ABSTRACT

The DVB Multimedia Home Platform (MHP) is a new open standard platform for interactive television and multimedia services. However, a significant challenge for broadcasters wishing to exploit the MHP is the migration from existing platforms and services. This paper explores how the DVB MHP might be introduced where there is an existing service using MHEG-5.

Several strategies are described for supporting for the MHP whilst continuing to provide the existing applications for MHEG-5 platforms. It is shown that different techniques can be used to provide equivalent or enhanced applications for the MHP, re-using elements from the existing MHEG-5 applications to minimise the additional bandwidth required.

INTRODUCTION

Whilst many broadcasters have launched or are planning digital television services there has not been a convergence within the industry on a common format for interactive applications such as electronic programme guides and information services. On the contrary, the launch of digital television services across the world has featured the deployment of a variety of non-interoperable and often proprietary platforms, each of which is unable to provide access to all the services available to consumers. This situation threatens to prevent the evolution of a thriving, open market for digital receivers and services. It is also likely to deter investment in interactive TV content since worldwide sale and distribution is impossible without the expensive reworking of applications.

Since 1997, the DVB consortium has been working to complete the specification for an open standard platform for interactive TV and multimedia services called the Multimedia Home Platform (MHP). The primary goal of the MHP is to enable the birth of horizontal markets for digital television and multimedia services, where there is open competition between content providers, network operators or platform manufacturers at each level in the delivery chain. A further goal is to exploit the potential for convergence between broadcasting, the Internet and consumer electronics. The MHP may eventually provide a solution to the problems created by the current diversity of platforms. However, a significant challenge facing many broadcasters wishing to support the MHP is the migration from their existing platforms and applications (these will be referred to throughout this paper as legacy platforms and applications).

This paper explores strategies that could be used in the migration from MHEG-5 as it is currently used in the digital terrestrial television services within the UK. There is first a general discussion about the scenarios and goals for migration. An overview is then given of the different platform technologies relevant to the migration from MHEG-5 and strategies for migration are proposed. Finally, the results of case studies are reported in which two of these strategies were explored.

MIGRATION SCENARIOS

In the majority of migration scenarios the legacy platform will be present in large numbers. In most cases the technical specification of the legacy hardware will be inadequate to support a software upgrade to the MHP. This means that in many scenarios it will be necessary to support the legacy platform for the remainder of its economic lifetime and the duration of the migration process will be prolonged.

Ideally, when support for the MHP is introduced it should provide access to legacy applications or alternative applications providing equivalent functionality and information. To encourage the uptake of the MHP platform it will be probably be necessary to provide attractive new applications or enhancements to legacy applications that are backwards compatible with the legacy platform.
During the migration period service providers will be keen to minimise the duplication of authoring and maintenance costs and also any additional requirements for bandwidth on the broadcast channel. The migration strategy they choose may vary from application to application and will be influenced by the characteristics of the existing platform technology.

MHEG-5

MHEG-5 is an object-orientated, interpreted content format for interactive TV applications designed for platforms with limited memory and processing power. Unlike low level procedural languages such as Java, MHEG-5 is a declarative content format where applications are expressed in terms of high level constructs such as scenes, visible objects and links. Some examples of the visible objects provided for use in MHEG-5 applications are text boxes, images, buttons, and video objects.

UK MHEG-5 PROFILE

A closely specified profile of MHEG-5 has been developed for the digital terrestrial television services launched in the UK (1). The UK MHEG-5 profile is based on the ISO MHEG-5 specification (2) and uses the Object Carousel specified in the DSM-CC specification (3) to deliver applications and data across the broadcast channel. In order to achieve interoperability between the platforms developed by different manufacturers it was necessary to define detailed profiles of both these standards and include additional rules for text rendering, data caching, etc.

Many important elements of this work are not specific to MHEG-5 and have been incorporated into the DVB MHP specification. The most significant of these is the detailed profile of the Object Carousel. This means that the broadcast data delivery system used by the UK MHEG-5 services is compatible with the MHP. Also important is the fact that the MHP supports all the content formats used in the UK MHEG-5 profile. The compatibility of data delivery and content formats is critical to the possibility of migration between the two systems.

