The Web Media Decade

Anticipating the Unexpected

Global standards have transformed video consumption. What might happen next?

John Simmons, Media Platform Architect, Microsoft
The Decade of Web Media

The decade-long effort to define global Web media standards provides a clue about the future.

What to Expect Next

The effort continues, not just improving the streaming experience, but also taking Web media portability closer to its eventual destination.

Anticipating the Unexpected

Global Web media portability is a disruptive development. Are we approaching an inflection point? What can other disruptive technologies tell us about the future?
The Web Media Decade

How a paradox raised in a 2003 United Nations report contributed to the development of commercial Web media portability.
In the Summer of 2007, while working on a paper on the future of DRM technologies, I came across a 2003 United Nations Report which described the following paradox:

“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.”

The application of technology must establish a point of scarcity on behalf of the rights holder while providing rather than preventing access.
If DRM-protected media was as portable as “in-the-clear” media, would that ‘application of technology’ solve the WIPO Paradox? And if so, how could this be done?
Microsoft 2007 CLEAR Proposal

Sept 2007
CLEAR proposal to address the WIPO PARADOX by making DRM-protected content nearly as portable as in-the-clear content.

Oct 2008
Based on the CLEAR proposal, the ATHENS project begins engaging standards organizations to adopt a DRM-interoperable container optimized for adaptive delivery along with a standard for adaptive delivery.

Jan 2009
To build support for common encryption, Microsoft proposed to the multi-DRM Digital Entertainment Content Ecosystem (DECE) that they adopt the DRM-interoperable ATHENS container for use in Ultraviolet.

June 2009
DECE adopts the ATHENS container format for use in Ultraviolet, requiring all DRMs to support what would later become the ISO/IEC Common Encryption specification.

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May 22, 2019
The ATHENS team planned a multi-layer standardization engagement strategy to make commercial Web media nearly as portable as “in-the-clear” content, with a plan to engage MPEG, 3GPP, W3C and IETF.

ATHENS began with the most difficult problem at that time - convincing DRM providers and device manufacturers to embrace DRM-interoperability.
At IBC
Microsoft releases specs for DRM-interoperable encoding of commercial video content

Feb 2011
(W3C) Web and TV Interest Group meeting at FOKUS which gave rise to EME/MSE

April 2014
(APPL, MSFT) Collaboration begins on the Common Media Application Format (CMAF)

Feb 2016
(MPEG) MSFT, APPL, Akamai, BBC, Cisco, Comcast, BAMTech, Turner & 9 other propose CMAF

Sept 2017
(W3C) EME is a published Recommendation

March 2010
(MPEG) call for proposal to standardize adaptive streaming

(W3C) EME and MSE proposed

(WAVE) The CTA Web Application Video Ecosystem project created

Nov 2016
(W3C) MSE is a published Recommendation

Dec 2018
(WAVE) Content Specification of CMAF Media Profiles published

(MPEG) DASH and Common Encryption published

(WAVE) Content Specification of CMAF Media Profiles published

(MPEG) CMAF becomes a published ISO/IEC specification

(WAVE) publishes Device Playback Capabilities spec

Milestones for Web Media Portability

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<table>
<thead>
<tr>
<th>Feature</th>
<th>Recommendation</th>
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<tbody>
<tr>
<td>Cross-platform Progressive Web Apps (PWAs)</td>
<td>Web Workers and Web App Manifest – W3C &amp; WHATWG</td>
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<tr>
<td>JavaScript control of adaptive streaming</td>
<td>HTML5 Media Source Extensions (MSE) – W3C</td>
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<tr>
<td>JavaScript interaction with DRM</td>
<td>HTML5 Encrypted Media Extensions (EME) – W3C</td>
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<td>Industry standard manifest (m3u8)</td>
<td>HTTP Live Streaming (HLS) - Apple published in IETF</td>
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<tr>
<td>Industry standard manifest (mpd)</td>
<td>Dynamic Adaptive Streaming over HTTP - ISO MPEG DASH</td>
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<tr>
<td>Manifest independent live-linear and on-demand encoding</td>
<td>Common Media Application Format – ISO MPEG CMAF</td>
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<tr>
<td>DRM-Interop encode/decode</td>
<td>Common Encryption for fragmented MP4 - ISO MPEG CENC</td>
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**Web App Manifest**, W3C Working Draft 08 May 2018, [www.w3.org/TR/appmanifest/](http://www.w3.org/TR/appmanifest/)

