

Proposed Open Source Model for Video Offline Distribution using Cinema DRM for Home Users

Sunil Pardeshi¹, Soon Chul Kwon², Seung Hyun Lee², and Alaric Hamacher^{2*}

¹*Department of Plasmabiodisplay, Kwangwoon University, Korea*
sunil@datacops.in

^{2*}*Graduate School of Information Contents, Kwangwoon University, Korea*
{ksc0226, shlee}@kw.ac.kr, alaric.hamacher@virtual-experience.de

Abstract

Video Content owners seek to squeeze the maximum amount of revenue from their assets via distribution into more territories. Digital Cinema Package(DCP), trusted solution to distribute protected content to theaters, caters to relatively small user base, which limits revenue. With the growth of the Internet & other digital media, the economics of media content has changed dramatically. Security remains main concern to deliver content to millions of consumers using intelligent digital display devices like Tablets, Smartphones, Smart TVs, Desktop & Laptop. By making the video content available to this segment securely, content owners will benefit from increased revenue. Through this paper we propose Open Source HomeDCP model to distribute the content to home users for offline viewing. We propose to include other open source CODEC than JPEG2000/MPEG2, which are specifically designed for theatrical performance. Final image size will be further reduced considering the display device resolution where video will be finally played. Key Delivery Message(KDM) system to be altered to suit new devices. This will be a big boost to Content Economy as content owners would be able to distribute the content securely to the wider audience & ensure more revenue.

Keywords: *Digital Cinema Package(DCP), Digital Rights Management(DRM), Interoperable Media Format(IMF), Cinema DRM, Off line distribution, Home Video, Piracy*

1. Introduction

The ability to enable content access anytime, anywhere, from any device is a crucial success factor for any digital content service. In order to meet these consumer demands and achieve success in emerging digital markets, content owners must be able to provide a variety of purchasing and consumption models. The foundation behind any flexible pricing and licensing plan is content security. Digital Transmission Content Protection-IP(DTCP-IP) and High-bandwidth Digital Content Protection(HDCP) are two of the most widely adopted methods of protecting digital content on home and personal networks including devices such as, PCs, tablets, smartphones & smart TV[1]. Scope of our paper is limited to making the Digital Video Content available to consumer offline, limited internet access would be essential to validate the security keys and delivery of KDM.

2. DCP(Digital Cinema Package) Concept

DCP was launched in 2002, as a digital distribution format and to protect the movies from unauthorized copying from the Cinema Theaters. DCI initiative is quite successful in movie industry. It is being used & supported by most studios, theater equipment makers worldwide. This successful model only caters to cinema theater like infrastructure. Content owner would like to maximize his revenue by distributing the content to wider audience with certain level of security.

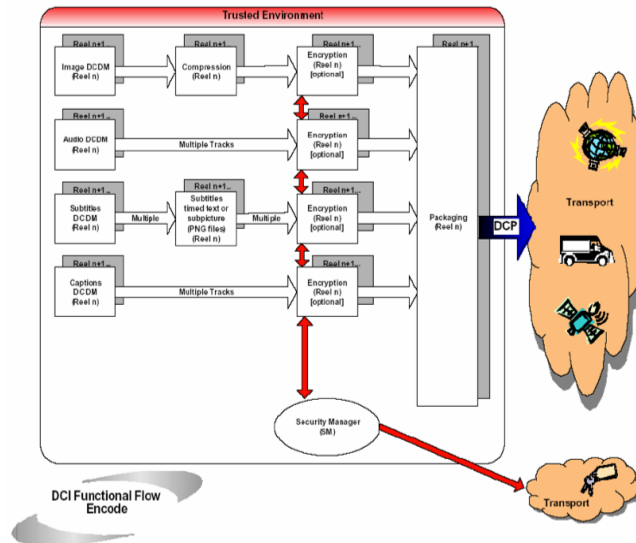


Figure 1. Trusted Environment (DCP Functional Flow Encode) [2]

As shown in the Figure 1, the current DCP system has following main components:

1. Digital Cinema Distribution Master(DCDM) – Contains system requirements regarding the uncompressed, unencrypted file or set of files containing the content and its associated data. This includes Images, Audio, Subtitle, Captions DCDM.
2. Compression – Contains system requirements regarding the process that reduces redundancy in source essence data and its inverse, decompression,
3. Packaging – Contains system requirements for the process of encryption and decryption of compressed image and audio essence, wrapping and unwrapping of compressed and encrypted files for distribution and playback.
4. Transport – Contains requirements related to the distribution of the packaged media. Since the final image size is so big, mostly HDD media or satellite downloading is preferred.

3. Proposed Open Source Model for Home DCP

There would certain changed to suit the home users, which needs to be modified from the DCP functional framework. DCPs are now designed to play back on standardized Digital Cinema Projectors, a special step needs to be made in the mastering process[3][4]. The encoding of the JPEG 2000 usually is made in XYZ Color Space with a Gamma of 2.6. These settings do not correspond to most of the home equipment, monitors and Televisions. The content therefore needs to be encoded in a colorspace REC709. Alternatively the player has to perform a live conversion the appropriate colorspace of the users viewing devices.

The low quality of JPEG 2000 falls behind the consumer expectation, since commercial distribution codecs like H264 and H265 as well as free codecs like VP8 and VP9[5][6] offer better subjective image quality and achieve more efficient encoding than JPEG 2000. The other challenge is the playback on the

consumer side. While most consumer codecs are adapted to work with low to medium power CPUs, most of the Computer Infrastructure at home, as well as on mobile devices is likely not be able to play back movies encoded with JPEG 2000.

