be understood by another API.

Free to air services which do not need a CA system are heavily affected by the fragmentation of the markets coming from different API's.

1•2 Convergence only in a horizontal market

After the initial phase - creation of the DVB infrastructure - the architecture for interactive services begins. Standards were created for "network independent protocols" and for return channels in different transport media (cable, PSTN, ISDN, GSM), this was between 1995-1996.

During this phase, it became clear that standardisation of only the infrastructure would not be sufficient and as a consequence, the issues of "Interoperability" were triggered to create an API.

In the meantime, the pay TV operators started regular services in their own (vertical market) segment, controlling the entire "value chain" - CA system, API, programmes EPG (Electronic Programme Guide) ...

The vertical market segments/companies had their proprietary API's such as Media Highway (Canal+ / France), OPENTV (TPS/France) d-box Network (KIRCH/Germany). A customer (subscriber to TV services) would have been forced to have various set top boxes to access different pay TV operators. This was entirely unacceptable for a mass market.

A mass market needs an unfragmented horizontal structure in which a set top box can access different TV program operators. To create the platform for that, clearly defined interfaces are needed in the different levels of the "value chain" based on a uniform API. Only a horizontal market can create convergence of TV, Internet, PC and Consumer Electronics.

The DVB Steering Board decided in December 1996 to give the green light for the start of Multimedia Home Platform (MHP).

Support for the DVB-SB initiative was provided by the "Free TV projects" (DTG/UK, in Sweden, ARD/ZDF in Germany) as these Broadcasters had only an interest in a strong horizontal market.

In Spring 1997, the Commercial Module (CM-MHP) was formed and thereafter the Technical Module of MHP (TAM). The TAM group had the task to create the specification based on commercial requirements of the CM-MHP. This new phase could also be considered as the move from "Infrastructure" to "Infrastructure".

The MHP covers [2]

- set top boxes, idTV receivers, Multimedia PC
- In home networks
- Peripheral equipment
- Enhanced broadcast with Multimedia data services
- Interactive broadcast with return channel

MHP shall bridge hardware - software; consumer-computer world.

2. DVB-Specification for MHP

The DVB consortium/project has developed OPEN STANDARDS (standards "TOOLBOX") for digital broadcast, which were tailored not only for genuine broadcast services, but also for interactive services, as outlined before. These standards cover all transmission means (satellite, cable, terrestrial).

The development of the MHP specification was the "phase of harmonisation" to guarantee important features such as:

- Interoperability of Applications
- Download mechanism
- Scalability and upgrading of receivers

The key role of harmonisation, to create a horizontal market, is the Application Programme Interface (API), which creates a platform-independent interface between different applications and the manufacturers' specific hard

and software.

The main purpose of MHP in Fig. 1 shows that Applications from different service providers 1, 2 and Internet etc. must run on MHP. These services must run on different hardware platforms from low-cost set top boxes (STB's) to High End PC's with different functionality.

2.1 Key Commercial Requirements for MHP

Interoperability:

Between different service providers

Scalability:

The applications should be made available based on processor capacity, memory size and Video, Audio features and requirements.

Upgrading:

It should be possible to upgrade system software of the MHP.

Separation between application and data:

To facilitate the functionality of the total system, data and application have to be transmitted separately. This allows that different applications can access the same/common data which are delivered periodically as a data-carousel.

Support of different CA-Systems:

MHP has to be independent of CA systems. The API must guarantee the access to different Conditional Access (CA). This shall be accomplished through the DVB-CI (Common Interface).

Open Standards:

The standards will be made open by the ETSI - European Telecommunication Standard Institute. Further evolutionary will be discussed in the DVB platform.

ETSI has published (10.7.00) the MHP standard for the API as TS101812 V.1.1.1 and it is planned to have the final version (V.2.0) ready by DVB in December 2000.

