Using Service-oriented Architectures towards Rights Management interoperability

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Abstract— **In a World where all forms of digital content are growing at an increasing rate, there are some issues that need to be addressed. Intellectual Property Rights (IPR) is one of the most crucial and important one. If in the analogue World the IPR issues are addressed in a fairly well manner, the same doesn't apply to the digital one. Users are permanently confronted with this important dilemma – to be or not to be a pirate. The choice is not obvious or trivial because it implies choosing between something which freely available on a P2P network or opting by paying an amount of money to get the same content, that is protected and won't work everywhere. In this paper, we will provide some information about the problems arising from the fact that protected content has obtrusive limitations and we will present part of a solution that can be used to address the DRM interoperability problems based on Service-oriented architectures.**

Index Terms— **Digital Content, interoperability, DRM, SoA, web-services, security**

I. Introduction

Content is part of our daily life. Since we wake up in the morning until we go to bed in the night, in a way or another we are always using content. Content has evolved through time. What we consider old fashioned in our time, such as vinyl records or VHS movies were once state of the art. However, content evolved suffering from some external influences and the main was the Information Technology and Communication one. This digital information revolution has influenced decisively the way content is created, captured, modified and used. From this influence content has become more powerful and appealing.

As someone once said, with great power comes great responsibility, this new digital content types can offer much more to the end users with little effort. However, this significant change has also influenced our lives deeply. In this digital information era, bits are can be moved or copy easily – and they are easier to copy than to move (when we refer to moving we are doing an analogy to the physical world where the same object cannot be twice at the same time). This seems a silly property, but in the digital world it is extremely hard to move bits, and extremely easy to copy bits from side to side. The same property applies to digital content. It is fairly easy to copy from side to side. It is not only easy to copy, but also to modify and distribute. This is where the problem starts.

The problem can be put in a fairly simplistic way: content was authored by someone; this person, the content author, has the copyright over content; the author has the right to receive some payment for its work (because it is fair and because it is lawful); if someone violates this right by using content in a non-authorized way, it also brakes the law. The Intellectual Property Rights (IPR) is a well established principle in our society and is also changing in this digital era.

Once content can be easily copied and distributed through digital means, IPR is most of the times violated in a deliberately or non-deliberately manner. IPR, itself has become digital (e-IPR). Several measures have been created to prevent these e-IPR violations, such as copy-protection (CP) and digital rights management (DRM). These measures are effective up to a certain level; however, they clash against the end-users rights by imposing them a certain level of restrictions that are against the most basic user rights. Users should be able to use their legally acquired digital content anytime, anywhere are anyhow.

Modern DRM and CP mechanisms are too obtrusive for end-users. They impose a vertical DRM model over the content the users acquire, meaning that a specific type of DRM-governed content can only be used on a specific device or on a limited set of devices. As a practical example of this situation, a music file legally acquired at the iTunes online music store, can only be played in the iTunes PC music player or in any of the iPod players – if the user would like to play it on a Creative Zen player, it would be impossible [1][3].

This is a well-known issue of today's DRM systems: interoperability between different DRM systems is virtually inexistent. It is a complex problem to address, and it is not only from a technical point of view, but also from the business perspective point of view. This article is mainly focused on the technical aspects of the problem [2].

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II. DRM Generic Framework

It is possible to identify the main actors and services of a generic DRM framework (Figure 1).

In general, any DRM framework should address the following actors: the End-User, the Content Owner and the Content Provider. This generic DRM framework, which was originally proposed by [8], identifies seven key DRM services: the Content Service (e.g. search for content), the License Service (e.g. issue licenses), the Access Service (e.g. authenticate consumers), the Tracking Service (e.g. produce usage statistics), the Payment Service (e.g. billing), the Import Service (e.g. submit content to the DRM system), and the Identification Service (e.g. reveal abusers) [8].

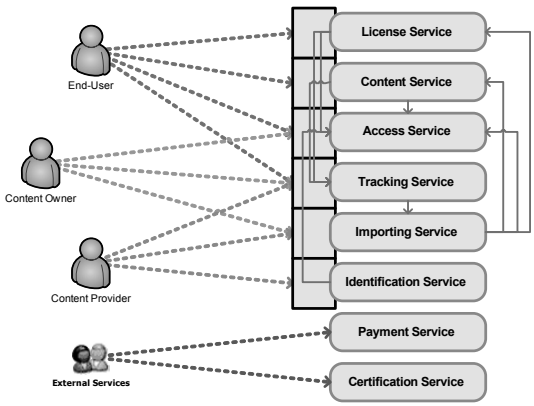

Figure 1 – Generic DRM Framework

While in [8] the authors tend to see DRM in a layered organization to provide interoperability between the different key services of different DRM products, we have a different approach – instead of layers, we tend to see the different DRM key-services as generic distributed services which hide their implementation details from the different DRM actors while exposing publicly their functionalities. This approach could allow the distribution of the different key-DRM services over distributed open-networks, such as the Internet (with proper protection), and DRM key-services to be developed regardless of their own specific and proprietary implementation. This way it can be possible that DRM-services provided by vertical DRM solutions like Windows Media DRM, Helix DNA or even Apple FairPlay to implement a specific interface to expose their basic functionalities to other services. Even new DRM solutions providers can appear in the market and offer their own particular DRM-services without having to implement a complete end-to-end solution. The integration between all the services could provide an interoperable environment.

This approach could also enable the construction of mixed DRM solutions. This idea results from the fact that the some specific and proprietary services from one DRM provider could complement a DRM solution in which such specific service is missing.

III. DRM-Services as Web-Services

In computer science, the integration between different software elements provided different vendors, have always represented a huge challenge for system integrators. One set of technologies have emerged to provide a common solution for the problem – middleware.

Middleware is connectivity software that consists of a set of enabling services that allow multiple processes running on one or more machines to interact across a network. Middleware is essential to migrating mainframe applications to client/server applications and to providing for communication across heterogeneous platforms. This technology has evolved during the 1990s to provide for interoperability in support of the move to client/server architectures [18].

These middleware technologies play an important role in the integration of the different applications, including enterprise legacy applications. Technologies such as CORBA, DCOM and RMI have an important role in the integration of applications and services, and recently web-services technology has leveraged these integration technologies to a higher level.

Middleware is computer software that connects software components or applications. It is used most often to support complex, distributed applications. It includes web servers, application servers, content management systems, and similar tools that support application development and delivery. Middleware is especially integral to modern information technology based on XML, SOAP, Web services, and service-oriented architecture.

The same middleware characteristics that can make service oriented architectures helpful for enterprise application integration, dealing with some incompatibility architectures and formats, can also be used to address the DRM interoperability problems.

This paper extends the middleware solution for software and application interoperability problems to a similar scenario in DRM. Each of the DRM services identified previously in the generic DRM framework can be represented as standalone web-services (Figure 2).

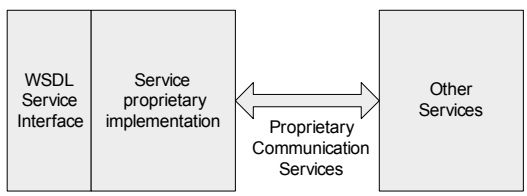

Figure 2 – Implementation of a generic DRM service

Each of these standalone web-services will have its own specific proprietary implementation – that is specific from the supplier of the DRM service – and will have a specific public description of the service available (WSDL). It is envisaged that the middleware interoperability scenario in this case is MOM-based (Message Oriented Middleware). Therefore, the availability of a public web-services interface would provide