How to establish an MHP application development environment

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Danmarks Radio (DR) has carried out an analysis on how to establish an MHP application development environment.

In this article, some of the conclusions and considerations are presented. Different areas of relevance are discussed: the technical changes in the transmission chain, the establishment of the application development environment and some aspects of the play-out system.

During the past few years, a lot of effort has been put into the development of an open API standard for DVB transmissions. The main goal of this work has been to provide a generic standard that is widely accepted by broadcasters, telcos and hardware manufacturers, and which can satisfy their needs for many years to come.

Version 1.01 of the MHP standard was agreed in October 2001 [1], closely followed in November 2001 by *Version 1.1* [2]. Since then, the hardware manufacturers have been busy trying to implement the latest standard in their set-top boxes (STBs) which are awaited with excitement. Indeed, it is now possible to obtain samples of version 1.1 equipment from several manufacturers.

DR [3], the Danish national public service broadcaster, recently carried out a six-month project to analyze the implications of MHP services in a broadcast environment – from different perspectives. The project group consisted of several internal profiles that are involved professionally in broadcasting, as well as two external consultants – PWC Consulting and Icon Medialab. DR believes that the subject of this work may be of relevance to other broadcasters, which has inspired us to write this article.

With the dawning of digital television, a whole new land of opportunities has arrived. We were used to the introduction of new technical elements in television during the years of analogue television, but they were all the results of long-term processes. In those days, new functionalities were realized by introducing new ***hardware*** in the television set (e.g. teletext and stereo chips).

Today, a much larger step can be taken in ***software*** – by creating an "engine" for running applications, like we have become accustomed to with the PC. This implies that *the step now being taken with the introduction of MHP will influence the introduction of new applications for many years to come*. This will significantly reduce the time to market for new applications. Similar applications coming from different broadcasters will potentially have a different look and feel. It will be possible to bring new applications into use for just a limited time and scrap them afterwards, since they will not require additional investment by the consumer.

MHP applications will have an impact beyond the traditional broadcasting world. There will be extended commercial potential for these applications and, as a consequence, applications will also be developed by non-broadcasters.

DR has had some experience with applications for digital television, mainly as a result of an interactive television show called ROFL which ran for six months,. That application, which was aired during the first half of

2001, had elements of multifeed streams, quizzes and surveys – and also provided additional information which could be selected by the user. It was implemented in OpenTV [4], but provided valuable experience in the analyzis work carried out on the MHP platform.

Transmission

With the demand to transmit new applications along with the traditional video/audio and teletext services, some changes to the existing transmission equipment are needed.

The essential new equipment is called an ***object carousel*** and it serves the following functions in the distribution:

- physically contains the data that is to be inserted in the transport stream;
- lets the user(s) and administrator control various parameters in the transmission – e.g. bandwidth, repetition rate and priority;
- allows different clients to have different rights in the set-up;
- provides the interface to the multiplexer.

The object carousel can, to a certain degree, be compared with the functionality of the teletext carousel. It is a hybrid transmission and data-generating equipment and is fed by several different systems in the "Back-end".

The infrastructure of the distribution aspects of digital television is quite complex – taking both different content providers and different network operators into account. This is illustrated in *Fig. 1*.