Among this main considerations would be:

1. Open Source Light CODEC(VP8&VP9) – to support device level hardware & better video quality.
2. Provision to use different open source codecs.
3. Key Delivery Mechanism (KDM) – Email ID & Device ID combination.
4. HomeDCP Player supporting playback on intelligent digital display devices.
5. Managing all purchases by user.
6. Enabling payment system through HomeDCP Player which can be provided by any payment gateway.

As this system is designed for end users, expected display devices at this end would be: Desktop Computer, Laptop, Tablet, Smartphones, Smart TV- All devices will have some Operating System(OS). The Proposed system components, will be same as in DCP workflow, except few changes to suit the end user environment.

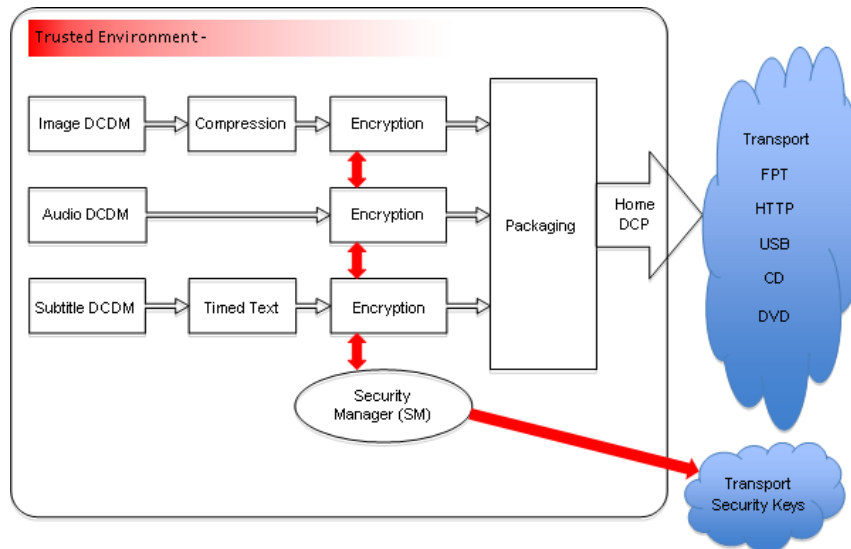


Figure 2. Content Development & Encryption, Transport Block

As shown in Figure 2, Content Development & Encryption, Transport block, will include, Image, Audio & Subtitle DCDM which will be compressed & encrypted with 32-digit security key. Security key management, where the User will receive Signed HomeDCP images, User can request for Decryption key from the Server, which is identified by the Security Manager. Decryption Keys can be received via email, Online Server. This module will be implemented in Security Manager. This will be linked to Payment module as well. This is not part of this specification; it can be implemented through player software.

1. Content Development & Encryption:

Once Video Contents are developed (up to DCDM stage), using Open Source software similar to OpenDCP or DCP-O-Matic, can be used to encrypt the data & make a final signed package available for distribution.

2. Content Distribution (Transport):

Protected Image will be made available to end users using different methods, most common would be HTTP download, FTP download, where internet download is possible. Physical media distribution includes USB/ DVD / CD – where Internet speed is not suitable for downloading. Security Key can be transported through email or if user has low speed internet connection can be retrieved from the authentication server online.

3. Content Projection & Security:

As shown in Figure 3, Secured Media block will receive the HomeDCP image, with Security Keys. HomeDCP Player will decrypt the images, open all the assets in secured environment, with forensic marking same will be send to video display

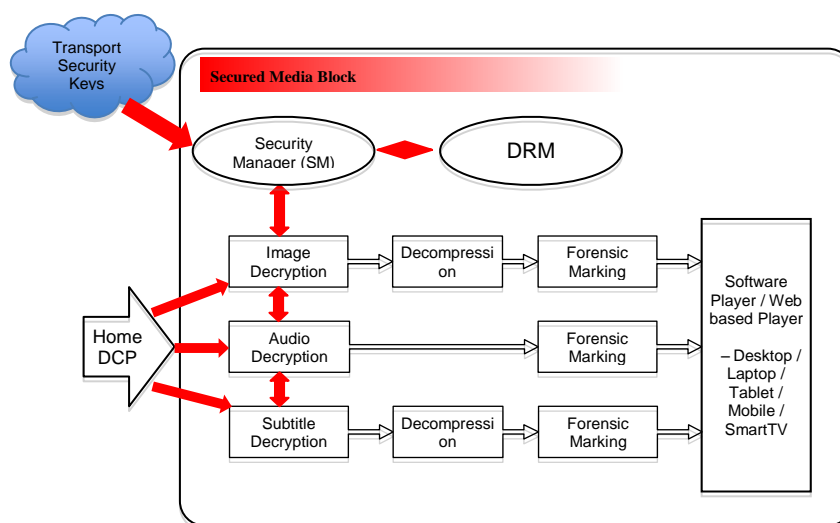


Figure 3. Content Projection & Security Block

5. Conclusion

By proposing HomeDCP solution, we plan to bring the most trusted industry level solution, DCP for – digital video content protection. Any video content can be easily protected using open source tools & made available for offline viewing to millions of user with strong security. Use of new codec will reduce size of final image with improved video quality. Final Image size will be dependent on display device resolution. Video Player software can maintain complete inventory of the HomeDCP images, with their valid decryption keys. This Key management can be hosted on cloud. This will give complete flexibility to the user to view the purchased video from anywhere. Users email id can be used as unique identifier. As one customer owns various devices like, Desktop, Laptop, Tablet, Smartphone, he/she can pay only once for the HomeDCP image but can viewed on various device owned by limit. Projection software (Viewer Player Software) will be able to play various Audio tracks as well subtitles provided by the content developer. Video content developers (Education, Training) will be able to have more control over the distribution of their contents and can develop a business model generating revenues while taking advantage of an open source DRM system.

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