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 <indecs> 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

Figure 1 - Four Dimensions of the Creations and Their Relationships
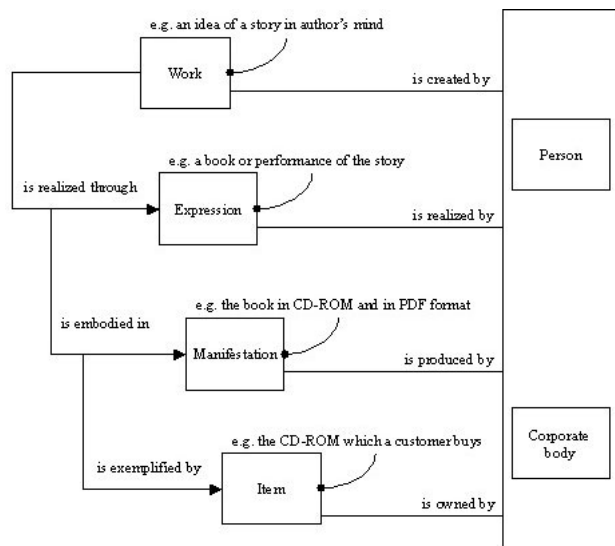
use a notation of UML class diagram (Jacobson et al., 1999). Entities in the domain model represent the basic actors, different realizations of a creation and rights descriptions evolving from offers to agreements describing permissions and obligations. Figure 2, presenting the integrated domain model, entails different entity categories organized in three columns, as these differentiate 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 trading.

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 follow the straightforward rules of the <indecs> 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 offered to the customers as something concrete and an experience worth of paying. 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 expression 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 by applied with different dimensions of the creation. Moreover, 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 intellectual 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. Optionally, 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 exploitation 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 distribution and delivery, in facilitating and reporting on sales and payment transactions and in providing marketing functions towards the customers. However, 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 requirements of material utilization. Permissions consider the usage of the material, 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 Language (ContentGuard, 2001). Like its competitor for the standard, XrML attempts 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 trading 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 descriptions 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 requirements 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
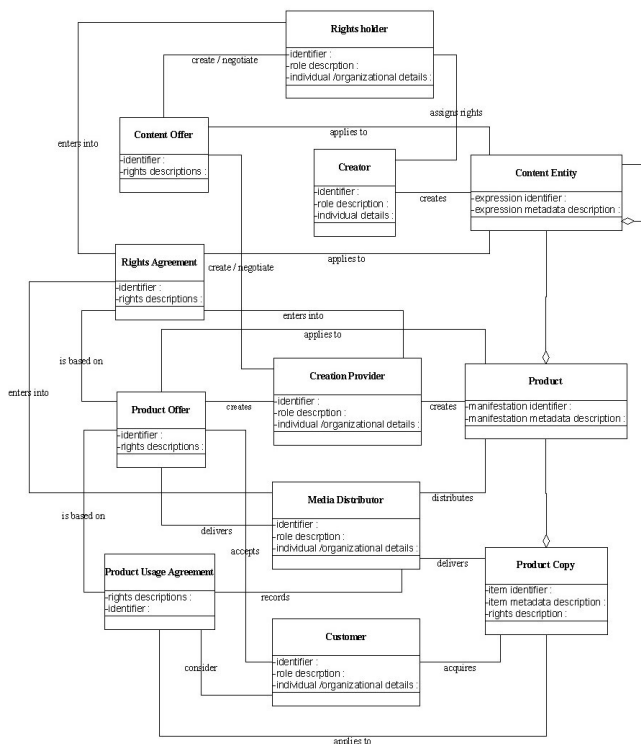
and products are subject to further research. The integrated domain model of digital rights management facilitates this examination.

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