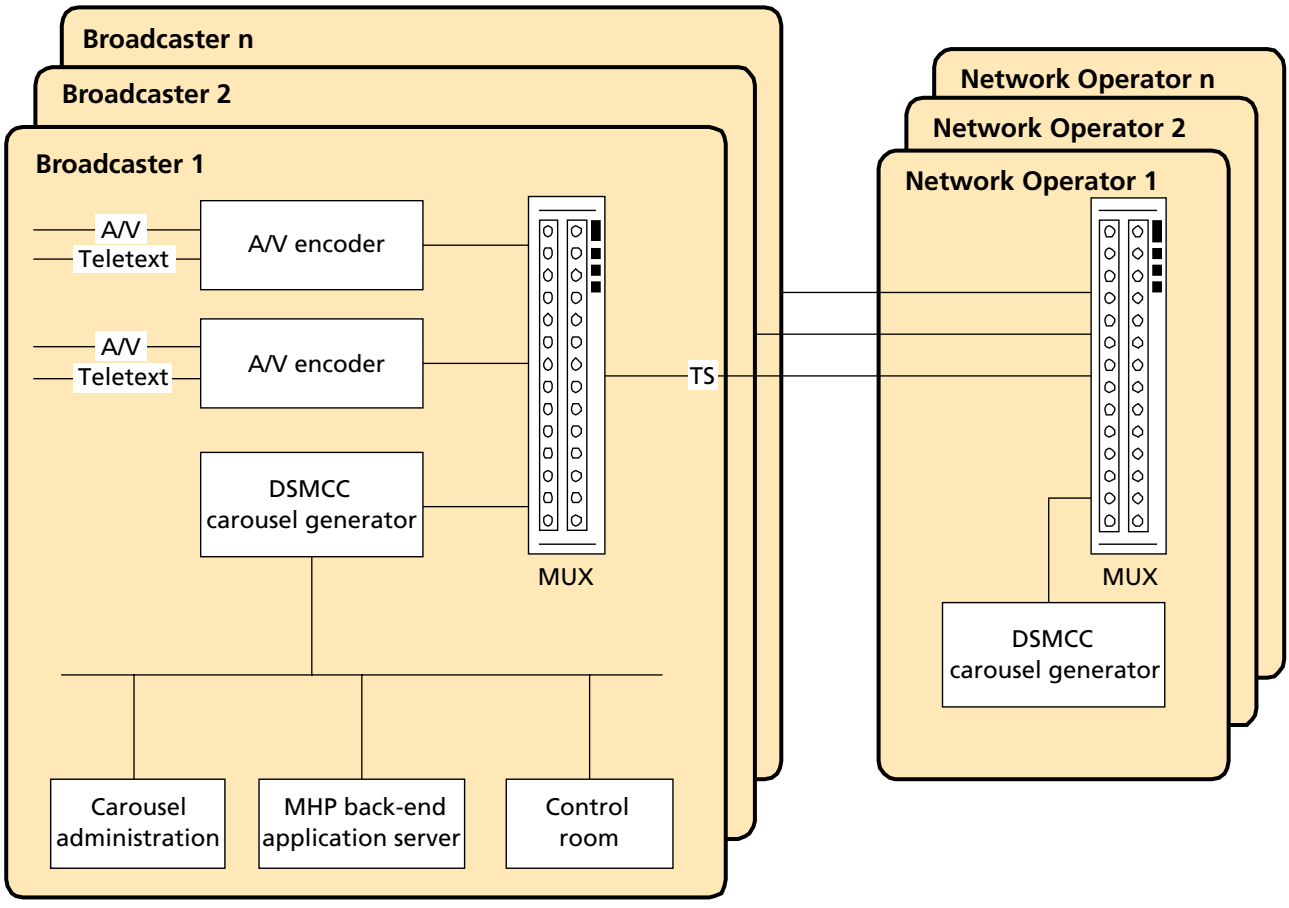

Figure 1
The distribution aspects of digital television

It is possible to use other, different, interface levels between the broadcaster and the network operator, rather than the one shown here; for example, the encoders – as well as muxes and carousels – can be controlled/operated by the network operator. DR has spent some effort in analyzing this and has compared the pros and cons of the different locations. We came to the conclusion that *we prefer the carousel used for our applications to be under our own control* for the following reasons:

- to maintain control of all the components in our digital programme offer;
- to ease integration with the back-end systems;
- to avoid having to manage different clients in different carousel systems used by different network operators.

Consequently *we will aim at delivering a final transport stream from our premises*, which can then be used in different networks carrying our programming.

Play-out

The introduction of MHP applications in programming will have an impact on the play-out situation. Different applications will introduce different requirements on the play-out facility:

- the live transmission of TV programmes containing interactive content is naturally managed from within the studio control room;
- applications which are programme-independent (e.g. info services, 2.5-generation Teletext) will need a permanent setup;
- programmes which are pre-recorded and edited (incl. interactive content), as well as repeat programmes, can be set up to run with no need for additional control/handling, but the applications may require synchronization with the video/audio.

Aside from the dependencies mentioned above, some *new roles need to be defined*. A person who is responsible for bandwidth allocation – which can vary from programme to programme – and also responsible for setting up priorities on the different files in the carousel, needs to be appointed.

