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URM -

USAGE RIGHTS MANAGEMENT[1]

Abstract: In this paper a new method to support the adherence to copyrights is described. The method is based on informing users about the usage rights of the digital media files on their local workstation. After the definition of URM, we will show how a user can manage (self made) digital licenses. Further aspects of URM like how to define rights, digital signatures and file sharing will be discussed.

Keywords: URM, Usage Rights Management, ODRL, DRM, copyright, usage right, user defined rights.

1. Introduction

Sony BMG[2] and Apple[3] announced recently to give up DRM by means of copy protection. This marks the trend to give up strict DRM systems with music files. However, this doesn't mean that customers may proceed at will with the acquired music files. What are users allowed to do with their files? The answer can be found in the conditions of use of the webshops and in the copyright laws of the different countries. For consumers it is hard to understand what these sources mean to them.

iTunes is only one example for different sources from which music files can be attained. Further supply sources are converted CDs, file sharing networks,

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

[3]   "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

download platforms or radio recordings. For most of these sources, there are different legal rules. Some files of these sources are illegal.

URM (Usage Rights Management) helps users administrate the rights of their music files. These rights are stored in so-called license files with help of the XML-based rights expression language ODRL (Open Digital Rights Language) [1]. Every license refers to one song. The license can be read by a media library, for example with an extension for Winamp. The consumer can then see short information about their rights. The colors of traffic lights visualize whether a song can be played (green), it cannot be played (red), or no license information is available (yellow).

At this point of our research work, URM is primarily an information instrument. So far, none of the user's actions, be it playing or copying files, is prevented at all. URM is independent of right enforcement systems, but can also manage copy protected files. Other interactions with right enforcement systems are the subject of further studies.

URM offers a solution for music fans who would like to behave legally in the jungle of digital rights. Furthermore, URM is also transferable to other media types, for example videos or e-books.

2. URM – Definition

2.1. DRM

The term "Digital Rights Management" (DRM) is often used even though a single, widely accepted definition does not yet exist. An often cited, broad definition by Iannella reads:

> "Digital Rights Management (DRM) involves the description, identification, trading, protection, monitoring and tracking of all forms of rights usages over both tangible and intangible assets – both in physical and digital form - including management of rights holders relationships" [2]

As this definition shows, DRM denotes not only technical solutions such as copy protection, but the term also covers legal and organizational aspects of virtual goods.

Solely technical solutions are so-called Digital Rights Management Systems (DRMS), typically comprising server and client applications, which allow content vendors to control which rights concerning virtual goods their customers exercise [3]. To make sure users do not circumvent the DRMS, the actual content is often encrypted, thereby making it copy protected. Obviously,

this approach lacks flexibility: users are bound to a certain software and certain standalone players, and audio files that were bought at webshop A cannot necessarily be played on player B. Furthermore, if a vendor shuts down their server application, already purchased goods might become unusable sooner or later.

Considering the fact that even market leader Apple recently announced to not sell copy-protected audio files anymore, DRM with the meaning of technical rights enforcement can be regarded as dying out, at least as far as music is concerned – copy protection is still rather popular for purposes such as pay-TV or gaming consoles. On the other hand, DRM in a broader sense is still very relevant for music commerce: new business models remain to be developed. E.g., the so-called PotatoSystem is a webshop that makes up for the lack of copy protection by offering users incentives to legally pay for audio files [4]. To date, the PotatoSystem fills only a niche in the market.

While many DRMS enforce particular rights and even alternative business models rely on the user behaving legally, it is not always obvious what the respective rights are.

2.2.   Usage Rights

In Germany (as well as in many other countries), a complex legal system for intellectual property exists. The originator (e.g., a musician) has certain unalienable rights, but can sell exploitation rights to others (e.g., music labels), who can then sell the produced goods. As a last part of this chain, the customer is granted usage rights, which define what they are allowed to do with the purchased goods. Some of these usage rights are explicitly defined by the originator or the vendor, but some are also implicitly granted by law, e.g., the creation of exclusively private copies and other fair use rules.

