The Web and Digital Rights Management

Enhanced content protection, the technical solution to the Web-DRM paradox and the disruptive implications

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The Web and Digital Rights Management

- DRM, commercial media and the Internet
- DRM interoperable media encoding
- Cross-platform enhanced content protection web applications
- Implications for commercial media and the Web
DRM, Commercial Media and the Internet

The paradox of commerce on the Web, facts and misconceptions about DRM and the recent arrival of a solution.
“The development of the Internet has ... created significant challenges to any distribution model which depends on scarcity...

The application of technology to this problem must ... establish a point of scarcity on behalf of the rights holder.

However, this raises a fundamental paradox ... the business of publishers lies in providing access rather than in preventing it.

Nevertheless, unless copyright is to be abandoned as a mechanism for trading in intellectual property entirely, it will be essential to find an answer to this paradox.”

"Digital files cannot be made uncopyable, any more than water can be made not wet." Bruce Schneier, May 2001

“We have Ph.D.'s here that know the stuff cold, and we don't believe it's possible to protect digital content.” Steve Jobs, December 2003

“If we’re still talking about DRM in five years, please take me out and shoot me.” eMusic CEO David Pakman, February 2007

“This is unethical.” Ian Hickson, HTML5 editor, upon learning of the Netflix-Google-Microsoft Encrypted Media Extensions proposal - February 2012 (5 years later)
The fundamental Digital Rights Management problem derives from a lack of interoperability which prevents mobility of experience.

Web Video Ecosystem
- Encoding
- Encryption
- Rights Expression

Web Video App Framework
- Decoding
- Decryption
- Rights Management

The solution is to combine interoperable commercial web video content with a cross-platform web video app framework.

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DRM Interoperable Media Encoding

Making DRM content interoperable while making Web applications DRM agnostic.
Digital Rights Management requires that DRM clients are managed by a DRM cloud service.

Unless there is one such cloud service for the entire world wide web, interop requires a way for multiple cloud services to manage the same content.

Interoperability on the content side was made possible by the 2012 ISO MPEG Common Encryption specification, which standardizes encryption and multi-DRM signaling.

This common encryption standard was introduced with a companion ISO MPEG spec - Dynamic Adaptive Streaming over HTTP (DASH).
Cross-platform Enhanced Content protection web applications

Enhanced content protection requirements push the DRM into the trusted platform. An open interface to enable open source browsers to access platform DRM. Hosted native apps based on EME/MSE complete the picture for a cross-platform Web video application framework.
Cross-platform commercial video apps are enabled by the Encrypted Media Extensions and Media Source Extensions to HTML5.

The Media Source Extensions are the W3C HTML5 application correlate to the MPEG DASH media presentation specification.

The Encrypted Media Extensions are the W3C HTML5 application correlate to the MPEG CENC multi-DRM specification and work with DASH.

Combined these four specifications enable interoperability and the mobility of experience for commercial video distributed over the Internet.
The Web, EME and Enhanced Content Protection

The HTML/JS app selects the DRM and controls key exchange between DRM client and server.

Browser extends HTML5 media element to allow JavaScript handled key acquisition.

A CDM exposes a key system to JavaScript. It is transparent whether the CDM is in the browser.

Contrary to a common misconception, with EME DRM functionality is not in the HTML/JS app. There is no DRM in HTML5 with EME, and ECP requires that this be the case.
The Web, EME and Enhanced Content Protection

The HTML/JS app is portable but not trusted by the cloud DRM service.

The browser can be cross-platform if the interface to the platform DRM is open.

The portion of the CDM in the browser cannot be trusted. The real CDM should be in the TEE.

The DRM must be trusted and run in the TEE.

As a result, ECP requirements segregate the HTML/JS app and browser from the DRM – enabling the app to be more portable.
Enabling Open Source Interop with Platform DRM

Open Source Browser

HTML/JavaScript Application

| Browser | CDM | MediaKeys | MediaKeySession |

Platform-specific Remote Procedure Call (RPC) Mechanism
Microsoft published open interface specification

AuthN

| Media Engine | CDMi | Cdm_MediaKeys | Cdm_MediaKeySession |

DRM Licensed Client

DRM Device Porting Kit
Enabling Open Source Interop with Platform DRM

**Platform-specific Remote Procedure Call (RPC) Mechanism**

**Microsoft published open interface specification**

**Open Source Browser**

- **HTML/JavaScript Application**
  - **Browser**: CDM
  - MediaKeys
  - MediaKeySession

**Platform-Specific interface**

**DRM Licensed Product**

- **Media Engine**
  - **AuthN**: CDMi
  - Cdm_MediaKeys
  - Cdm(MediaKeySession)

**DRM Device Porting Kit**

**Trusted Execution Environment**

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Works off the W3C Manifest for Web App specification

Builds Native hosted apps when possible, polyfill with Cordova when not.