MHEG-6

Although satisfactory for many compelling interactive TV applications MHEG-5 is lacking in its ability to manipulate data. To improve on its limited computational capabilities the MHEG-6 standard was developed (4). This allows MHEG applications to launch associated Java applications in a call or fork operation. Java is a general purpose programming language and run-time environment developed by Sun Microsystems. The MHEG-6 specification includes the core packages of the Java language and an iso.mheg5 package that maps MHEG-5 classes to Java interface classes. This allows the Java applications in MHEG-6 to access variables in the MHEG domain and return values following computations. It also allows the Java applications to manipulate MHEG objects and control the presentation of visible objects.

DVB MHP

The DVB MHP is a new open standard platform for interactive television and multimedia services. DVB has adopted Java as the interoperable application format for the MHP. It has developed a version called DVB-J that includes the core of the standard Java language and provides extensions to support broadcast and TV specific requirements (5). These extensions include a new application model and a replacement for the PC-centric user interface used in standard Java applications and Applets.

The use of Java provides content developers with a high degree of control and flexibility for their applications. For example, it makes it practical to tailor the behaviour of applications to suit user preferences. It also allows applications to deal with many protocols and data formats that are not specifically supported by the MHP. In the case of newly developed protocols this ability provides extensibility. In the case of legacy protocols this ability can help to support migration.

DVB is currently working on the last of the three initial profiles of the MHP:

1. **Enhanced Broadcast Profile**: the baseline MHP specification.
2. **Interactive Broadcast Profile**: adds support for a return channel using IP networking.
3. **Internet Access Profile**: provides an integrated web browser and access to other Internet services.

In addition DVB is also addressing the issues raised by legacy systems and has recognised the problems that these will create for broadcasters wishing to adopt the MHP. The MHP specification will provide support for optional “plug-in” decoders for legacy application formats. DVB will not define the specifications for particular plug-ins but will provide a generic infrastructure to support them (e.g. signalling). Plug-ins can be implemented as interoperable DVB-J applications or as manufacturer-specific applications. They can be embedded during manufacture or added later using
an add-on module. In the case of interoperable DVB-J plug-ins they can also be broadcast within a legacy service and downloaded by platforms each time they are required. Extensions to the MHP specification have recently been proposed to allow frequently used applications to be stored locally in an MHP, subject to the availability of sufficient non-volatile memory. For DVB-J plug-ins this would help to reduce the bandwidth requirements and latency associated with the broadcast approach.

MIGRATION STRATEGIES FOR MHEG-5

Since the UK digital terrestrial service uses a broadcast data transport system and a set of content formats that are compatible with the MHP many difficult problems are avoided.

The remaining difficulty is the difference between the declarative MHEG-5 content format and the procedural language used for MHP applications. This section describes some strategies to address this problem. With some modifications these strategies may also be applicable to other declarative content formats such as HTML.

Shared content assets

One approach to migration is to broadcast MHEG-5 and MHP applications in parallel. This is often referred to as the simulcast approach. The additional bandwidth required for this can be minimised by sharing a common pool of content assets such as images and graphics. However, the service provider has to develop, maintain and co-ordinate two very different types of application throughout the migration period.

Partial MHEG decoder

The shared assets approach can be extended by also exploiting the objects from MHEG-5 applications within MHP applications. This is possible because of the powerful capabilities of DVB-J and the object-orientated nature of MHEG-5; MHP applications can include code that allows them to load and parse MHEG-5 objects in order to create equivalent objects in DVB-J. This approach allows visible objects or even entire scenes from MHEG-5 applications to be rendered and displayed by an MHP application.

MHEG-5 plug-in

The idea behind the "plug-in" concept devised by DVB is to provide a complete decoder for a legacy application format. The provision of an MHEG-5 plug-in for the MHP would enable it to run a legacy MHEG-5 application in exactly the way it would run on the legacy platform. However, although satisfactory in many situations there are some limitations in this approach due to the lack of integration between MHEG-5 and DVB-J. Once a legacy application is running using the plug-in it is difficult to provide a way for the user to navigate to any other MHP applications that may be available. It is also impossible to enhance the legacy applications to provide extra features for MHP users. This may mean that there is little incentive for consumers to choose an MHP rather than the legacy platform.

