From OPIMA to MPEG IPMP-X: A standard's history across R&D projects

Carlos Serrão[a],*, José Miguel Salles Dias[a], Panos Kudumakis[b,1]

[a]*ADETTI/ISCTE, Associação para o Desenvolvimento das Telecomunicações e Técnicas de Informática, Edifício ISCTE, 1600-082 Lisboa, Portugal*
[b]*inAccess Networks S.A., 95A Pentelis Av., GR 152 34 Halandri, Athens, Greece*

Abstract

This paper describes the work performed by a number of companies and universities who have been working as a consortium under the umbrella of the European Union Framework Programme 5 (FP5), Information Society Technologies (IST) research program, in order to provide a set of Digital Rights Management (DRM) technologies and architectures, aiming at helping to reduce the copyright circumvention risks, that have been threatening the music and film industries in their transition from the "analogue" to "digital" age. The paper starts by addressing some of the earlier standardization efforts in the DRM arena, namely, Open Platform Initiative for Multimedia Access (OPIMA). One of the described FP5 IST projects, Open Components for Controlled Access to Multimedia Material (OCCAMM), has developed the OPIMA vision. The paper addresses also the Motion Pictures Expert Group—MPEG DRM work, starting from the MPEG Intellectual Propriety Management and Protection—IPMP "Hooks", towards the MPEG IPMP Extensions, which has originated the first DRM-related standard (MPEG-4 Part 13, called IPMP Extensions or IPMP-X) ever released by ISO up to the present days.[2] The paper clarifies how the FP5 IST project MPEG Open Security for Embedded Systems (MOSES), has extended the OPIMA interfaces and architecture to achieve compliance with the MPEG IPMP-X standard, and how it has contributed to the achievement of "consensus" and to the specification, implementation (Reference Software) and validation (Conformance Testing) of the MPEG IPMP-X standard.
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*Corresponding author.
  E-mail addresses: Carlos.Serrao@adetti.iscte.pt, carlos.serrao@iscte.pt (C. Serrão), Miguel.Dias@adetti.iscte.pt (J.M.S. Dias), panos@ieee.org (P. Kudumakis).
  URL: http://www.adetti.pt.

[1]Panos Kudumakis from 1998 to 2004 was with Scipher-Central Research Laboratories (former EMI), Dawley Road, Hayes, Middlesex, UB3 1HH, UK.
[2]MPEG IPMP-X was released in 2003 and is currently the single ISO standard in the DRM arena.

1. Introduction

While digital technology has enabled new and more flexible means to create, exchange, store and consume multimedia content, when compared to the "analogue era", it has eliminated many of the barriers which have been implicitly granting value to the content, allowing, e.g. an easy sharing of digital material over networks with no loss of quality even after an unlimited number of copies. In this context, the modern content distribution business models such as the Internet download and super-distribution (through Peer to Peer—P2P networks), have proven to have considerable flaws and drawbacks. This has led to the need of reassessing and modifying, traditional approaches of content protection. This change in the value chain has affected mostly the music and film industries. Mass storage and copy systems have become cheaper, Internet bandwidth at the final user home has increased, as prices for maintaining it have fallen, and the content compression technologies have evolved in such a way, that it has created an increased interest for potential illegal use.

Currently, the content industry is trying to identify illegal copiers who are using file sharing systems. Internet providers are forced by court to open their user logs and allow externals to prosecute their illegal users. On the one hand, the principle of anonymity and the protection of personal information have become highly questionable. On the other hand, this approach will have difficulty in coping with the complete number of illegal distributions, since the number of users that are taking part in these systems (in the order of millions and growing on a daily basis [16,17]) are diminishing the probability of being caught and consequently the prevention of illegal media distribution. Other approaches must be found. These can only work by controlling either the distribution of the content via trusted channels or the protection of the content with access control, or the combination of both.

This paper provides both an overview of the development of new standards (from ISO and other bodies) and technologies which deploy a comprehensive framework for dealing with digital copyright protection and intellectual propriety rights as well as the description and achieved results of two EU Information Society Technologies (IST) RTD projects (Open Components for Controlled Access to Multimedia Material (OC-CAMM) [45] and MPEG Open Security for Embedded Systems (MOSES) [41]), that have addressed the implementation, benchmark and evaluation of such technologies and standards. This set of Digital Rights Management (DRM) technologies are currently enjoying world-wide support not only because they have been approved as International Standards (ISO/IEC JTC1/SC 29/ WG11 14496-13 (MPEG-4) [27] and 13818-11 MPEG (MPEG-2) [20]), but also due to the fact that they provide the means for achieving interoperability among different manufacturers of devices, independently of the way that content is protected. The paper is organized as follows: First, a definition of DRM is given, which has the agreement of the Networked Audio–Visual Systems and Home Platforms projects of the Sixth Framework Programme of the European Union. Afterwards, the OPIMA initiative [48] is introduced, where most of the concepts currently supported by the Intellectual Propriety Management and Protection (IPMP)-X standard were originated. The IST project OCCAMM, which implemented for the first time the OPIMA vision, is then described, focusing in the developed architecture and achieved results. The MPEG community own efforts of creating a DRM-related standard are then introduced, starting from the IPMP "Hooks", that evolved into the current MPEG IPMP-X ISO standard, which is also described in a concise way. The Framework Programme 5 (FP5) MOSES RTD project is then introduced, since it aimed at extending the OPIMA implementation (from IST OCCAMM) to achieve compliance with MPEG IPMP-X and, at the same time, to contribute to the development of this ISO standard. This was achieved with success and two of the technological results, that have integrated with the MOSES MPEG IPMP-X implementation, are then described, namely the open-source DRM platform, referred to as OpenSDRM—Open Secure Digital Rights Management and Music-4You, a digital music B2C