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Digital Rights Management

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12.1 Introduction
Digital Rights Management, or DRM for short, is a much-discussed topic nowadays. The main reason for this is that DRM technology is often mentioned in the context of protection of digital audio and video content, for example to avoid large scale copying of CDs and DVDs via peer-to-peer networks in the Internet. However, DRM technology is much more than a simple copy protection technology. It is one of the enabling technologies that open the way to secure distribution and exchange of digital content over open digital infrastructures such as the Internet.

In order to show how DRM addresses this challenge, we will discuss what DRM technology actually is. There are two main lines of DRM technology based on two different approaches to the problem. The first approach is preventive, while the second approach is reactive.

12.1.1 Preventive DRM Technology
Preventive DRM technology aims at preventing behavior that violates the regulations. The technology is based on encryption of the content. The encrypted content can only be accessed through an encryption key. The use of this key is regulated by so called usage rights. A typical electronic distribution system consists of a client-server system. At the server side the content is encrypted and sent to the client. The client needs to be in possession of both the key and the usage right to access the content. The DRM software that runs on the client checks that this is the case. The key and usage right together are typically contained in a data object that we call license. More details and examples can be found in the section on DRM architecture and the case.

12.1.2 Reactive DRM Technology
Reactive DRM technology aims at tracing of behavior that violates the regulations. The approach is also called forensic tracking. The technique that is commonly used is that of embedding information in the content itself that
allows tracing the origin of the content. The main technology that is exploited in this context is that of watermarking. Watermarking allows inserting information in music or movies in such a way that consumers do not perceive any difference from the original. It is very difficult to remove or detect a watermark when the characteristics of the watermark are not known. A typical reactive DRM system consists of a server that inserts the watermark containing information on the client at the moment a client downloads content. Violations can be detected by using a watermark detector. Such a detector may, for example, be used to monitor content distribution in the network. If, for example, a usage rule does not allow a client to redistribute the content and the content is nevertheless spotted in the distribution network, the watermark can be used to trace the client that originally downloaded the content.

12.1.3 Relation to Other Chapters
This chapter discusses the protection of multimedia data using DRM. It also positions DRM in the Multimedia Information Retrieval System architecture presented in Chapter 1. In this extended architecture both the content server and the client are extended with DRM functionality. DRM introduces the concept of licenses, which may be regarded as metadata. The concept of metadata is introduced in Chapter 2, which provides an overarching framework to ensure interoperability of digital multimedia objects, including protection and management of rights.

12.1.4 Outline
In the remainder of this paper we concentrate on preventive DRM systems. The next section discusses the context in which DRM operates such as the legal framework and the applications areas for DRM. Section 12.3 describes the general DRM architectural principles. Section 12.4 discusses a case to highlight a number of technical aspects relating to DRM. As an example the Personal Entertainment Domain (PED) DRM concept is chosen. We focus on the person-based and domain-based aspects of PED-DRM. We conclude with further reading and a summary.

12.2 DRM Context and Application Areas
12.2.1 DRM and the Legal Framework
It is important to note that DRM is more than technology alone. DRM technology functions in the context of a legal framework that outlines the regulations that DRM technology supports to enforce. Examples of such legal frameworks are copyright laws, privacy laws and antitrust laws.

Copyright law differs per jurisdiction although mostly the same principles are present. The background of these principles can be found in an international treaty called the Berne Convention for the Protection of Literary and