MHEG-6 plug-in

The limitations of an MHEG-5 plug-in can be overcome by adopting the MHEG-6 approach. This provides a good integration between the MHEG and Java domains. It would also be of benefit to extend the standard set of Java APIs defined in MHEG-6 to include access to some of the DVB-J APIs, subject to the restrictions of the MHP security model. An extended MHEG-6 plug-in of this kind would allow legacy applications to be enhanced during the migration period to provide additional features for the MHP whilst remaining backwards compatible with legacy platforms.

DIGITAL TEXT CASE STUDIES

In 1999 the BBC launched an information service using MHEG-5 called "Digital Text" on its Digital Terrestrial services in the UK. A demonstration version called the Digital Text Barker was shown widely before the full service was launched. The Barker application presents a number of sample pages containing text, graphics and images. It was decided to study how this application might be supported on the MHP alongside the existing MHEG-5 application. Two of the migration strategies proposed in this paper were therefore explored using the Digital Text Barker as the target application.

Shared assets approach

To explore the shared assets approach to migration a Java version of the Digital Text Barker application was developed using DVB-J that could be simulcast alongside the original MHEG-5 application. The application uses the same set of images and graphics used in the MHEG-5 application but is otherwise completely independent.

Each page of information displayed by the application is built up using a number of components
conforming to the standard Java lightweight components model that is supported by the MHP. Each of these components is equivalent in appearance and behaviour to the visible objects used in the original MHEG-5 application.

The fact that the UK MHEG-5 profile and the DVB MHP specification share many common elements was of considerable help during application development. For example, the common font and text rendering rules mean that identical text layout can be obtained on the two platforms without difficulty.

It was found that the size of the Java class files and ancillary data files required to simulcast an application for the MHP was around 40 KB, less than the typical size of just one of the many images used in the legacy application. This suggests that for legacy applications with a significant number of images the additional bandwidth required on the broadcast channel to support a simulcast service for the MHP could be relatively small and may be an acceptable overhead during the migration period.

The completed application was demonstrated at IFA '99 running on several prototype MHPs. A screenshot showing a page from the information service can be seen in Figure 1.

![MHP Digital Text Barker application](image)

**Figure 1. MHP Digital Text Barker application**

**Partial MHEG decoder approach**

One aspect of the shared assets approach that was found to be unsatisfactory was the need to broadcast a set of ancillary data files describing the layout of each page of the information service when this information was already present within the MHEG-5 application. This is a waste of bandwidth and the preparation of the data would require additional work by the broadcaster throughout the migration period. A second MHP application was therefore developed using the partial MHEG decoder approach to show that DVB-J can be used to extract the required information directly from the MHEG-5 objects in the legacy application without difficulty.

In this MHP application each MHEG-5 Scene object is loaded and parsed to extract a list of the MHEG-5 visible objects used within the scene. Each visible object is then loaded and parsed to extract the object attributes. The MHP application is therefore able to obtain all the information that is required to display any page of information directly from the MHEG-5 version of the Digital Text Barker application. The information pages can then be displayed by the MHP application with identical results to the original MHEG-5 application.

This approach is more complex than the shared assets approach described earlier and the total size of the Java class files is slightly larger, due to the size of the parsing routines. However, the overall size of the application is reduced due to the elimination of the ancillary data files that are now redundant.

The conclusion of this study was that DVB-J can easily load, parse and present MHEG-5 objects or complete scenes from MHEG-5 applications and use them within MHP applications as required. This is an interesting alternative to the provision of a full MHEG-5 plug-in decoder which would be significantly more complex to implement. It also minimises the additional bandwidth that must be provided to support the simulcast of an MHP application during the migration period.

**CONCLUSIONS**

A number of techniques have been proposed that can be used to provide services for the DVB MHP in an MHEG-5 environment.

It has been shown that where legacy applications use a large number of images and graphical data it is practical to a simulcast a DVB-J application and share these content assets. It has also been shown that the flexibility of DVB-J allows MHP applications to load, parse and exploit the objects and data used by MHEG-5 applications.

The functionality of "plug-in" decoders for legacy application formats has been discussed. It has been suggested that a plug-in that simply emulates the legacy application environment and reproduces the behaviour of legacy applications is not ideal. It is more useful if the plug-in can provide access to some features of the DVB MHP and allow the enhancement of legacy applications in a backwards compatible manner during the migration period.
The flexibility provided by the proposed techniques suggests that MHEG-5 applications and DVB-J applications can coexist in a mutually supportive way during a period of migration between the two systems.

REFERENCES


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