Application development

The idea and development of MHP applications will be a new challenge to the broadcasters. Before the digital television age, the broadcaster just had to supply new data when new systems were introduced (e.g. teletext, PDC, stereo systems). Now there is the opportunity to contribute to the viewing experience with tailor-made applications.

There will be different ways of developing applications. High-level tools exist which can provide some basic functionality, and they will probably be refined in the years to come. But, *in order to have full flexibility, you need to develop the applications from scratch in the Java environment – using DVB-J*.

Abbreviations

API	Application Programming Interface	**MHP**	(DVB) Multimedia Home Platform
A/V	Audio / Video (Visual)	**MPEG**	Moving Picture Experts Group
DSMCC	Digital Storage Media Command and Control	**MUX**	Multiplex / multiplexer
DR	*Danmarks Radio* (Denmark)	**PDC**	Programme Delivery Control
DVB	Digital Video Broadcasting	**STB**	Set-Top Box
DVB-J	DVB - Java	**TS**	(MPEG) Transport Stream

During the second half of 2001, DR gained considerable experience in developing MHP applications. We established an environment in which it was possible to do basic MHP application development. The MHP standard 1.0.1 provides DVB-J (Java) as the means to develop applications. In the later version (1.1.), there exists an option of using DVB-HTML, which can be used for simpler text presentations. The DR work focused on DVB-J.

The development environment should consist of the following:

- Java development tool;
- MHP emulator (optional);
- test set-up – enabling the developer to put the application on the object carousel to verify the performance on a set-top box;
- one or more set-top boxes.

The Java environment can be standard for Java development, but the use of it requires knowledge of the MHP standard and its associated classes.

To our knowledge the only way to observe performance issues is to have the applications inserted in an actual object carousel and transmitted to a set-top box.

With our development set-top box, another possibility is to use network connections to transmit the application to the set-top box.