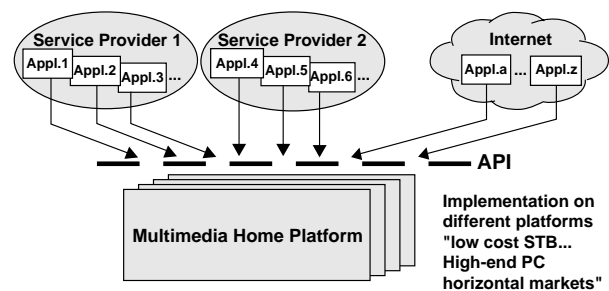


Fig. 1 Interoperable Applications in a Horizontal Market.

2•2 Development of Applications

There are three layers of services:

- (i) Enhanced Broadcast
- (ii) Interactive Broadcast
- (iii) Internet Broadcast

In Fig. 2 it is shown how not only the technologies may converge, but also the applications. In the presented scenario, the broadcast and interactive channel can be freely combined depending on the application.

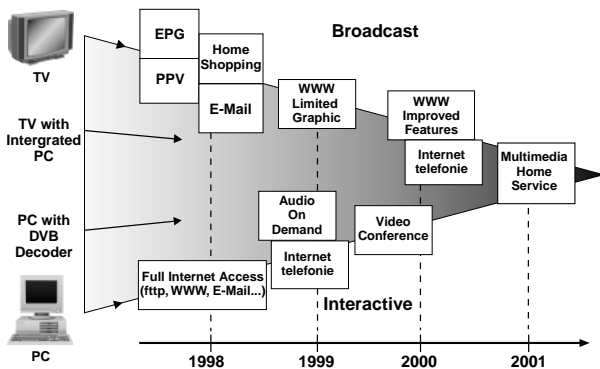


Fig. 2 Migration, Development Path of Applications.

2•3 DVB-Java Platform

The MHP is based on a special Java platform called DVB-J. The advantage is that with the aid of a "Virtual Machine" (VM), manufacturer specific hardware of MHP can be "decoupled" from system software (operating system OS, hardware specific drivers, firmware etc.).

Fig. 3 shows the software structure of DVB-J. The manufacturer specific control-application is responsible for the individual configurations of MHP and the neutral access of all services by means of a "NAVIGATOR". The Java VM offers different API's realised in classes.

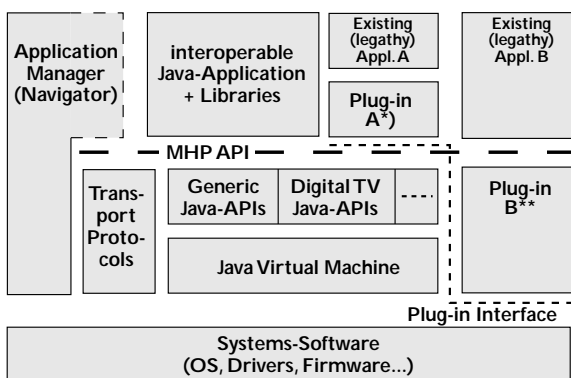


Fig. 3 Software Structure of DVB-Java.

2•4 Plug-Ins for existing systems

There exist DVB systems with different API's and therefore these systems must be supported to allow the migration to the MHP API. To accomplish that task, Plug-in interfaces were defined, which guarantees that legacy (old) API's can still be used in addition to the standardised MHP API's.

Plug-ins can be realised on the DVB-Java platform (type A in Fig. 3) or directly implemented on the system software (type B on Fig. 3), which is then platform specific.

Possibilities for Plug-ins

Plug-in to implement diving receiver production.

Plug-in implemented in a shop.

Upgrade of a receiver by the user through a SmartCard, Multimedia Card, and DVB-Common Interface.

Upgrade through a network (downloading).

2•5 Internet Access

In a similar form a browser for the HTML, used in the Internet, can be embedded. By doing so, there will be an Interface not only for Java-API's but also for Internet applications (Fig. 4). The Internet access is optional in the MHP standard and covered in the Annex. It should be mentioned that in addition to HTML also other standards are being used which should be implemented to access Internet content.

Following standards are to be mentioned:

ECMA Script - used to dynamically control HTML content

Document Object Model (DOM) - defines the exact presentation with fonts, colours...