**Media Source Extensions**, W3C Recommendation 17 November 2016, [http://www.w3.org/TR/media-source/](http://www.w3.org/TR/media-source/)

**Encrypted Media Extensions**, W3C Recommendation 18 September 2017, [http://www.w3.org/TR/encrypted-media/](http://www.w3.org/TR/encrypted-media/)


What to Expect Next

A brief survey of some important work, categorized in a way which may suggest what the future will bring.
This work provides important improvements but will impact the future in a predictable way except *

The improvement of Web Media portability is a disruptive technological development.
Anticipating the Unexpected

Web Media Portability is disruptive. What can Internet/Web history suggest about the future? Will cord cobbling be replaced by super aggregators? Or by something else, something unexpected?

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Anticipating the Unexpected

WEB MEDIA PORTABILITY

- A key goal of the Web Media Decade was making commercial media content portable across devices on the Web.
- Much of that work is complete, but more work remains, and as a result we have yet to see the full disruptive impact of commercial media portability.

DISRUPTIVE TECHNOLOGY

- What is a disruptive technology?
- Have we seen something similar before and what might it tell us about the future of Web media?
“The strategic inflection point is the time to wake up and listen”

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

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

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

— Andrew S. Grove, Only the Paranoid Survive

The Web Media Portability inflection point has features in common with both the Internet & World Wide Web inflection points.
AT&T makes Unix TCP/IP code public domain

- ARPANET to TCP/IP
- Domain Name System
- NSFNET backbone

Internet Inflection Point in 1989

Global Web Media Portability Inflection Point

1993

Hypertext Transport Protocol (HTTP) + Hypertext Markup Language (HTML) + Portable Browser (Mosaic) = Portability of Internet Experience (Web)

2020

Common Media Application Format (CMAF) + Dynamic Adaptive Streaming over HTTP (DASH) + HTML Media Extensions (EME, MSE) + Progressive Web Apps (PWAs) = Portability of Web Media Experience

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Traditional Media

- Closed ecosystem
- Regional
- Device component requirements
- Device interaction defined
- Value chain is narrow at the top
- Curated content
- Single Authorization Provider

Web Media

- Open ecosystem
- Global
- Device feature detection
- Device interaction enabled
- Value chain is wide at the top
- Content discovery
- Multiple Authorization Providers
TODAY

Traditional Media MVPDs provide curated content combining playback and discovery in a single framework and a single authorization credential. **A traditional walled garden.**

Cobbled OTT services provides curated content without a common playback and discover framework and requiring multiple authorization credentials. **Lots of small walled gardens.**

The FUTURE?

Traditional Media vMVPDs and OTT aggregators provide curated content combining playback and discovery in a single app framework with a single authorization credential. **A very large walled garden with tenant farmers.**

Cloud services which combine playback and discovery in a single app framework with cloud-stored, AuthN-linked, AuthZ tokens. **A personalized Web Media browser.**
Three Tiers of Commercial Web Media

**Tier-1 mainstream**: linear content from cable/satellite/telco, most popular and limited in variety because linear is bandwidth constrained.

**Tier-2 direct-to-consumer**: Tier-1 channels or channel programs going direct to consumer. Inherit interop challenge.

**Tier-3 Long tail**: vertical niche content made practical by global Internet standards for commercial media which are cloud addressable objects. “Farm league” for linear content.
The Decade of Web Media

Making Web Media nearly as portable as “in-the-clear” media was an unstated goal of the decade of Global Web Media Standardization.

What to Expect Next

Efforts underway to meet that portability goal can have a disruptive impact on commercial video consumption.

Anticipating the Unexpected

OTT DTC providers and vMVPD channel aggregators may be disrupted by the growth of long tail commercial content, making way for personalized Web Media browsers.

Concluding Thoughts

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Thank You