The total application development environment is shown in *Fig. 2*

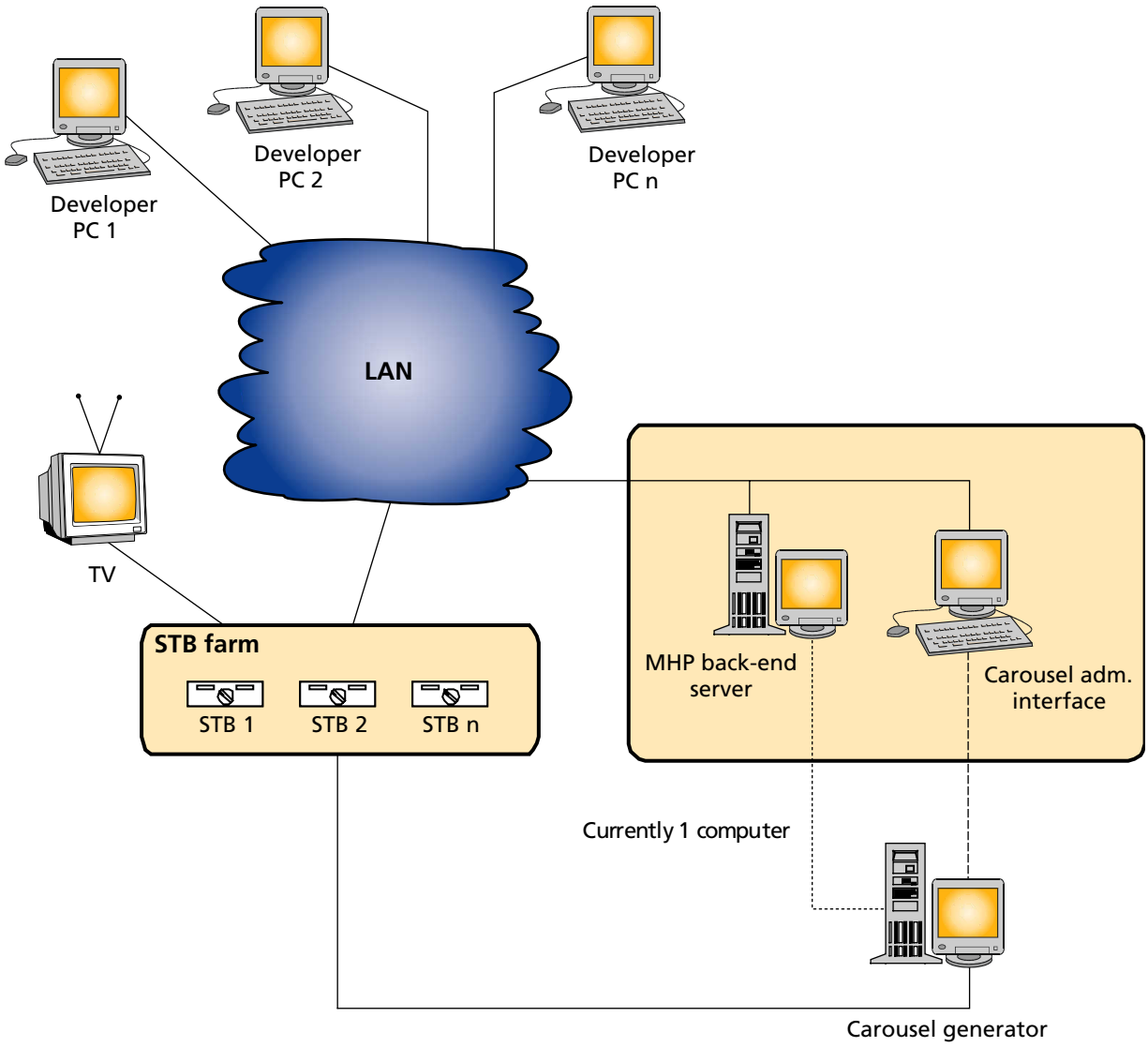

Figure 2
The total application development environment

There are several developer PCs with the Java development environment installed, and preferably some means of emulating the MHP function. The emulator serves as a first and local way of monitoring that the developed application performs as intended. Afterwards, the application needs to be verified via the more time consuming carousel and set-top box method.

We are currently investigating different carousel products and, for the time being, our set-top box farm consists of a Philips developer set-top box and a prototype Kiss MHP terrestrial set-top box.

For many applications there will also be a big task in developing back-end systems which will provide data for the applications and which will handle return-path communications. We have focussed on developing client MHP applications, since this is the new aspect for us. Nevertheless, the back-end systems can prove to be of at least the same order of complexity.

Our own experience with development in DVB-J showed that, *with relatively little effort, we managed to move Java developers toward MHP development. We also realized that Java code developed for the internet can easily be ported to run on an MHP box. This can provide lots of advantages in the development effort. MHP has proven relatively easy to work with, which has given us the impression of success several times during this start-up period.*

Conclusions

MHP will provide new opportunities for the broadcaster. For many years, convergence between the computer and broadcast worlds has been in the headlines – now, with the dawning of MHP, it is coming true.

It will require some changes in the different areas of broadcast production and transmission to fully support the development and implementation of interactive services. We have presented some of these in the areas of:

- transmission;
- play-out;
- application development.

But one of the overall challenges will of course be the creative side of broadcasting, where the ideas for new services and programming concepts should be developed. This has to be stimulated.

On the transmission side, we believe that a broadcaster whose signal is transmitted over several networks will be better off if he provides a self-established transport stream, containing video, audio and data (including applications). Otherwise the broadcaster will not have control over the different elements of the transport stream. Consequently, *the broadcaster will have to take ownership of the object carousel*.

In the play-out area, different application types will require different play-out architectures.

In application development, we have presented an environment which serves to develop DVB-J applications. We have been positively surprised by the ease and flexibility of the language.

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Mr Frølich has been working in the field of digital television for DR since 1992, and has represented DR in several international working groups including HD-Divine, DVB, DigiTAG and NorDig.

Bibliography

[1] ETSI Document TS 101 812 (October 2001): **Digital Video Broadcasting (DVB); Multimedia Home Platform (MHP) Specification 1.0.1**
http://webapp.etsi.org/workprogram/Report_WorkItem.asp?WKI_ID=12127

[2] ETSI Document TS 102 812 (November 2001): **Digital Video Broadcasting (DVB); Multimedia Home Platform (MHP) Specification 1.1**
http://webapp.etsi.org/workprogram/Report_WorkItem.asp?WKI_ID=13397

[3] DR: http://www.dr.dk/

[4] OpenTV: http://www.opentv.com/solutions/