Developers maintain the standard manifest, Manifoldjs builds the apps.

Updates to the web experience update in hosted web apps as well.

Support for Windows 10, iOS 8+, Android 4.1+, Windows 8.1, Chrome OS / Chrome Apps, Firefox OS 2.0, more coming soon...

A cross-platform framework of HTML-EME-MSE hosted apps targeting enhanced content protection platforms to consume DASH-CENC live and on-demand content is the logical replacement for cross-platform plugin frameworks like Silverlight & Flash.

Cross platform Web video app framework

Extends HTML/JavaScript to create hybrid apps, access to native device APIs through a polyfill, but all layout rendering done via web views.
Implications for Commercial Media and the Web

“In Technology, whatever can be done will be done”

“People in the trenches are usually in touch with impending changes early”

“You can be the subject of a strategic inflection point but you can also be the cause of one”

“The strategic inflection point is the time to wake up and listen”

— Andrew S. Grove, *Only the Paranoid Survive*

Changing technology and customer preferences are creating a new environment for accessing and delivering video content
Growth of IP Delivered Video

By 2018 video traffic will be 79% of all consumer IP traffic. Each second nearly a million minutes of video will cross IP networks.

It would take over 5 million years to watch the amount of video that will cross global IP networks each month in 2018.

Video-on-demand traffic will double by 2018. The amount of VOD traffic in 2018 will be equivalent to 6 billion DVDs per month.

– Cisco Visual Networking Index Forecast and Methodology, 2013-2018
Nearly three-fourths of the world’s mobile data traffic will be video by 2019, with mobile video increasing 13-fold between 2014 and 2019.

Mobile video traffic exceeded 50 percent of total mobile data traffic for the first time in 2012 and grew to 55 percent by end of 2014.

By 2020 total connected devices estimated to become 50 billion, with 15 billion video enabled.

— Cisco Visual Networking Index Forecast and Methodology, 2013-2018
Internet Inflection Point in 1989

- AT&T makes Unix TCP/IP code public domain
- ARPANET to TCP/IP
- Domain Name System
- NSFNET backbone
Web Inflection Point in 1993
Victorian futurists imagined that ‘wireless seeing’ with a ‘Telephotoscope’ would enable them to do familiar things in a new way. They could not envision television channels, networks, affiliates and commercial breaks.

We face a similar challenge seeing beyond our expectations to perceive the future of an Internet dominated by commercial video based on global standards delivered to billions of video-enabled devices.

Recent technical advances for Internet delivered on-demand and live commercial media constitute an innovation-driven inflection point for both commercial media and the Web.
Cable and Satellite content, most popular and limited in variety because broadcast is bandwidth constrained.

On demand content, less limited in variety, which can include original OTT programming, approaching long tail.

Long tail vertical niche content made practical by global Internet standards for commercial media which are cloud addressable objects.
Long Tail Commercial Video

Content Industry
- Legacy
- Mainstream
- OVD Original Content
- Niche Verticals

AuthZ Providers
- Cable/Sat/Telco
- Online Video Distributors
- Specialty providers

Devices
- Set top box
- Desktop
- Phone/Tablet Smart TV

Legacy Transition Future

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Promising Possibilities

- The demands for enhanced content protection coupled with merging global MPEG and W3C media standards constitute a disruptive innovation.
- An HTML/JS platform for commercial video apps and development methods like manifoldjs will lead to an explosion in long trail video services.
- Internet media will become more than an alternative pipe for delivering mainstream video content.
- Internet, broadcast, cable, satellite and telco video services will become relatively indistinguishable to consumers.
- Commercial video will transform the Internet and Internet delivered video will transform commercial video delivery.
Thank you

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