ECMA and DOM level O are also known as Java-Script Version 1.1.

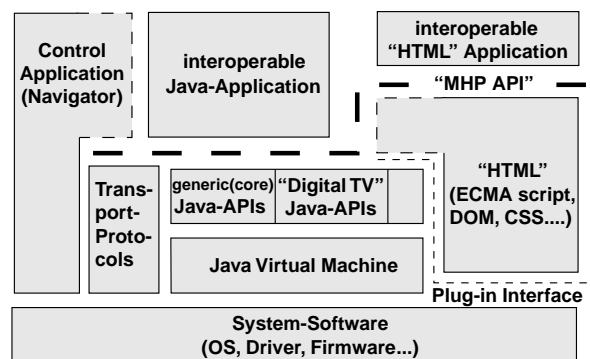


Fig. 4 DVB-Java Platform and HTML.

2•6 Transport Mechanism

The transmission of Broadcast-interactive data is properly defined in DVB standards, however, they allow different variances of data-transmission (3). There are special requirements for DVB-MHP with regard to interoperability, which needs to define properly the transmission protocols.

It is essential that one protocol must be mandated to establish a service connection over which additional protocol implementations can be loaded if not already present in MHP.

In Fig. 5 there are three variants of Broadcast-Transport-Protocols presented all being used for MHP.

These are the "DVB Object Carousels" which is a refined version of DSM-CC Object Carousel, the "Multi-Protocol Encapsulation" and the direct transmission of MPEG-2 transport packets, which allow all kinds of proprietary or even DVB-registered data broadcast.

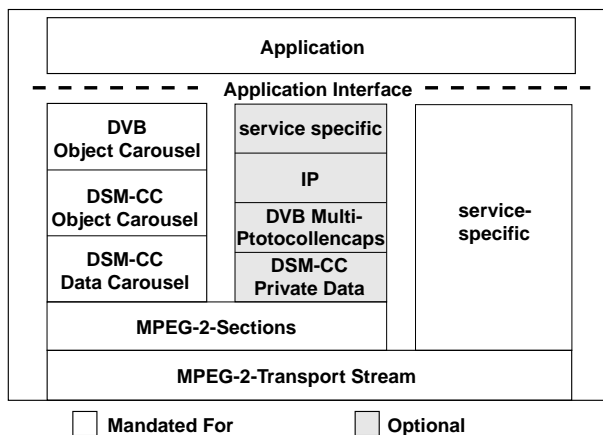


Fig. 5 Broadcast Transport Protocol.

2•7 Cornerstones of MHP Standard

The specification has almost 1000 pages of which some 800 pages are devoted to API.

The spec MHP V.1.1.1. is contained in page 1 ...188 and the Annexes start from page 189.

The important chapters are:

- §7 : transport protocols
 - §8 : content format
 - §9 : reserved for HTML which is to be finalised
 - §10,11 : Application model and signalling
 - §12 : DVB-J
 - §14 : Graphics reference model
- DVB and/or other activities are working on two

important matters.

- requirements for Conformance and Interoperability of MHP API Implementation (DVB group)
- reference implementation for testing purposes (IRT/Germany, SUN, Loewe Opta/Germany)

3. Migration to MHP

3•1 Migration Issues

The intention of this chapter is to focus on differences on existing (legacy) and new systems and to project technical and commercial paths from the current "Non- Standard" situation to a single standard : the DVB MHP - Multimedia Home Platform.

Number one requirement, in order to become successful is customer satisfaction, meaning the right quality of service (QOS) must be provided.

Low cost service can be provided by a "single standard" simulcasting can be avoided and a large number of developers can compete in providing MHP hard and software, not only in applications but also system software modules - middleware operating systems, driver modules.

Openness of all applications through the API is a very important part.

Java introduces that openness and together with XHTML 1.1 and a TV browser, the MHP Java provides methods for MHP presentation and system operation.

MHP Java standard provides a good QOS and therefore legacy systems (MediaHighway, OPENTV...) should be dropped.

