

# A License Management Model to Support B2C and C2C Music Sharing

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## ABSTRACT

Digital Rights Management (DRM) technology ensures protection of rights on distributed music over the Internet. Existing DRM systems emphasize the protection on Business-to-Consumer (B2C) distribution model, but pay very little attention on the protection of Consumer-to-Consumer (C2C) distribution model – referring to peer-to-peer sharing. In this paper, we propose a license management model to support not only the music distributor to consumer (B2C) music distribution, but also consumer-to-consumer music sharing. The proposed license management model consists of two types of license; namely official license and peer license. We proposed to implement these licenses using XrML.

## Keywords

Electronic commerce, digital rights management, peer-to-peer sharing, and digital music distribution.

## 1. Introduction

Facing the opportunities and challenges of digital music distribution, digital music providers, on one hand, require a system for protecting the digital rights of their distributed digital music and they, on the other hand, expect revenues from the music distribution business. Digital Rights Management (DRM) could be a desirable solution toward this direction. DRM refers to the process of honoring those copyright provisions, license terms and usage agreements established by the owners of the intellectual property [1]. A complete digital rights management solution allows digital content providers to 1. set and keep track of the operations on digital content, whether it is viewed, printed, copied, or passed along to someone else; 2. make transactions on the content, set conditions for granting access and accepting payment for content; and 3. extend to those transactions, how many times it can be viewed, or printed, or for how long, etc [8] Unfortunately, existing DRM systems enforce rights protection on the B2C distribution model (from music distributor to consumer), but not C2C distribution model (from consumer to consumer) also referring to peer-to-peering (P2P) sharing. In addressing this problem, it is noted that an appropriate license management model can resolve this issue. In this research study, we first identify common music sharing models and then propose a peer-to-peer license management model for these sharing models.

## 2. The proposed license management model

By observing consumer behavior in the traditional CDs and online digital music markets, we identify three common C2C or P2P music sharing models; 1. Superdistribution 2. Transfer of Ownership and 3. Rental. Many existing DRM systems [2, 3, 5,

7, 8] are designed for business-to-consumer distribution model. However, DRM systems for C2C or P2P sharing activities have not been extensively explored. Since these sharing activities mainly require transfer of ownership, usage authorization and so on, an appropriate license management model in DRM system could enable C2C or P2P with digital rights management. In this section, we propose a license management model to provide digital rights management in C2C or P2P sharing domain.

## 2.1 Overview

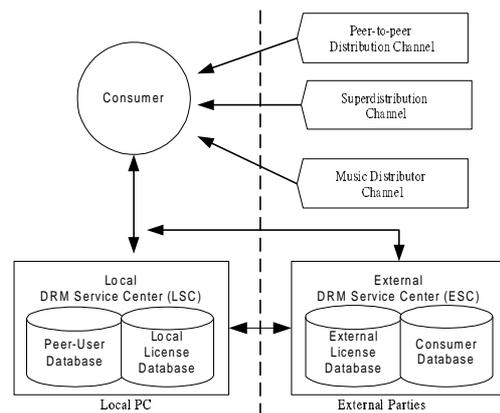


Figure 1: The P2P enabled license management model.

The overview of the proposed license management model is shown in Figure 1. This model is based on the enhanced license management model [4]. The model contains two types of service center; external and local. An external DRM service center (ESC) contains an external license database and a consumer database, while the local DRM service center (LSC) contains a local license database and a peer-user database. They both are responsible for license management operations. The ESC is responsible for consumer registration, payment and license issuing processes when a consumer requests a license for the music file purchased from content distributor or received via superdistribution channel. The ESC stores copies of issued licenses and user's information in the external license and consumer databases. The LSC functions like a small-scaled and simplified version of ESC. It is responsible for licensing music in peer-to-peer distribution model, and it stores licenses and information about the peer users in the local license and peer-user databases. In the proposed license management model, there are three different distribution channels for music distribution, 1. superdistribution channel, 2. peer-to-peer distribution channel, and 3. content distributor channel. The superdistribution channel will be involved in the distribution process that a consumer distributes a purchased music file to another user. The peer-to-peer distribution channel is used

when a consumer loans a digital music or transfers the ownership of music to another user. Lastly, the content distributor channel is used when a consumer purchases digital music.

