TDTrader: A methodology for the interoperability of DT-Web Services based on MHPCOTS software components, repositories and trading models

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Abstract

One of the main aims of a modern knowledge society is to be able to adapt to the new demands of market. The adoption of standards in the Digital Television (DT) industry —e.g., MHP (Multimedia Home Platform) for interactive services— will shortly produce a new market of software components where there is not a real development methodology or interoperability mechanisms with the rest of the traditional Internet software components yet. In this paper we present the purposes of the TDTrader project to develop a methodology and a set of tools for the deployment of a trading service and repositories of MHP services.

1 Introduction

The evolution of the Knowledge and Information Society development involves new capabilities, and the industry has to evolve to solve them by providing new and better solutions. Analogical Television is a good example. Some countries are upgrading their TV system to *Digital Television* (DT), from *Analogical* to *Digital Terrestrial Television* (DTT).

Although Digital reception (*versus* analogical) allows optimal and more digital channels, another important advantage on Digital reception is necessary, especially for TV and DTT industry: a market of Interactive Services. Due to political, social and economic reasons that underlie about the DTT industry, administrations, companies and organizations have collaborated for the emission of interactive services on the DTT. One of the systems used for interactive services and turned into a standard is the MHP (*Multimedia Home Platform*) specification, an open middleware system for interactive DTT services [13] [14]. The MHP enables the reception and execution of interactive services in local "Set-Top-Box" connected or embedded in the TV. This TV option entails new possibilities, more services and an important new market.

The adoption of standards in this industry will shortly produce a new market of software components where there is not a real methodology of development or interoperability with the rest of the traditional Internet software components yet. The component-based software engineering partly solves the "interoperability" by means of mechanisms of trading (traders) for COTS components (commercial components). There have been several attempts to clarify and develop a technique for interaction of DTT with the Internet (e.g., in [1], [3], [11]) but none of them is supported by well-defined DTT development methodologies and standardized. Here we present the goals of the TDTtrader project to generate knowledge to extend traditional trading models for MHP components: DTT interactive services.

This paper is organized as follows. Section 2 describes some background and related work. Sections 3 and 4 present the justification and description of the TDTrader project, respectively. Finally, Section 5 presents some conclusions and future work.

2 Background and Related Work

MHP (Multimedia Home Platform) Technology was adopted on February 2002 as a standard for programming multimedia and interactive applications for DTT in the DVB project (*Digital Video Broadcasting*, `http://www.dvb.org`). The MHP enables the reception and execution of interactive, Java-based applications on a TV-set.

Interactive TV applications can be delivered over the broadcast channel, together with audio and video streams. From a service and application point of view currently three profiles have been defined allowing manufacturers to develop a range of products that provide different functionalities: (a) Enhanced broadcast profile combines digital broadcast of audio/video services with download applications, which enable local interactivity. This profile does not support an interaction channel; (b) Interactive broadcast profile enables a range of interactive services associated or independent from broadcast services. It requires an interaction channel; (c) Internet access profile is intended to provide Internet services. It also includes links between those Internet services and broadcast services.

An MHP application is an interactive application written in the Java-programming language. The Java MHP applications are called "Xlets"; they run on top of the MHP middleware. The Xlets have a specific lifecycle and are controlled by the broadcaster or user via the middleware. The Xlets can be started, stopped, paused and resumed. MHP from version 1.2 has defined another standard that allows us to use DVB-HTML. It defines applications based on HTMLX compatible with other W3C technologies (as CCS-L2, DOM, ECMAscript, XML).

It is possible to classify the available interactive applications into two types: The first group of applications consists of the so-called program related applications that accompany the actual TV broadcast of certain programs. The second large group of applications consists of program-independent applications. Some types of interactive and non-interactive MHP applications are: (a) **Information Services**, EPG (Electronic Program Guide), News Service / Event Services, Weather Forecast, Traffic Service, Digitext (Digital Teletext); (b) **Communication Services**, T-Mail, T-Chat; (c) **Entertainment Services**, T-Games, Video on Demand Services; (d) **T-Commerce**, Tele-Shopping, Interactive Advertising; (e) **T-Government**, Regional Information Portals, Voting, Electronic Administration Services; (f) **T-Learning**, Kid's Education, involving kids in what they see and hear, Tools to learn languages, Professional Further Education; (g) **T-Health Care**, Dedicated applications for exchanging medical data, Interactive and bi-directional way of connecting patients and care persons or health institutions.

In Spain, many project involving MHP have been developed; Table 1 shows some of them. There are other emerging technologies related with this matter that are interesting to be described and compared. Table 2 describes these technologies and compares them with MHP.

Table 1: MHP applications developed in Spain

Project	*Developers*	*Description*
Identifica-T	RTVE, Indra.	Spanish ID (DNI) as identification in MHP Interactive Services
Arca RTVE	Telvente Housing, UPM	RT Traffic Information (pictures and videos) in Madrid
Iberoeka DESI	INDRA, SIDSA, Lambda, UPM	DTT Services and IPTV. Development of two games and one T-learning platform.
Si!Tvi	IECI, Net2U_	Users identification in DTT Interactive Applications by DNIe
T-Asisto	Net2U_, Sabia, Ita, Inves, Mapfre, Ministerio Industria	Interactive services for Tele Assistant Living. Monitored assisted people, Medical Agenda, Not activity alarm, ...

