Integrated Domain Model for Digital Rights Management

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ABSTRACT

Digital Rights Management (DRM) is an issue of controlling and managing digital rights over intellectual property. Currently, the domain has an essential problem: lack of models on an appropriate level of abstraction needed to support research and system development. This paper contributes in recognizing the principal entities by using the existing frameworks of the domain and our observations of the definitive characteristics of these entities. Modelling, identifying and describing the core entities enable the DRM functionalities. Our analysis distinguishes the evolution stages of digital content processed through the value chain and separates the different offers and agreements through which the rights are traded between the value chain participants. Definition of the differing characteristics is evidently important in specifying the requirements for a comprehensive DRM system.

1. INTRODUCTION

Traditional management of intellectual property rights in digital environment is based on prohibiting access to the content if customer has not presented the proper considerations. This is facilitated by encryption and security measures, and forces the content providers to select business models according to the available technology. Since success in electronic commerce seems to depend on the companies’ business models, it is conceded that the equilibrium between technology and the way of doing business should be vice versa (Rosenblatt et al., 2002).

Currently, associated under the term Digital Rights Management (DRM), the domain has developed from an immature consideration of digital products’ protection to identification, description, trading, protection, monitoring and tracking of rights permissions, constrains, and requirements over assorted assets, either tangible or intangible by limiting content distribution (Iannella, 2001).

Fulfilling such tasks with the intention of providing comprehensive solution sets high requirements to the development of an effective holistic information system, which shall be integrated with current operational systems. Moreover, the assignment of these requirements is challenging as the domain lacks sufficient framework, which has a level of abstraction applicable in multiple situations and which describes the definitive characteristics of the domain elements. We therefore attempt to provide a depiction of an integrated domain model in relation to the current research and standard development activities. Our scope to the rights management issues is on electronic assets - the content’s straightforward creation, management and trade in the digital environment.

2. EXISTING FRAMEWORKS

An existing work for describing DRM entities and their relations is presented in the framework of the <index> project (Rust & Bide, 2000). Their contribution is based on the assumption that the complexity of intellectual property rights information could be handled through generic models identifying the fundamental concepts with high-level attributes. The generic framework divides and identifies the principal entities that include parties, rights and content. From a commercial point of view, their relationships are: parties hold and trade rights over content, and parties create and use content.

This abstract presentation provides a basis for further discussion by clarifying what must be identified and described (parties, rights and content itself), what is traded in the domain (content and related rights), what we should protect (content and rights for infringements), and what is necessary for monitoring and tracking (usage of content and honouring the rights). Thus, identifying and describing the entities facilitate the DRM functionalities.

The International Federation of Library Associations (IFLA) has provided a valuable framework for observing and modelling the content’s development throughout its evolution stages (Plassard, 1998). IFLA’s model enables the creation to be identified through four dimensions, beginning from the most abstract: work, expression, manifestation, and item dimensions.

A work corresponds to the most abstract level of a creation, thus, a work is not an identifiable entity and it can be caught only throughout its expressions. An expression together with a specific media and format embodies a manifestation of that particular creation. An item is the entity, which finally ends up into the consumers’ hands. Each of the items is individual even if they would exemplify the same manifestation.

Despite the acknowledged contribution of these frameworks, they by definition cannot be used to capture and analyze the requirements of the development of a DRM system. Data collection, processing and management needs for DRM may be elaborated as the commercial view is considered with the evolution aspect and the definitive characteristics of the domain’s entities.

3. THE PROPOSED DOMAIN MODEL

In the attempt to provide an integrated domain model, we make use of the basic notions in the object-oriented discipline. Constructing the domain model is one of the fundamental tasks of the object-oriented analysis methods. We do not suggest object-orientation to be the most suitable for the implementation of DRM systems, but rather it provides a valuable tool for illustrating and visualizing the substance of the domain. In the domain model below, we present the proper considerations. This is facilitated by encryption and security measures, and forces the content providers to select business models according to the available technology. Since success in electronic commerce seems to depend on the companies’ business models, it is conceded that the equilibrium between technology and the way of doing business should be vice versa (Rosenblatt et al., 2002).

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use a notation of UML class diagram (Jacobson et al., 1999). Entities in the
domain model represent the basic actors, different realizations of a creation
and rights descriptions evolvinng from offers to agreements describing permis-
sions and obligations. Figure 2, presenting the integrated domain model, en-
tails different entity categories organized in three columns, as these differenti-
ete the evolution stages of digital creations and agreements created, processed
and used through the value chain. The notion of these different dimensions
offers valuable considerations for content identification, description and trad-
ing.