2.3.   Usage Rights Management

Our approach (like the above mentioned PotatoSystem) does not rely on technical protection measures. But unlike the PotatoSystem, it is neither based on a particular vendor's system, nor does it offer the user monetary incentives. Instead, it supports the user's will to behave legally by keeping an overview of which files are legal and which are not. Usage Rights Management (URM) is supposed to make it absolutely clear to users which rights they have concerning which goods. At this point we leave open if a usage system for virtual goods that incorporates a URM information service also contains a rights enforcement module or not. URM information is useful with and without an additional enforcement function. For the time being, information is superior to

enforcement because rights information without rights enforcement can be very effective while rights enforcement must never be enrolled without rights information.

As the name indicates, URM has features of "classical" DRM, but instead of enforcing rights via copy-protection, it focuses on the user, giving them the possibility to keep an overview of their rights, but also the responsibility to adhere to these rights. Rights are defined on a per-file and per-user basis, and are expressed in so-called license files using ODRL (Open Digital Rights Language), a W3C standard for rights expressions. In contrast to Creative Commons licenses, URM realizes a direct binding of a file and the license on the user's local workstation. Nevertheless, Creative Commons licenses are supported (cf. sections 3 and 5.1).

URM aims to provide and visualize license files for as many virtual goods as possible (at the moment it focuses on audio files), ideally allowing the user a precise overview of the legal status of their complete collection. Generally, license files can have two sources: they can be user-created or authority-created. In the latter case, digital signatures can be undeniable proofs of the licenses' validity, whereas in the former case, they serve mainly as an aid for the user. Keeping these license files can be useful in several respects:

• Users who are willing to behave legally of their own account can see which files they should delete (or buy, to own them legally).

• Users who are subject of an investigation have evidence or even proof (depending on the licenses' source) of the legality of their files.

3. URM Architecture Overview

The core element of URM is the management of (mostly self-defined) rights by the user. Just as a user administrates their digital music files with a media library (for example Winamp), this is also a good starting point to manage their rights. The technical solution comprises extensions to media libraries which are already in use. Figure 1 shows that two folders are managed by the media library. One folder contains the music files (in this case MP3 files). The other folder contains the license files in which the rights are defined. The binding of licenses and music files does not depend on the media library, but is realized through the licenses themselves. Their detailed structure will be described in chapter 4 "URM ODRL License".
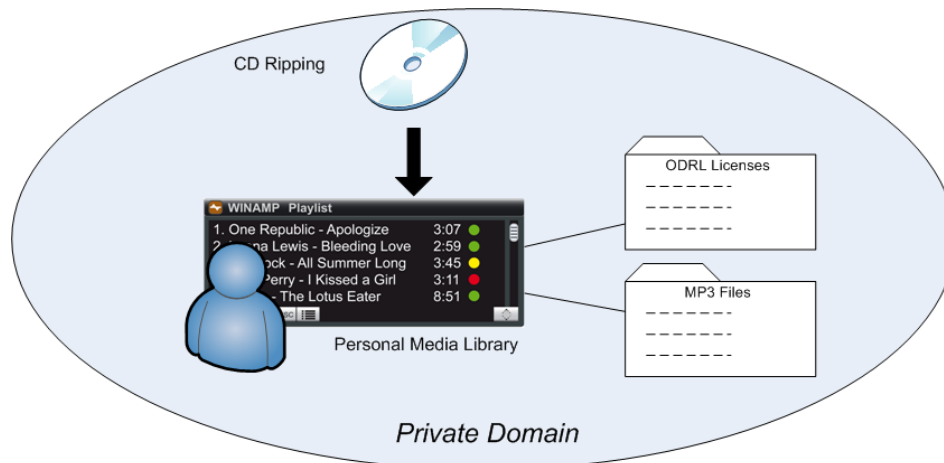
Figure 1. Personal Media Library

Figure 1 illustrates the CD Ripping function. The user can not only add the newly created MP3 files to their collection, but also define the rights related to these files. CD ripping is a good example for managing usage rights, since the CDs as well as the private workstation are in the private domain. In general, there are no digital licenses connected to a CD. The right of usage for the audio file is granted by law, and it depends on the ownership of a physical item– the CD itself. A digital license generated by the media library can bridge the gap between the digital music file and the physical CD by mentioning the latter in the license.