Nowadays, the adoption of MHP, particularly in Spain, is very poor; most of the "Sep-Top-Boxes" (STB) do not support MHP. There are other countries with a higher offer for MHP applications and MHP decoders. Governments and institutions are involved to boost the diffusion of MHP applications

Table 2: Other emerging DT technologies vs. MHP

Technology	*Description*	*Comparison with MHP*
IPTV	It is a system through which Internet television services are delivered by using the architecture and networking method of the Internet Protocol Suite. IP services provide live television or video on demand.	IPTV is not comparable to MHP. They are different things. MHP is a standard to develop interactive applications for DT (TV programs and data are sent via Radiodifussor as always). IPTV affects the way the video and audio is delivered to the television it comes from an ethernet connexion via IP.
Google TV [**?**]	Google TV is a software platform for STB and HDTVs based on the Android operating system and co-developed by Google, Intel, Sony and Logitech. Around the Web, Google TV finds the video that matches with the expected customer.	Google TV is a software to find IPTV contents. IPTV is normally downloaded (video on demand) or broadcasted (live television) from a specific location. This software provides an interface to find content. Like IPTV, Google TV is not comparable to MHP. They are different things.
Yahoo TV widgets [18]	Yahoo TV Widgets consist of adding the Internet while watching TV. They do not provide access to the Internet. They provide services or content coming from Internet via widgets. Widgets examples such as Yahoo!® Finance, eBay®, Yahoo!® Weather, Flickr® and Twitter® are adapted to get access to these services on the Internet.	MHP is a standard. Yahoo TV Widgets are a proprietary software. MHP data is sent via TV broadcasters and belongs to a channel—MHP applications can also be downloaded via the Internet without the necessity of a channel and even be stored in the MHP set-top-box. Yahoo TV Widgets only run in some Vizio, Sony, Samsung and LG TVs and only have the widgets that yahoo develops.
Applicast Bravia widgets [2]	Bravia Widgets are like Yahoo TV Widgets to Sony Bravia TVs.	The comparison of Bravia Widgets with MHP is like the comparison of Yahoo TV Widgets with MHP. The difference between Bravia Widgets and Yahoo TV widgets is how to get the widgets. To run widgets in the Bravia TV it is necessary to download them from "www.braviawidgets.com", copy them to a USB pendrive and connect the pendrive to the Bravia TV.

(e.g., the Plan Avanza to develop applications, Spanish Government; a contribution of 150 euros per interactive DTT receiver for 900,000 receivers, Italian Government). Some companies such as Phillips, Panasonic, Ita, Telenor and so on are providing MHP support. The main problem does not seem to be the technical platform for interactive services itself, but how to get the public be attracted to these services so that they buy a MHP version of a STBs at a higher price than other versions.

3 Project justification

The problem is that Science has not defined and established methodologies or strategies for the development of these Interactive Services yet. To solve this problem it is necessary to create a framework that can guide engineers in their process of developing information systems with guarantees and quality; This framework should use standardized information technologies, and open distributed programming paradigms (interoperable, heterogeneous, secure and solid) based on services and applications developed by third parties — traditionally known as components or COTS (*Commercial Off-The Shelf services*) [12].

The client/server models underlying in these modern methodologies guarantee the interoperability of heterogeneous systems, allowing them to adapt and evolve in view of any kind of request/client or net service provider. The clients of the web services or the applications stored in servers have traditionally been computers or laptops but nowadays there are a lot of clients who require services for mobiles phones or PDA. We are witnessing the access to this market of a new kind: DTT clients.

Due to social, political and economic interests underlying around DTT industry, administrations, organizations and companies have collaborated to allow the broadcasting of interactive services through DTT regulated, standardized and supported by governmental entities, organizations and consortiums

(for instance, in Spain is the "*Foro Técnico de la Televisión Digital*", *Ministerio de Industria, Turismo y Comercio*, `http://www.televisiondigital.es`).

The adoption of MHP on 2002 as a standard to develop interactive services for the DTT in the industry will allow sooner than later to arise a new market of software components for the DTT: such new market does not have a development methodology yet or even less an interoperability methodology to interact with the traditional component running on the Internet at present.

Therefore, though the advances to develop interactive services for DTT have been very important in the last few years (MHP 1.2 version is currently being developed and working in MHP 1.3) nowadays there is a scientific-technical lack of interest to solve: the interoperability between MHP interactive services and the rest of services used so far.

In Component-based Software Engineering the interoperability of components is partially solved by using traders (trading services) [10]. A trader service allows us to find in real time other services available in a net (software components developed by third parties) that have been previously registered [8] [9]. Commercial software components have generated a market of software components developed by companies and open to final customers or other companies through COTS (components repositories such as AppStore, Android Market, Softonic, etc.) that can be consulted.