The entity characteristics are demonstrated as attributes consisting of the
metadata describing the content, the details and the roles of organizations
and individuals as well as the details of offers and agreements expressed in
digital rights expression language. Associations between entities generally fol-
low the straightforward rules of the ‘<index>’ framework. Accordingly, there
are parties holding and trading rights over content, which is created and used
by the parties.

3.1 Identification and Description of Content
Within its lifecycle, a creation serves several purposes, being at first a
realization of its creator’s intellectual effort. Then, creation is transformed into
a product available for utilization, and at last, the copy of the product is of-
fered to the customers as something concrete and an experience worth of pay-
ing. Therefore, associated with the creation, we need to separate identification
and description schemes for different dimensions. Moreover, at different stages
of evolution, diverse rights holders can be distinguished. Therefore, reflecting
the right level of abstraction for creations, we may classify the subjects to
different agreements and further justify the different agreements in our model.

Techniques used for identification in the traditional environments cannot
be directly transferred to the digital world. One downside of the traditional
identifiers is that they consider creations at the manifestation dimension – an
identifier is assigned as creation is transformed into products. Nevertheless, in
the digital environment a need emerges to identify creations both at expres-
sion and item level to enable monitoring and tracking functionalities. Another
point of consideration is the unique identification of the parts in composites
consisting of several unique content entities.

Figure 2 – The Integrated Domain Model for Digital Rights Management

For describing the content, the complicated issue is not the selection of
metadata standard or scheme to apply. Similarly, it is a question on how a
scheme should be applied with different dimensions of the creation. More-
over, as the creation consists of several individual parts, different metadata on
expression and manifestation levels exist.

3.2. Identification and Description of Parties
To approve both the individuals and agents to perform their role specific
operations, actors of a system have to be identified and their roles recognized.
At present, a few recognized standards for such purposes prevail. In rights
management, the roles represent the basic activities in the trading of intellec-
tual property rights by initiating or facilitating the flow of rights, payments or
other information (IMPRIMATUR, 1999).

A creator wishes to circulate her creation and, as a result, assigns her
rights to exploit the creation to the creation provider with an agreement. Op-
tionally, the creator may have assigned her rights to some other legal entity;
thus, the agreement will be made between the third party rights holder and the
content provider. IMPRIMATUR suggests that the defining characteristic of
the creation provider is responsible for making a creation available for exploi-
tation or use, namely, making products. Additionally, the creation provider
operates in various functions concerning the control and management of the
creation, payments and intellectual property rights.

Media distributor’s task is to establish the trade of creations on behalf of
the creation providers in order to meet the needs of the customers. Media
distributor’s role may take responsibilities in packaging the product for distri-
bution and delivery, in facilitating and reporting on sales and payment trans-
actions and in providing marketing functions towards the customers. How-
ever, the basic responsibility of the media distributor is to deliver product
copies to the customer. Finally, value to the chain is returned as customers
acquire the product copies.

3.3. Identification and Description of Rights
Negotiation on the terms of the trade will be carried out as parties choose
to circulate and acquire the content – offers between parties are created and
possibly modified. Once parties accept the terms of the offering, they enter an
agreement specifying who (party) acquires what (content) on which terms (rights
descriptions). Rights descriptions consist of permissions, constraints and re-
quirements of material utilization. Permissions consider the usage of the mate-
rial, the downstream transfer of the material, content management and to the
reuse of the material. Permissions can have constraints such as assigning the
permission to a group of individuals, to some IP address space or for a period of
time. Moreover, the rights holder may set some requirements concerning the
utilization of material, for instance pre-use or per-use payments.

The terms above reflect the possibilities of a currently evolving rights
description language, Open Digital Rights Language (Iannella, 2002). One
similar development activity is in progress: eXtensible Rights Markup Lan-
guage (ContentGuard, 2001). Like its competitor for the standard, XrML at-
ttempts to provide “a general-purpose language in XML used to describe the
rights and conditions for using digital resources.”

Maintenance of the described data improves rights clearances and trad-
ing of rights over content in different situations. Moreover, digital rights data
in the delivery channel confines consumers to use the material in the way
defined in the rights descriptions. Such enforcement and possible tracking of
digital rights through special technologies strives to govern digital rights data
in a reasonable way.

Although the description of rights relating to the content has become one
of the most attractive single research areas, the issue of identification should
not be neglected here. Unique identification of rights descriptions enables
mechanisms to build an association between the content and the rights de-
scriptions regarding that particular content.

4. CONCLUSION
The constructed domain model presents data collection, processing and
management needs for DRM. It is therefore a valuable tool in specifying re-
quirements for a comprehensive management system. Additionally, the model
clarifies the need for separate identification and characteristics description of
offers, agreements, value chain participants and creations through their life
cycle. Processes and business models related to exchange of digital content
and products are subject to further research. The integrated domain model of digital rights management facilitates this examination.

REFERENCES