Figure 2 extends the core model with further data sources. In principle, it is desirable to maintain licenses for all audio files. In some cases, the information about usage rights needed to create license files is readily available. The best example is Creative Commons, where rights are given by predefined license models of Creative Commons[4]. Mostly, there are no predefined license conditions, as is the case with web radio recordings, downloads from webshops or P2P file sharing. Converting the rights for all data sources to licenses is a big task. In section 5.1 we give a short outlook on how to deal with the different sources.

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[4]   "Creative Commons Licenses"; Version 3.0 Licenses; obtained on April 14, 2009: http://creativecommons.org/licenses/
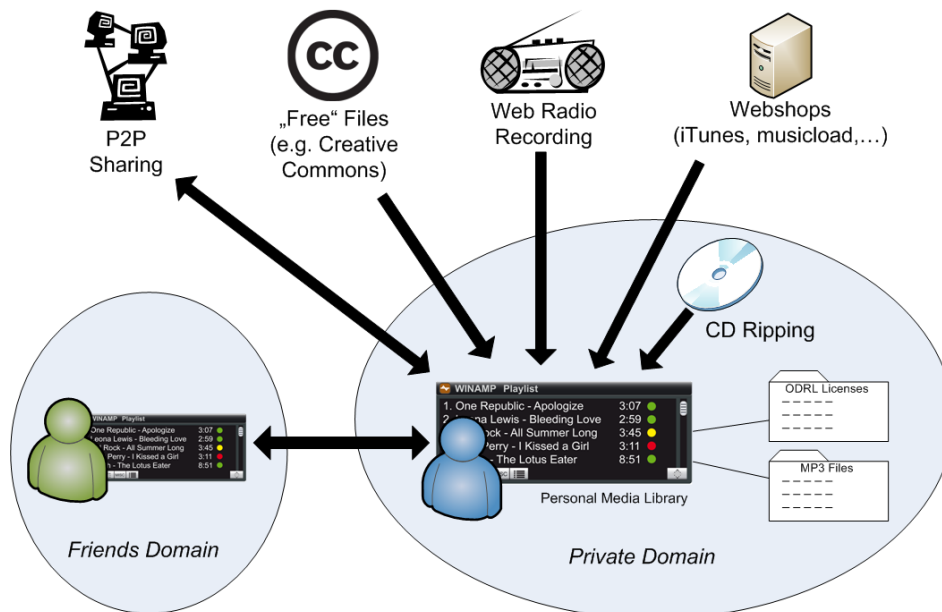
Figure 2. Data Sources for Personal Media Library

An interesting aspect of URM is the exchange of music files with a friend. Depending on the rights in the licenses it will be possible to forward files combined with new licenses which will depend on the rights of the target person. For example user A can forward a music file he has ripped from a CD to user B if law in A's jurisdiction allows this. The license of the receiving user B will mention that user A owns the CD. Since only user A has the right to forward the music file to a friend, the right of forwarding will be deleted in the license of user B.

In order to create a user friendly solution, only a few rights are illustrated for the user in the prototype of the media library. The legal status of the action "PLAY" is shown using the colors of traffic lights. Where *green* means that the user has the right to play the file, *red* shows that the file has an illegal source, and so the song should better be deleted by the user. *Yellow* signalizes that no license is available, which means that it is unclear whether the file may be played or not.

The second prototype was supplemented by a *blue* light. If the blue signal is visible, this means that the file can be forwarded to a friend. On first sight, the user will not need further rights information. The detailed licenses can be viewed in another display mode.

4. URM ODRL License

In this chapter, a first draft of a digital license in ODRL format is presented. This version is implemented in our prototype. It is not necessary to define a new ODRL profile and thereby extend the language's default vocabulary for this simple example, since the vocabulary of the ODRL core model of version 1.1 is sufficient. If new requirements for licenses arise in the future, a new ODRL profile could still be developed.