4 Project Description

As previously advanced, in the MHP/DTT-based systems programming, there are not public or private repositories for an MHP components market based on interactive services nor technical standard or methodologies help to register or discover new services in real time (i.e., *runtime*). Furthermore, the emerging market and the great advances in technologies and methodologies around DTT (so-far nonexistent) will allow a huge amount of runtime interactive services available through digital television in the next few years.

Figure 1 shows an example of a multi-service architecture that can be offered to users via TV. These services can be stored in the internal memory of the "Set-Top-Box", transmitted by the TV carousel itself or better, they can be downloaded by the "Set-Top-Box" itself from an online repository in real-time by using an Internet connection. This last solution shows the need for some mechanisms to register and find applications; therefore, it is extremely important to define repository models and trading services of commercial MHP components (we called them MHP-COTS components, or simply MHPC).

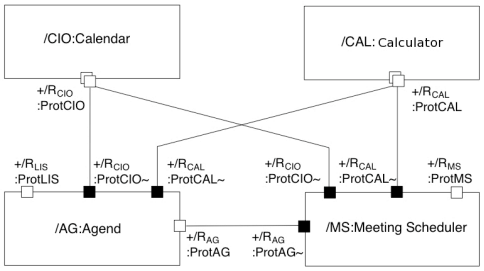

Figure 1: Example of possible MHP Services Interaction (adapted from [8])

Therefore, the purpose of this project is to develop a methodology to design and define trading services and its interaction with the rest of Internet services. Basically, the action lines are the following: (a) MHPC-Document. A model and a language for commercial interactive services MHPC definitions and documentation; (b) MHPC-Repository. A model and a language for public and private MHPC repositories definition; (c) MHPC-Trader. A model and a language for trading MHPC services; (d) Development of tests and final repository collection of MHPC; (e) Development of a MHPC trading service based on the MHPC-Trader model defined; And (f) Implementation of a development kit (*toolset*) that supports this methodology.

On the basis of these lines defined above, we intend to develop commercial products and services. The project has been structured in two stages. In the first stage, we start by ana-

lyzing the kind of information associated to an MHP component (service). Later, in the same stage, we define a model of MHP templates repository: framework, usage policies and administration policies. Besides, we expect to develop an extended query language, which will adopt the trading model later on. Then, the first research to develop the MHPC trading model will take place.

In the second stage, it is expected to develop the trading model. We intend to study the federation of trading services and MHP services (not widespread). Once the three basic models (documents, repository and MHP trading) have been defined, we will study the "how-to" introduce an MHP trading service in cooperation with other Internet systems.

This study will lead us to an MHP deployment methodology. We expect this methodology to be validated with a framework. Both methodology and framework entail studies such as service-composition, network identification policies of services, security in MHP components, and communication and interaction of services (components).

Finally, we want to achieve the total integration of MHP programmed interactive services and application broadcasted via DT with the rest of clients as PDA, mobile phone, computers and laptops as shown in Figure 2.

The technological solution proposed is structured as a set of tasks as follows: (*task A*) Preliminary study. Preliminary research to know all the different technologies involved in the Project. Identify and create DTT applications. Classify and catalogue them; (*task B*) Definition of a model for MHPC component templates. Development of an XMLSchemas-based description language to write MHPC templates; (*task C*) Definition of a repository model of MHPC applications. Development of a XQuery-based language for MHPC templates; (*task D*) Definition of a model for trading MHPC components. Definition of search algorithms of the trading service; (*task E*) Architectural issues: service composition, policies, security, communication, interaction and architecture of services; (*task F*) Implementation of isolated and collective tests; and (*task G*) Implementation of case studies and scenarios of DTT service interoperability.

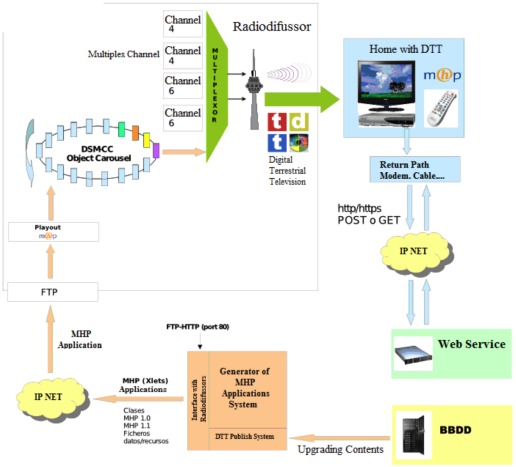

Figure 2: System Interaction with traditional web services and data bases

5 Conclusions and Future Work

This paper presents the goals of the TDT-trader project to extend traditional trading models for MHP components: DTT interactive services. As a result, the project expects to generate a methodology and a set of tools for the deployment of a trading service and repositories of MHP services in "Ingenieros Alborada, S.L.", a company which tries to create a market of MHP services (software components for DTT).

The project pursues the formal definition of a model and a language for interactive services definitions and documentation, public or private repository definition and a *trader* for service mediations. It will be useful to standardize the interactive services and facilitate the evolution of the market of TV interactive applications. And even more important, it will assure the integration of MHP software with Data Bases and Web Services that are already working properly for other customers such us mobile phone or PDA, nowadays almost completely integrated with the traditional computers [5].

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