

License Distribution Mechanism for the Rights Sharing Between Consumers

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Abstract

Most existing DRM systems give too much power to rights holders and have not concerned the requirements of the consumers. In this paper, we propose a mechanism for license distribution that considers the distribution of rights between consumers. we describe the protection of digital content in two digital licenses, formal license and peer license. Also we propose an extending mechanism to control the distribution of rights between consumers. For this mechanism, we define it by extending the ODRL model in the end.

1. Introduction

DRM is the technology to distribute digital contents in a secure manner that can protect and manage the rights for all participants in contents distribution value-chain including producers, providers, distributors, and consumers[1]. Typical DRM systems include the Windows Media Rights Manager(WMRM) from Microsoft[2], Commerce and Rights System from InterTrust[3], etc. To increase the distribution of digital contents, these typical DRM systems have supported to distribute digital contents from consumer to consumer instead of selling the digital contents in web site or a computer store. But the consumer has to purchase a license from license server of DRM when using the digital content for first time. This can make profit for the rights holders, but from the standpoint of the consumers, it is not convenient. Because the consumer likely cannot use the rights purchased completely and has the requirement of sharing the rights with other

consumers.

A DRM system controls usage and distribution of the digital contents by the digital license, which contains the decryption key and specification on how the content can be used by a consumer. Rights Expression Languages(REL) such as the Open Digital Rights Language(ODRL) or the Extensible Rights Markup Language(XrML) provide language concepts and vocabulary for the composition of digital license.

In this paper, to satisfy the requirement of consumers, we propose the distribution of rights between consumers. For this kind of distribution, we describe the protection of the content resource in two digital licenses: formal license, peer license. Also we propose an extending mechanism to control the distribution of rights between consumers. For another thing, we define this control mechanism by extending the ODRL model.

The structure of this paper is as follows: In section 2, we describe the related work, and also describe the main system models for supporting the distribution of rights between consumers, and

This work is supported by Technical Development project of Growth Engines of Gyeonggi-do.

section 3 describe the mechanism of license distribution that we proposed, In section 4, we demonstrate the effectiveness of our approach and finally summarize our contributions and future work in section 5.

2. Related Work

Kwok and Liu describe a license management model for B2C and C2C music sharing[4]. This model contains two types of service center: External Service Center(ESC) and Local Service Center(LSC). They also propose two kinds of license in their license management model: official license and peer license. The information and data structure of both official license and peer license are the same. The only difference is where they are issued. The official license is issued by the ESC and the peer license is issued by the LSC. Licenses are described with XrML to process the specified usage rights.

However, digital content is not only music file, and also includes much more complex content format, such as text, audio and video etc. How to distribute these kinds of digital contents securely is an important point be considered.

Project of KW-DRM have already designed the DRM system architecture for the distribution of rights between consumers. The main models of license server for the generation and distribution of license are shown in figure 1.

These models implement the function of generating and issuing license for consumer_i who purchased the digital contents from the distributor website and for consumer_j who received the rights from consumer_i.

We assume that consumer_j purchased the digital contents and received license from license server. When consumer_i want to send some rights to consumer_j, Consumer_i will first send the request of the distribution of rights to license server. License server will authenticate the rights requested by consumer_i whether they are in the range of the rights of consumer. If the request satisfy that condition, license server will generate the license

and issue license for the consumer_j. At the same time, the information of modification about license will send to the consumer_i to update the license.

Through this architecture, we can know about the process of creating of license for consumers. However, in this paper, we make the concern on the mechanism of license distribution between consumers.

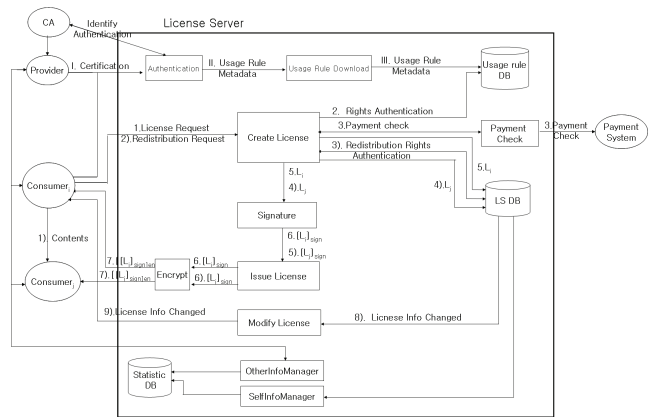


Figure 1: Models of License Server for the generation and distribution of license