4.1. ODRL License Structure

Figure 3 shows an ODRL-License which was created by a CD ripping plug-in for the Winamp Media Player. In this example, the XML namespaces were deactivated for a better readability. The plug-in prototype was implemented for Winamp as an example, but could be implemented for virtually every media player which allows modifications or plug-ins.

The license contains the main information about the date of ripping (<date>-element), the name of the asset, the location of the media file on the local file system (<dlocation>-element), and a unique id for the digital file (<uid>-element). Furthermore, the party which holds the usage rights for the asset as well as their permissions are mentioned. In this case, these permissions are limited to the actions "play" and "duplicate". The right to duplicate the asset is limited to 3 duplicates, which fits best to current applied German copyright law. In order to ensure that the user does not violate the copyright laws of other countries, which can have other regulations, the right to duplicate is limited to Germany (<spatial>-element).

An interesting feature of the license is the <plocation>-element. In the CD ripping prototype the user is able to define it as they wish. It refers to the physical location of the real CD. In a broader context, this element tells the user where the item is that serves as a proof that the user holds the usage rights. In the example shown above, this item is the physically available CD. The user would be well advised to remark in this field where the CD can be found in the CD storage rack.

```
<?xml version="1.0" encoding="utf-8"?>
<rights>
  <agreement>
    <context>
      <date><fixed>2009-04-20T22:33:51</fixed></date>
    </context>
    <asset>
      <context>
        <uid>c32969acdd6ab7415bf7a9e564afa4f37c974bb</uid>
        <name>
          Queen - 1994 - Greatest Hits I - Bohemian Rhapsody
        </name>
        <dlocation>
          file://C:\local_music_directory\01_Bohemian_Rhapsody.mp3
        </dlocation>
        <plocation>Helge's storage rack</plocation>
      </context>                                          asset
    </asset>
    <permission>
      <play />
      <duplicate>
        <constraint>
          <count>3</count>
          <spatial><context>
            <uid>iso3166:DE</uid>
          </context></spatial>
        </constraint>
      </duplicate>                                     permissions
    </permission>
    <party>
      <context>
        <uid>hundacker@uni-koblenz.de</uid>
      </context>                                          party
    </party>
  </agreement>
</rights>
```

Figure 3. Example of a URM license

4.2.   Location of the Licenses

The URM concept is an open approach which is supposed to be configurable and extensible for other purposes. In this way the user is able to write a license in form of a text file to a directory of their own preference. A good location could be a folder near the music files, as shown in the examples in figure 4 below.

The location of the folder must be configured in all tools which are able to write or read these licenses.

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Another approach for storing the licenses is to write them to ID3-tags, which contain metadata about MP3 files in clear text, and which are contained within the MP3 files themselves. The advantage is that there is no need to keep track of separate paths for music and license files. If the MP3 file is copied to another device, the license is copied as well. On the other hand, this is also a disadvantage, since the license contains personal data which the user might not want to leave the private domain. Furthermore, ID3-tags are limited to MP3 files and cannot be used for other file formats such als WMA. Regarding these disadvantages, the possibility to store licenses in ID3-tags can just be a feature, but not a solution.
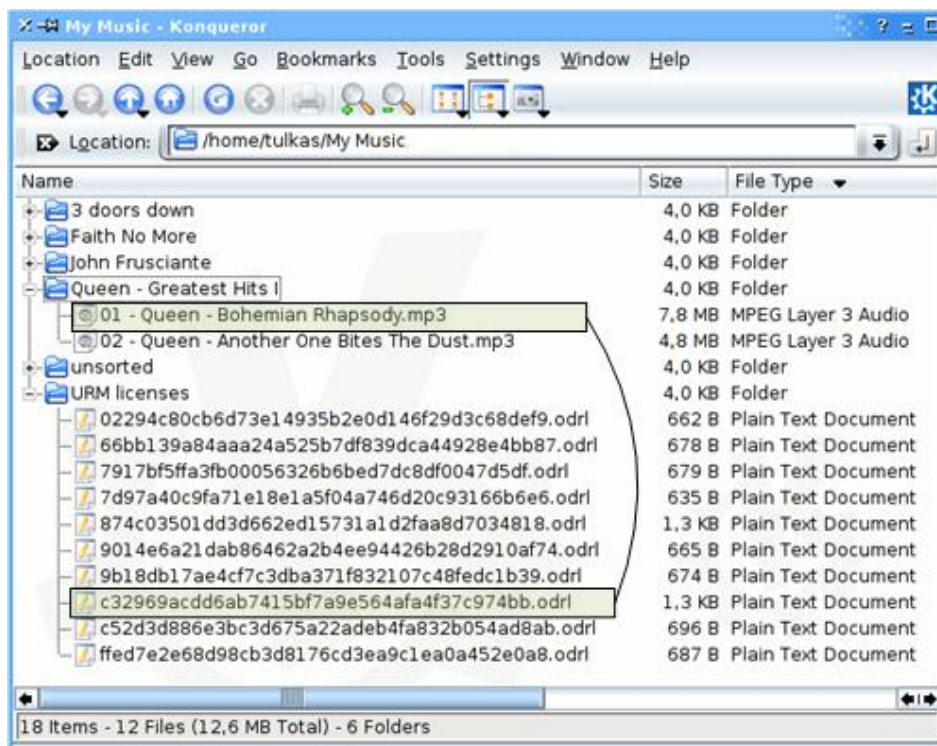