## 2.2 Digital License

According to functions of DRM, usage and distribution of digital music are subject to the terms and conditions stated in the digital license. A digital license in general contains the information about the consumer, distributor and transaction. It also contains the usage rules and the key to play the music. In the proposed model, eXtensible rights Markup Language (XrML) is used in intermediate digital license file that defines the usage rights about the distributed music. The intermediate digital license file is issued by one DRM service center and then transferred to another DRM service center. There are two types of digital license in our license management model. They are "official license" and "peer license". The formation and data structure of both official license and peer license are the same. The only difference is where they are issued. The official license facilitates B2C distribution model, while the peer license assists C2C distribution model. The official license is issued by an ESC at the distributor side to a consumer, and it is stored on the local license database at the consumer side. This official license is only used when a consumer requests a license for digital music either purchased from the distributor or received via the superdistribution channel. The peer license is issued for digital music to be loaned to, or rented by another user. The peer license in principle is used for music distribution from one user to another user – peer-to-peer sharing. Technically, the peer license is generated by the LSC from which the digital music originally is, to the LSC at the receiving end. The peer license can be further classified into two kinds; they are "peer-rental license" and "peer-redistribution license". The peer-rental license grants the recipient with the rights to play digital music, but not to transfer his rights to another user. On the other hand, the peer-redistribution license grants the recipient with the rights to transfer the ownership of digital music to anyone.

## 2.3 License Acquisition Process

The ESC is responsible for handling digital license requested by consumers who attempt to play a newly purchased or downloaded digital music from the distributor website or the superdistribution channel. The ESC will first validate the consumer identity by checking the consumer ID from the consumer database. If the consumer is not identified, he or she must register to the ESC. Consumers are required to provide registration information and the registration information will be kept in the consumer database at the ESC. After the identification process, an official license will be generated with the information about the digital music, consumer, transaction and the key to play the music. The official license will be encrypted with the consumer public key and then transferred to the consumer. Beside, the information such as the digital music, the recipient of the license, the consumer who requests for the license, the key to play the music, the issuing date of the license, and the expiration date of the license is updated to the license database at the ESC. When the LSC on the consumer machine received the official license, it will decrypt the official license by the consumer private key and store the information in the local license database. The LSC is mainly responsible for C2C distribution model – a peer-to-peer sharing. It generates peer license for the digital music which is being loaned to, rented by another user, or whose ownership is being transferred. For example, Consumer B wants to rent a digital music from

Consumer A (acting as a third-party distributor). If Consumer A accepts the "rental" request, the LSC at the Consumer A's local PC will initiate the license acquisition process by generating a peer-rental license and then transferring it to the LSC at the Consumer B's local PC.

The license acquisition process for peer license is similar to the official license. The LSC at Consumer B (LSC-B) first sends a peer license request to the LSC at Consumer A (LSC-A). The LSC-A will first verify the identity of Consumer A. Consumer B's identity will be checked as well. If Consumer B is not a registered peer user of Consumer A; it means there is no record in the peer-user database at LSC-A, Consumer B needs to register with LSC-A. LSC-A will then add Consumer B to the peer-user database. Then LSC-A will check the local license database for a valid official license for the digital music that Consumer B wants to rent/loan. If the official license is absent, it will check for a valid peer-redistribution license. If both the official license and the peer-redistribution license are absent, the license acquisition process will terminate. If the official license exists in the license database of LSC-A, a valid peer-rental license will be generated. The peer-rental license will be saved in the license database of LSC-A, and then delivered to the license database at LSC-B. Since then, Consumer A is not able to access the digital music, as his rights to access the digital music have been suspended due to the generation of the peer-rental license for Consumer B. For the case of transfer of ownership, the license generation process is similar as before, but a peer-redistribution license will be generated instead of the peer-rental license.

A prototype based on Media Rights Manager was built to evaluate the overall performance of the license management model for peer-to-peer sharing activities. Further research will be conducted to study the security issues of the licensing process.

## 3. Acknowledgement

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