

A License Aware P2P Client with URM^{*}

Helge Hundacker, Verena Liesenfeld, and Rüdiger Grimm

University of Koblenz-Landau
56070 Koblenz, Germany
{hundacker|vliesen|grimm}@uni-koblenz.de

Abstract. This paper shows how the adherence to usage rights can be supported by a license aware peer-to-peer (P2P) client. The idea described depends on the concept of URM, which uses user-defined licenses to support the management of the usage rights related to the user's media files. The presented P2P client is able to share media files only if the rights situation permits it.

Keywords: P2P, peer-to-peer, file sharing, URM, Usage Rights Management, ODRL, DRM, copyright, usage right, user defined rights.

1 Introduction

Hard DRM mechanisms have not succeeded in the area of digital music. After Apple¹ and Sony² have abolished DRM copy protection, there are now nearly no vendors left who use hard DRM mechanisms in the area of digital music.

Today, users are able to handle music files without enforced technical limitations. On the one hand it is good that users can take full control of their media files. On the other hand though, this will allow forbidden transactions, which are neither in the interest of the media files' rights holders, nor in interest of the users, since there have been waves of cease-and-desist letters sent to P2P users (at least in Germany). Most of these cease-and-desist letters include demands for monetary compensation in the range of several thousand Euros³ (typically 450 Euros per song). These warning letters are mostly based on sharing music files on peer to peer (P2P) file sharing systems.

According to these facts, P2P file sharing means a high risk for the users. Accordingly, an improvement of the situation is needed [1], so that users can be

* This work is supported by the "Stiftung Rheinland-Pfalz für Innovation" within the project "SOAVIWA – Eine Service-orientierte Absicherung virtueller Waren"

¹ "Changes Coming to the iTunes Store"; Apple.com; January 6, 2009; obtained on April 7, 2009: <http://www.apple.com/pr/library/2009/01/06itunes.html>

² "Sony BMG Plans to Drop DRM"; Business Week; January 4, 2008; obtained on April 7, 2009: http://www.businessweek.com/technology/content/jan2008/tc2008013_398775.htm

³ "Abmahn-Jahresbericht 2009"; netzpolitik.org; January 11, 2010; obtained on May 12, 2010: <http://www.netzpolitik.org/2010/abmahn-jahresbericht-2009/>

supported in acting legally without constraining their freedom of unlimited use of their media files.

Event though peer-to-peer (P2P) file sharing is mentioned as the most used vehicle for copyright infringement [1], it is important to understand that P2P file sharing itself is not illegal, but it is illegal to offer copyright protected media files to and obtain them from unknown people with and also without P2P systems. Since it is widely known that many copyright infringements occur in P2P file sharing networks, most people think P2P file sharing is always illegal. Therefore, it is hard to establish a legal P2P solution not only technically, but also with regard to its social acceptance.

This paper is organized as follows. In section 2, the concept of Usage Rights Management (URM) to help users behave legally, is described. Section 3 explains the basic concept of our prototype of a file sharing system named CUP (Client for URM based P2P file sharing). CUP allows users to share music files via a P2P system without providing other users with illegal copies that could incriminate the offering user. It also can prevent the user from downloading illegal music files from the P2P network. Section 4 addresses the implementation of CUP. In a concluding section 5 the paper summarizes the achievements of CUP and gives an outlook to further research.

2 URM – Usage Rights Management⁴

The Concept of Usage Rights Management was first described in [2] at the Virtual Goods workshop in 2009, Nancy, France. The basic idea of URM is empowering users to act legally with respect to their digital media files. With URM, users are able to manage the rights on their media file with self-generated licenses. These rights can then be visualized so that the users can easily get an overview of their rights situation.

URM is made for persons who want to act legally. Since URM depends on voluntary usage, there are no security issues. That means that users are able to fake licenses. In fact, these fakes might help the users cheat themselves, but can not change the real legal status.

It is also important to understand that URM is not a tool for rights enforcement, but for rights information, i.e it supports the awareness of users about their rights on their songs. It helps to manage rights of protected songs by explicating the rights to the user.

2.1 The URM License

The URM license is based on ODRL (Open Digital Rights Language). Since the main topic of the URM license is to describe digital rights, ODRL is a proper means. The first version of the URM license is based on ODRL Version 1.1 [3].

⁴ URM is part of the SOWAVIWA project on “Service Oriented Architectures for Virtual Goods” at the University of Koblenz-Landau in Germany, which is supported by the “Stiftung Rheinland-Pfalz für Innovation”.