Figure 4. Example folder for the licenses

4.3. Binding of License and Asset

In the section before, it was described that the digital licenses are written to a folder defined by the user. In the license the location of the music file is noticed. This causes problems if the user moves the music file to a different folder.

The normal way of using the license is that a user opens their media library. The media library then reads the media files and gathers their metadata. In order to find the appropriate license for each media file, a unique characteristic is needed which allows identifying the right license explicitly. The solution in the first URM prototype is to create such a unique ID in dependence of the content of the media file. More precisely, a hash value of the body part of the media file is calculated. This means that even if the header information (like ID3-tags) is changed, the ID remains stable since the computation of the hash value does not take the header information into account.

If the media library then wants to read the license information for a specific media file, it has to calculate its hash value. The licenses can be found in the predefined license folder. The name of each license contains the hash value (see figure 4), which makes it easy for the media library to identify the right licenses for each media file. In the license of figure 3 the hash value can be found in the <uid>-element since this hash value allows to identify the asset uniquely.

Identifying the licenses by the assets' SHA-1 hash values is just one possibility. Other solutions can use so-called robust hash values [5], which allow identifying a piece of music even after alterations to the file, such as reencoding with a different bit rate. It should be kept in mind that this solution brings up the legal question if the usage rights remain valid for different files from different sources which will lead to the same robust hash values (and thereby identify the same piece of music).

Another solution can consist of using identification standards such as URN. In this case, the identification value has to be written to the header information of the media file. Since this can be changed, the body hash value is the best solution at the moment, because identification can be executed in both directions: from the media file to the license and from the license to the media file. This way, wrong information in the <dlocation>-tag of the license can be corrected.

5. Further Steps

The purpose of this paper is to give an overview of URM. The possibilities of URM are very broad. This chapter gives an idea of what is possible with URM and which tasks are connected to these possibilities.

5.1. How to define the usage rights of all data sources

In chapter 3, different sources (P2P, free downloads, web radio, webshops, CD ripping) of media files where mentioned, but the question of how to define

their digital rights was not answered, yet. Defining digital rights leads to two special questions:

1. How does the user know from which source their digital files are?
2. How should the permissions for files from a specific source be set? For example, how many duplicates can be made?

The first question can come up if a user wants to include their old file collection in a newly installed URM media library. If a user does not know where a specific file was originally from, forensic methods can help [6]. For a private user, methods which can be executed on their local workstation are particularly useful. Examples of these methods are the analysis of the ID3-tags or the search for special patterns in the media file. Persons who distribute illegal MP3 files on a semi-professional basis often mention in the ID3-tags that they have provided a file. Information like this can hint to an illegal source. Some vendors might include additional information, for example, iTunes inserts the customer's e-mail address into media files bought in the iTunes store.

Finally, online verification services (which are not available to date) could be of help by checking the media files' origin. These services can use black and white listings of the characteristic hash values. The user can send the hash value of a media file to a web service anonymously, which will answer with the source if it is known. A prototype of such web service is being built at the university of Koblenz-Landau as part of our research work.