3. The Mechanism of License Distribution

3.1. The Basic Idea for License Distribution

For the management of license distributed between consumers, we propose two types of license, "Formal license" and "Peer license". Both of licenses are issued from the license server samely. But the formal license is only used when a consumer requests a license for digital content either purchased from the distributor or received by the superdistribution. The peer license is only used when consumer want to share his rights with other consumers. The flow of the digital content and license distributed between consumers is shown in figure 2.

From this flow, we can see that the consumer A purchased the digital content from the distributor and received the formal license A, the same as the Consumer A, consumer B received the digital content B and the formal license B. The next is as shown in figure, Consumer A and Consumer B can share digital content each other, and also can share with other peers. For these

digital contents received from other consumers, they received peer licenses from the license server.

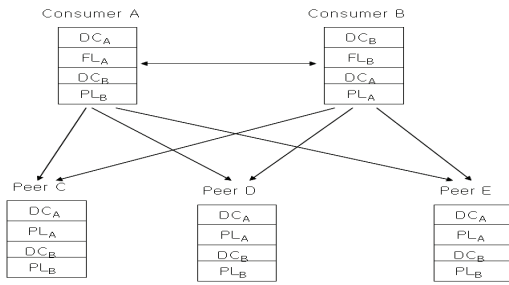


Figure 2 : the flow of the digital content and license distributed between consumers

DC_{A/B} : Digital Content A/B
 FL_{A/B} : Formal License A/B
 PL_{A/B} : Peer License A/B

3.2 Control Mechanism of the Distribution

A DRM system controls usage and distribution of the digital contents by the digital license. Digital license in general contains the information about the digital contents, consumer, distributor, and also contains the usage rules and the key to decrypt the digital contents.

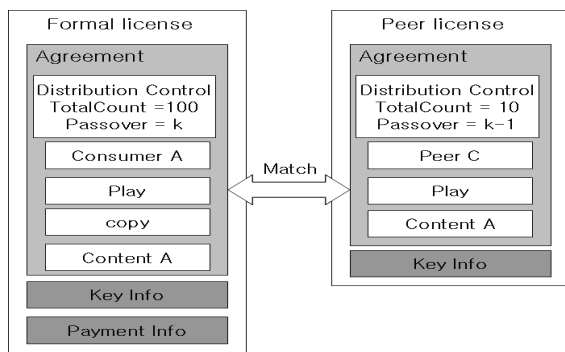


Figure 3 : the structure of license

For distribution of license between consumers, we add an extending mechanism called "Distribution Control" and shown in the Figure 3.

The distribution control model includes two kinds of elements, "TotalCount" and "Passover". TotalCount is the total count that consumer can distribute rights to other peer. Passover limits the steps of distribution between consumers. For example, we suppose the passover is 3. The kinds of distribution are possibly as the following, and

Peer_E can not distribute the rights to the next peer.

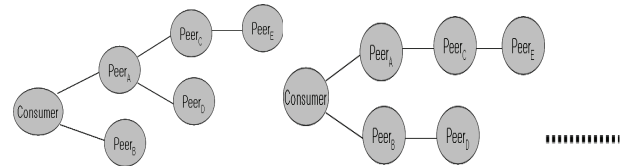


Figure 4 : the example of passover

3.3 Example for the Control of Distribution

At initial status, consumer A and consumer B purchased the digital content and received the formal license. The total count is n and passover is k in the formal license. If the average rate of the count in each distribution is 1/k and if the consumer A distributes rights to consumer B, peer C, Peer D, Peer E at the second status, the total count turns to (k-4)n/k and passover turns to k-1. The total count and passover in peer license correspondingly are the n/k and k-1. Consumer B is also the same as the consumer A. If either the total count or the passover becomes to the 0, the distribution is over.