Further versions can be based on ODRL Version 2.0 [4]. A notification using RDF (Resource Description Language), which is discussed in another submission⁵, is also a perspective.

For every digital media file, one license file should exist which contains information about the legal status. Media files and license files are both stored at separated locations on the hard disk, but can be linked together by technical issues. So there is a loose coupling between the files.

2.2 The URM Media Library

The first URM prototype was a media library which visualizes the current rights situation for every song by using the colours of traffic lights. In this case green means that the user has the right to play the media file. Red means that the media file came from an obviously illegal source and the user should delete the respective file in order to behave legally. Finally, yellow refers to an unknown rights situation, i.e. no URM license is available. In addition to the colours of traffic lights, a blue light was added which represents the right to forward the media file. The latter case has a particular meaning in the area of digital rights and especially in this paper.

2.3 CD Ripping Plugin

As another prototype in the URM project, a plugin for Winamp, a well known media player for Microsoft Windows, was developed. With this plugin, users are able to rip Compact Discs (CD) and store a simultaneously created URM license in the license folder in one process. Thus, users can support their private URM information base comfortably.

2.4 TURM – Toolkit for URM

The previously shown prototypes provide the basic features a user needs for a closed private domain without an internet connection. Nowadays, most people receive media files from different locations in the internet. In fact, the number of potential media file sources is not even countable. Taking this into account, the next development is an extensible framework based on the platform independent programming language Java. This framework, called Toolkit for URM (TURM), is the starting point for following URM tools. The toolkit is designed in a way that different features can be added as modules. In “Table 1: Possible Extensions for TURM”, enhancing features are introduced. Within every category, every mentioned example could be implemented separately in order to assist the module based architecture.

Currently, several persons are developing features for TURM. These features are:

⁵ “Making the Semantics of ODRL and URM Explicit Using Web Ontologies”; Andreas Kasten; to be published

- A basic URM(TURM) license
- An RDF reading / writing extension
- A media manager
- A graphical user interface (GUI)
- A media file analyzer
- An online verification service
- A P2P file sharing extension (CUP)

These features are not subject to deeper discussion in this paper. For further information read [2] or contact the authors. The focus of this paper is on the P2P file sharing extension.

Support of different media types	audio, video, images, eBooks, ...
Support of different media file types (e.g. in audio area)	mp3, aac, ogg, wma, ...
Support of different rights template depending of the media file source (e.g. in audio area)	web shop download, Creative Commons ⁶ , web radio recording, P2P file sharing, ...
Support of different license coding	ODRL 1.1-XML, ODRL 1.1-RDF, ODRL 2.0-RDF, other rights description languages

Table 1. Possible Extensions for TURM

3 CUP (Client for URM based P2P file sharing)

3.1 Basic Concept of CUP

The aim of the research work addressed by this paper is a P2P file sharing system with which users can share copyright protected media files legally. To realize such a system, the file sharing tool has to adhere to the copyright terms that are associated with the respective media file. URM will be able to provide the copyright information in a machine readable format, e.g. ODRL.

Figure 1 shows the basic scenario of CUP. On the left side, the user with the URM system is illustrated. The user has music files with different usage rights situations. In the file sharing scenario, only the right “duplicate” matters since this right allows the user to forward music files to other persons. Depending on copyright law and the vendors’ usage conditions, the duplicate right status can have three different cases.

The easiest case is that the vendor simply prohibits every transfer to other persons. CUP will not transmit these media files. The next case allows the unlimited forwarding of the media files. These media files are under public domain,

⁶ “Creative Commons Licenses”; Version 3.0 Licenses; obtained on May 27, 2010: <http://creativecommons.org/licenses/>