Other methods like checking digital watermarks can lead to privacy problems and will probably depend on the cooperation of the respective vendors. For further information refer to [6].

The second question is a legal problem. The easiest solution for this problem is if the rights are defined by the publisher, as is the case with Creative Commons. Creative Commons has no direct binding of rights to a special asset. This gap will be solved in a future project. Another case where the issuer can directly define rights for their media files is webshops. Since it would actually give their customers an incentive to behave legally, webshops should provide licenses for the media files they sell. These licenses could be used as receipts as well. Refer to section 5.2 below for further information regarding this point.

If licenses are not defined by the issuer, the rights definition can be derived from copyright law or from the terms and conditions of the vendor. The exact definition should be verified by legal professionals.

5.2. Digital Signature for shops

To date, webshops that sell audio files do not always make it clear to their customers what they are allowed to do with their purchased goods. Some DRMS enforce usage rules (which are often stricter than the customers' actual rights). This could be regarded as a (potentially unwanted) method to make usage rights more or less explicit. In the case of unprotected audio files, however, users have no such "help".

In the future, webshops could provide their customers with additional license files for each audio file they buy. Considering the simple structure of license files, they could easily be assembled at the moment of purchase. Furthermore, if webshops create digital signatures for these licenses, customers will have undeniable proofs for the legal source of their bought files. The advantage for customers is obvious: if they are accused of owning illegal audio files, they can easily prove that their files were bought legally.

On the vendor's side, some obstacles have to be overcome: commonly accepted PKI certificates are needed for creating digital signatures, which means that the vendor must either operate their own PKI or buy certificates from a well-known PKI provider. Considering that webshops already pay providers for web server certificates, the latter could be realized with manageable cost. Moreover, vendors must be willing to make their customers' rights explicit: for instance, in order to conform to what is currently applied German law, a license should allow the customer to give copies of the purchased file to up to three friends.

5.3. License-aware P2P-Client

Most present-day P2P file sharing systems provide only the technical basis for file sharing. They can be used for legal as well as illegal purposes, but they are hardly ever aware of the legal status of the files being shared. In the end, it is up to the user to decide if their up- and downloads are actually legal.

A P2P client that supports URM could offer new possibilities: if every file in a user's collection has a corresponding license, the client can easily find out which files may be shared legally, for example self-made songs by the user or songs under a Creative Commons license. The client will then only offer these files to other users. Likewise, when the user wants to download files from other license aware P2P clients, their client can check beforehand what rights are associated with which files. When downloading them, the licenses are obtained, too, so the user does not have to create a new one.

5.4.   Other digital media types

While our momentary software implementation focuses on MP3 audio files, the concept of URM can also be used for other media types. As far as user rights are concerned, video files have features that are very similar to audio files.

Software makes up for yet another media type: in principle, the URM infrastructure can deal with software rights just like it deals with music rights. In practice, software licenses are more complicated than music file licenses: often, complex texts explicitly state what users are allowed to do with the software, and these licenses can vary immensely from product to product. Finding common software license conditions, including them in ODRL license files and visualizing them in a way that is easily understandable for users are subjects of further research.

6. Conclusion and Outlook

The concept of URM was first presented to the public at the CeBit 2009 in Hannover, Germany. The discussion with users and vendors of virtual goods pointed to the fact that strong copy protection mechanisms have failed for digital audio files. It also supported our thesis that users have a lack of information concerning what they are allowed to do with their audio files. URM is a good mechanism to close this gap. If users know the rights associated with their files, they have the chance to exercise these rights without being afraid of behaving illegally. "Soft" mechanisms of DRM like pricing, incentives and determent (in contrast to "hard" copy protection mechanisms) are promising to rule the digital audio market in the future.

The next steps of URM will be the explicit definition of rights for different data sources by legal professionals and the integration of further components, like the support of file sharing clients, digital signatures and a rights verification services. Other fields of interest are the interplay of URM with rights enforcement, the development of rights detection services, and the extension to more media types, particularly to software usage rights.

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