Exclusive legacy applications shall be maintained through "Plug-ins" if they are not supported by MHP, however, there will be a need for new, special services and applications requiring performance that can only be accomplished by hardware or embedded software native, optimised Java should then be preferred.

3•2 UNITED KINGDOM situation

The UK DTT (Digital Terrestrial TV) has launched MHEG5 services and start-up difficulties have to be solved rolling out services.

The majority of receivers are set top boxes using MediaHighway+ which includes MHEG5. First generation products use 2+2 Mbit memory structure, but now 4+4 Mbytes are commonplace.

UK has two strong players - BSKYB/Satellite and Ondigital/Terrestrial.

The Sky satellite has launched interactive services using OPENTV whereas ONdigital implemented MediaHighway.

MHEG5 is easy to be implemented a plug into MHP. MHP data formats are backward compatible as MHEG5 and MHP use the DSM-CC object carousel.

3•3 Nordic Countries (Finland, Norway, Sweden) situation

• Finland, Norway

The Nordic countries have three different systems:

OPENTV, MediaHighway and DVB. These countries formed the NorDig group to discuss and co-ordinate extended media services for TV receivers.

NorDig has decided to go straight away to MHP bypassing MHEG5.

The Internet profile may run on a hardware 8+16 Mbyte FLASH+RAM memory and 200 Mips called NorDig II hardware.

- 1st generation boxes use (1+1/10 and 2+2/20) with and without bootloaders and with and without Common Interface.

- 2nd generation boxes NorDig I are being displayed now as (4+4/50)

- to avoid EPG (Electronic Programme Guide) simulcasting for DVB and MediaHighway, a combined/common EIT (Event Information Table) based EPG (Electronic Programme Guide) was developed.

Remark: Canal +/France have developed MHP including also the Internet profile. This means that NorDig II boxes with MHP may be introduced in Spring 2001.

• Sweden

In Sweden, SENDA AB is the company responsible for collecting and co-ordinating the requirements of all broadcasters. This company has also the responsibility to decide on the API for DTT and they decided in 1998 to go for OPENTV and to migrate to DVB-MHP as soon as possible. This may be accomplished in Year 2001.

The migration scenario will be:

Phased out Period: OPENTV + DVB MHP middleware.

3•4 Central European situation

The situation in other European countries is similar to

Scandinavia.

In Germany, a migration from OpenTV to MHP will take place and also "Premiere World" of Kirch group have the intention of migration.

Existing set top boxes low end use 2+2/20 hardware.

3•5 Practical Migration Scenario

• 2+2 (FLASH, RAM) Legacy Systems

The large population of set top boxes has 1-2 Mbytes Flash, 1-2 Mbytes RAM. These boxes may have only a limited lifetime of 2 more years because they cannot be upgraded for reasonable cost.

It becomes already clear that all 1st generation and even some 2nd generation receivers have not enough memory even for Internet not to mention "Interactive Shopping", however, Internet and Interactivity are very important for users.

Migration could mean to swap rapidly legacy receivers because new services/applications are essential for Broadcasters, pay TV operators.

Conclusions

Most of the European countries can go directly to MHP as they don't yet provide real DVB services.

The UK-ONdigital seems to consider MHP receivers with MHEG plug-in.

Set top boxes with bootloader and 6+6/50 hardware could be upgraded, but simulcasting of OPENTV and MediaHighway together with MHP is a precondition for upgrading.

With all the "shortcomings" in today's receiver population, it can be expected that in some 2 - 3 years, MHP will become dominating. Already, the IFA2001/Berlin (International Electronics Exhibition) may be a real trigger for MHP products.

References

- [1] Europe and the global Information Society - Recommendations for the European Council based on the so-called "Bangemann Report". Brussels, 26 (May 1994).
- [2] Evain, J P, The Multimedia Home Platform - an overview. EBU Technical Report No.275 (Spring 1998).
- [3] Ladebusch, U, Einfubrung in den DVB-Dateurundfunk FKT publication #52 (1998).

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