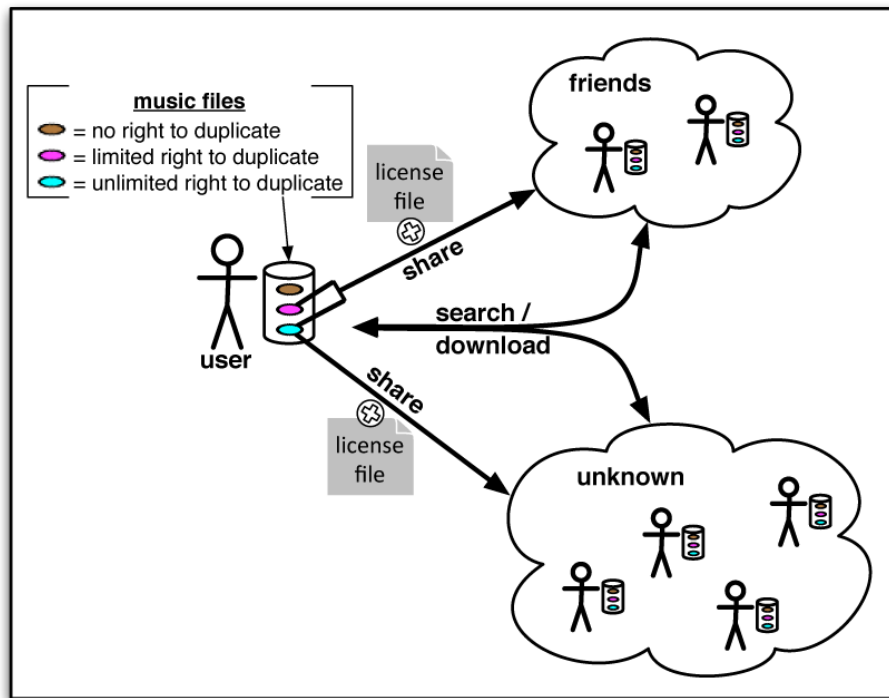


Fig. 1. CUP Scenario

or they are the user's own creation, or they are licensed under a Creative Commons license. CUP would allow these media files to be transferred to other users. The third case comprises a limited transfer right. This represents conditions derived from special law statements like the American "fair use"⁷ or the German so called "private copy". These cases are discussed in detail later.

Depending on the case of the transfer right, the other users of the P2P file sharing network have to be split into two groups. The first group consists of personal friends (who have to be indentified as friends), the second consists of all other users participating in the file sharing network.

Since every user in a P2P file sharing network has the same upload, searching and downloading constellations, it will be sufficient to analyse the use cases of the user on the left side of Figure 1. These use cases will be discussed in the next sections.

For a user, there are different benefits in using CUP. Among others, a special benefit is the self protection against illegal behavior. The benefits can be

⁷ "§107 Limitations on exclusive rights: Fair use"; obtained on May 27, 2010 <http://www.law.cornell.edu/uscode/17/107.html>

derived from different applications of CUP, which are explained in the following subsections.

3.2 Application 1: Only Forward Media Files Legally

In the topic of self protection it is very important that CUP only provides media files with a rights status that allows the transfer to other users. It was already mentioned in the introduction that cease-and-desist letters have been sent to people using P2P file sharing systems. These cease-and-desist letters mainly apply to the case of illegal upload, i.e. the user acts as provider of illegal media files in the internet.

There are different possibilities for inspectors to detect illegally provided media files. The easiest and most often applied method is simply to log the IP addresses and the behavior of users of a P2P network [5]. Based on the monitoring of this illegal behavior a prosecutor can initiate legal measures.

Another option is to analyze media files to find out their origin. There can be metadata or digital watermarks in the media files that indicate the user as provider of the media file. For example, iTunes inserts information about the user like the e-mail address into media files in plain text. If such a marked media file is found by an inspector, he can easily identify the person who bought the media file from iTunes and provided it to a P2P file sharing network. For further information how inspectors investigate copyright infringement see [5].

As a conclusion, the best way to avoid being caught as an illegal uploader is just to avoid submitting illegal media files to P2P file sharing networks. Therefore, if there is no URM license available, CUP prevents file transfer as a protection of its user against prosecution. This is the most important function of CUP.

3.3 Application 2: Only Receive Media Files Legally

Not only transferring (as described above as application 1), but also using copyright protected media files without legitimation is illegal, at least in Germany since the last change of the German copyright law [6].

To ensure that a downloaded media file has a legal duplicate status, the receiving user can trust the offering user in the first instance. If the offering user also uses CUP, the trust would be higher than without CUP. In particular, in this case the receiver can assume that the offering user has a high interest in behaving legally, as explained in section 3.1.

The legal status of a media file can be checked, especially if it is free for exchange, in that the offering user gives a hint about the file's legitimation. For example, a Creative Commons licensed media file would have a special web page where the media file is promoted and declared to be licensed under the respective type of Creative Commons license. CUP would always transmit a URM license combined with the media file. In this case, the receiver of the media file can check the information of the received license.

3.4 Application 3: Private Copy

The term “private copy” is derived from the German copyright law, although this term is not used explicitly in the legal text [6]. The term represents the right that customers of copyright protected works are allowed to copy that works for private, non-commercial purposes, provided that it does not come from an illegal source and that it has not been protected by technical means (e.g., encrypted). This includes the right to transfer a limited amount of copies to friends. This latter is not explicitly mentioned in the legal text either, but it is applied in practice. Similar regulations like the German “private copy” can be found in other countries’ laws.

