Chapter VIII

A P2P Based Secure Digital Music Distribution Channel: The Next Generation

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ABSTRACT

This chapter presents a conceptual framework enabling content providers to successfully sell digital music. We show that content providers must overcome three main hurdles to successfully sell digital music. The first is to establish an efficient and economically viable distribution channel. Second, they need to develop a secure and interoperable framework for protecting copyrighted digital music from piracy by integrating digital rights management systems into the distribution channel. The third hurdle is to set-up a robust payment mechanism that meets the content providers’ needs for revenue capturing and the consumers’ needs for hassle-free and legal content acquisition and usage. This chapter finally presents a conceptual framework for the next generation of digital music distribution which could address and overcome the three hurdles. We conclude that a DRM supported P2P network gives content providers as well as consumers the secure, legal and most cost-efficient and user friendly digital distribution channel they have been searching for.

INTRODUCTION

Over the last few years, technology advances such as IP-Networks, CD-R(w) and the development of compression formats such as MP3 have enabled individuals to easily copy and distribute digital music on a mass scale. These technologies have significantly impacted the businesses of content providers, especially the music industry. The result has been the desegregation of the value chain, an increasing digitisation of content, and a faster, simpler, and cheaper distribution channel. These technologies, and resulting trends, are a double-edge sword to content providers. On the one hand, they provide enormous opportunities, such as access to new markets, direct distribution to consumers, and opportunities for new products and business models like pay-per-listen and superdistribution. On the other hand, they provide enormous threats of increasing piracy.
and the unlawful storage, usage, manipulation, and sharing of billions of pieces of intellectual property (IP) content. This has become worse with the emergence of decentralized peer-to-peer (P2P) networks. In that respect, content providers must carefully choose how to deliver their digital content to their consumers by simultaneously enabling copyright protection on one hand and the sales on the other hand throughout the life cycle of their product.

The aim of this chapter is to show that there are three main hurdles content providers must overcome to conduct business with digital music. The first is establishing an efficient and economically viable distribution channel. So far, most legal music downloads are based on centralized systems such as client-server based models. However, most users today use decentralized systems to access and download music files such as peer-to-peer networks. Despite the fact that sharing of copyrighted content on those networks is illegal, they have found widespread usage. This chapter compares the two distribution systems along various dimensions such as cost of ownership, scalability, performance, security, quality of services/control, and concludes that decentralized systems have many advantages over centralized ones, where the main weakness is security and control.

The second hurdle to overcome is to develop a secure and interoperable framework for protecting copyrighted digital music from piracy. The emergence of Digital Rights Management Systems (DRM) enables content providers to control the access and usage of their digital content. This chapter outlines the key components of a DRM, the core entities involved, discusses the pros and cons of DRM, and concludes that DRM has the potential to overcome some of the weaknesses of decentralized distribution systems by offering additional and augmenting functionalities for security and control.

The third hurdle is to establish a robust payment mechanism that meets the content providers’ needs for revenue capturing and the consumers’ needs for hassle-free and legal content acquisition and use.

Finally, this chapter presents a DRM supported peer-to-peer network which could address and overcome the three hurdles mentioned previously. It presents a framework, which is different to the existing ones by outlining and describing in detail the key components needed such as the log server, the index server, the licensing server with key management, and rights management functions. Furthermore, we discuss the various technological, business, and legal mechanisms to overcome like fault tolerance, free riding behavior, denial of service attack, access control, and usage tracking. We conclude that integrating DRM into a P2P network gives content providers the secure, legal and most cost-efficient and user-friendly digital distribution channel they have been searching for.

THE FIRST Hurdle:
DIGITAL DISTRIBUTION

Choice Between Client-Server and Peer-to-Peer

Computer systems can be classified into two groups: centralized or stand-alone systems, and distributed or network systems. This chapter defines a digital content distribution system as a distributed computer system enabling the delivery or exchange of digital content from one computer to another. Figure 1, adapted from Milojicic et al. (2002), provides a good classification of computer systems with respect to digital content distribution systems.

Distributed systems consist of different components located at networked computers, which communicate, collaborate, and coordinate actions such as sharing resources or content. There are many examples of distributed systems (Nelson, 2002) at various scales such as LAN, Intranet,
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