Table 1: Initial Status

Status = 0	DC	FL	Distribution Control	
			TotalCount	Passover
Consumer A	DC _A	FL _A	n	k
Consumer B	DC _B	FL _B	n	k

Table 2: Second Status

Status = 1	DC	FL	PL	Distribution Control	
				TotalCount	Passover
Consumer A	DC _A , DC _B	FL _A	PL _B	(k-4)n/k, n/k	k-1
Consumer B	DC _B , DC _A	FL _B	PL _A	(k-4)n/k, n/k	k-1
Peer C	DC _A , DC _B	0	PL _A , PL _B	n/k, n/k	k-1
Peer D	DC _A , DC _B	0	PL _A , PL _B	n/k, n/k	k-1
Peer E	DC _A , DC _B	0	PL _A , PL _B	n/k, n/k	k-1

Table 3: The End Status

Status = N	DC	FL	PL	Distribution Control	
				TotalCount	Passover
Consumer A	DC _A , DC _B	FL _A	PL _B	0	0
Consumer B	DC _B , DC _A	FL _B	PL _A	0	0
.....					
Peer N	DC _A , DC _B	0	PL _A , PL _B	0	0

DC: Digital Content
 FL: Formal License
 PL: Peer License

3.4 License Representation in ODRL

Rights Expression Languages(REL) is designed to express usage rights for assets. To represent the license in a machine-readable and processable language, we make use of the XML-based rights expression language ODRL because it is extensible and it has a clear structure.

Based on the ODRL Version 1.1[5], We make an mapping of license model we proposed to ODRL Model (shown in figure 5).

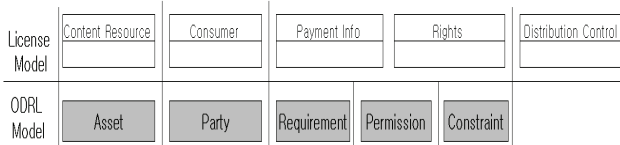


Figure 5 : the mapping of the license to ODRL model

Through this mapping, we can find that the vocabulary of the ODRL is not sufficient and the distribution control model we proposed could not be expressed. Because ODRL is extensible, one possible method is to define a new model to satisfy our requirement. The extending model is shown in the figure 6.

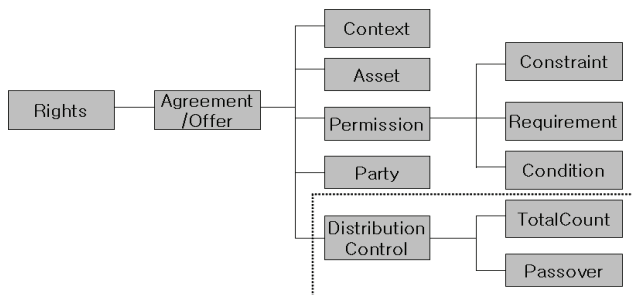


Figure 6 : the extending structure of the ODRL model

4. Evaluation and Comparison

The goal of our work is to provide a mechanism for license distribution between consumers. In Table 4, we compare the analysis result of our proposed with those of other DRM systems, such as MS DRM, InterTrust DRM, OMA.

Compared to other systems, we propose two kinds of license, formal license and peer license. It is flexible to the management of license. And all

of the systems support superdistribution, but only our proposal supports the distribution of rights between consumers and make more convenience for consumers.

Table 4 : Comparison with other DRM System

	Proposal	MS DRM	InterTrust	OMA
License category	Formal License Peer License	License	License	License
License Form	Separately	Separately	Separately	Separately
Usage Rule	Extending of ODRL	XrML	XrML	Extending of ODRL
superdistribution	active	active	active	active
rights sharing	support	not support	not support	not support
consumer convenience	rather good	good	good	good
Copyright Protection	good	good	good	good

5. Conclusion

In our paper, we propose a mechanism for license distribution. We define two kinds of license in the protection chain of digital content. Distribution control mechanism is used as a key element for the distribution of rights between consumers. For this mechanism, we show an example that concerns the control of the distribution of license. Moreover, we define it by the extending ODRL model. Further research will be conducted to study the security issues of the license process, such as, the distribution of key, and the authentication of peers etc.

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