For the license aware P2P client, these regulations lead to the aforementioned limited right to duplicate. In order to execute the limited right to duplicate, a “friends list” is used. In the “friends list”, the user of the current CUP can add friends and also remove them. These friends are identified by their e-mail addresses. If a friend who is registered in that list searches for a song that the CUP user owns, CUP can provide this song according to the right of private copy.

In the legal text of the “private copy” no explicit amount of how many copies are actually allowed is mentioned. In the applied practice, different numbers from three to seven are named. As a precaution, CUP has a default number of three copies. The user can change this number with the configuration settings of his CUP, if he is willing to take the higher risk.

Independent of the number of allowed private copies, a CUP has to check how many private copies have been delivered in order to prevent more than the predefined number of copies from being transmitted. In the section before, it was explained that the offering user should always deliver a URM license to the receiver. This so called “URM Export License” will be created by the delivering CUP, especially to transfer the right to play the media file to the receiving user. The URM export license can then be transmitted to the receiving user and is also saved locally. If all created versions of the URM export licenses are saved, the CUP can count all URM export licenses referring to a special media file, and can avoid delivering more than the configured amount of private copies.

The locally saved copies of the URM export licenses have another advantage. If a user loses the right to duplicate a media file, for example because he sold the original CD, the CUP client can revoke the respective URM export licenses. The receiver then has the choice to delete the media file, buy a legal copy or behave illegally by keeping the licensed-less copy.

The idea of URM includes being cautious. In the case of the private copy this means that the transfer to friends in different countries is not possible, unless it is clear that in the country of the receiving friend, a regulation like the German “Private Copy” or the American “Fair Use” exists. Since there is a lack of proven compatibilities of the different laws, it is recommended not to share media file with users in foreign countries.

3.5 Application 4: Receiving a URM Export License

This application has been implied in the subsections before, however, it should be explained in more detail here. The main idea of URM is to have a complete documentation of the origins of the media files in order to have full transparency about the rights situation. This aim of URM is supported by sending the URM export license to the receiver automatically. Here too, different cases can occur.

The first case to be mentioned is the already explained private copy. In this case, the offering user somehow has a proof for the media file's origin. In the easiest case, it is a CD represented by the real disc in the CD shelf or a digitally signed certificate or receipt of a web shop. If such a proof is available, the URM export license includes information that the proof of origin will be available by the providing friend. The receiving friend then has a chain of proofs, which can verify that he has the right to play the media file.

The other case comprises media files with an unlimited duplicate right. A proof of origin should exist in this case, too. In fact, it is often very hard to get real proofs of public domain media files. In the case of Creative Commons, the proof is normally represented by a declaration on the Creative Commons web site or the provider's web site. For Creative Commons, the hint of proof could be a reference internet address. For a URM export license this means that the offering user does not have to be named in the license since the receiver can directly reference the web page.

In addition to the reference link, it will be recommendable to save a copy of the relevant web page as screenshot or PDF file. Such a digital proof would still exist even if the web page of the Creative Commons declaration is out-of-date or just not available.

4 CUP Implementation

In the previous chapter 3 we discuss the basic concept of CUP. To date, a prototype exists with most of the previously mentioned features. The CUP implementation is mainly based on the JXTA⁸ P2P system and has been integrated into the TURM (Toolkit for URM), which is described in section 2.4. JXTA is an open source framework initiated by Sun Microsystems⁹ in 2001. Since JXTA, as well as TURM are implemented in Java, and JXTA is an open framework with academic ambitions, it is ideal for the CUP implementation.

The CUP implementation was mainly driven by the diploma thesis of one of the authors of this paper [7] and was supported by the URM and SOAVIWA projects [2].

Figure 2 shows a sequence diagram of the basic process of the CUP. A P2P client usually acts as a client as well as a server. As the CUP is still only a prototype, these functions cannot be used concurrently, but the user has to choose between two different modes (server mode and client mode) on program

⁸ "JXTA Project"; obtained on May 27, 2010: <https://jxta.dev.java.net>

⁹ Sun Microsystems; obtained on May 27, 2010: <http://de.sun.com>

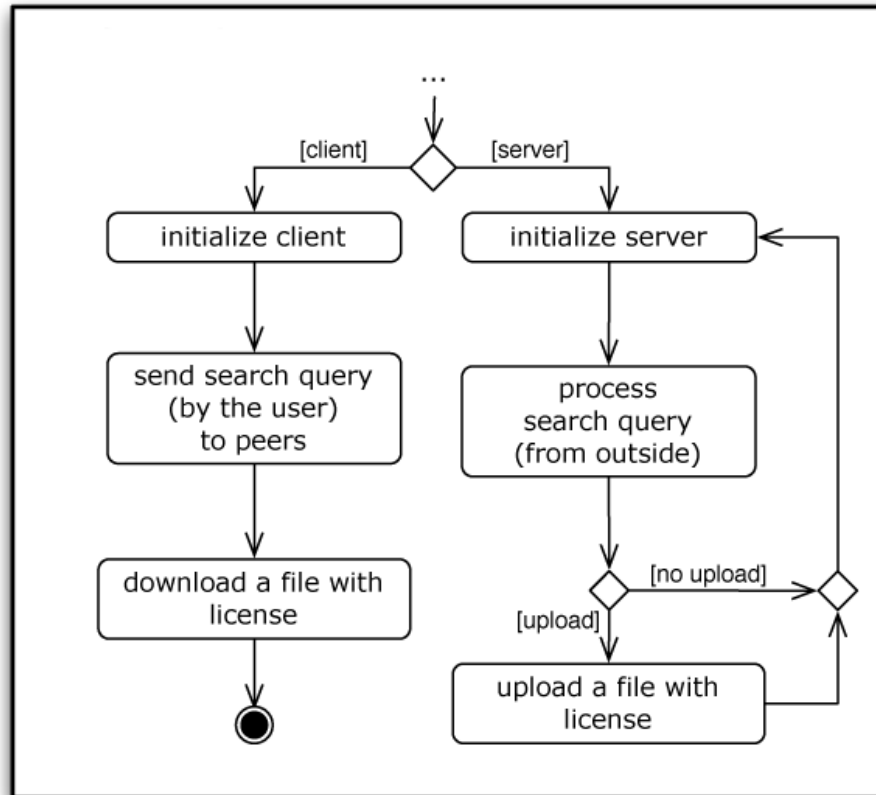


Fig. 2. CUP Process

startup – of course, he can easily start several CUP instances, e.g. a server that keeps running and a client for each search query he wants to send. In fact, there are three initial modes, the third being just for administration of the friends list. Since the latter is just a support function, it is not included in the above diagram.

In the following, the process is described as a sequence of communicating instances (server mode and client mode) in the case of a media file transfer from an offering user (acting in server mode) to a receiving user (acting in client mode). At the beginning, each user starts the CUP; typically (but not necessarily), the first instance is started in server mode (initialize server). Doing this, the CUP will join a P2P file sharing network and will offer a search service to the current net group. Further on, the CUP in server mode will monitor the search service for incoming search queries.

If another user searches a media file, he initializes a CUP instance in client mode. The CUP in client mode looks for the search service and transmits the

user's search query to the peers of the search service. The peers in server mode receive the search query and process it locally. Each server CUP first checks if any of the managed media files fits the request. For every file found, the CUP then checks if the respective rights allow an upload (this includes uploads based on the "private copy") and takes files that are not allowed to be uploaded off the list. If there are search hits left in the result list after this step, it is transmitted to the requesting CUP. If the CUP in client mode received several of these result lists, the user can choose one of the offering CUP servers and directly download the requested media file. Before the CUP in server mode allows the file transfer, it checks the rights situation once more, creates a URM export license and finally starts the transfer of the requested media and the URM export license.

5 Conclusion and Outlook

In this paper, the "Client for URM based P2P file sharing" (CUP) was presented. It was shown that there are several benefits to the users of CUP. The first benefit is the possibility to use a P2P file sharing system with a self protection function. It is possible to share media files while adhering to copyright law.

The next benefit is the option to share media files which have limited duplicate rights associated with them. These media files can be exchanged with friends in the sense of a "private copy". Normally, the exchange of media files as private copies implies some effort, for example burning a CD. This "manual" process can be substituted by automatic processes.

The last benefit which should be mentioned is the assistance in keeping URM rights information up to date. URM license information can be exchanged directly between the users.

Since CUP is only a first prototype of a URM based P2P client, there are different features which could be worth adding. For example, the management of friends is very rudimentary (but sufficient at the moment). Additional features like reserving a license of particular media file for a special friend or hiding particular media files from another friend could be interesting.

Many restrictions of the TURM currently also affect the CUP. For example, at the moment only a few media file types are supported by the TURM. Since there are many possible extensions shown in section 2.4, there is a high potential for further contributions.

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