Interoperability and the Large-scale Growth of Broadband Video

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Muriel Deschanel (Standards Program Manager) and John Simmons (Media Platform Architect) from Microsoft Corporation would like to participate in the upcoming W3C Web and TV workshop and present the position paper below. John Simmons will be the presenter.

Abstract

The explosive growth of broadband video and Internet-enabled embedded devices is transforming the Internet. There is a need to define cross-platform, broadband video standards, supporting adaptive HTTP streaming, common encryption and DRM-interoperability, and support for these new standards should find expression in HTML5.

The Video Transformation of the Internet

We are witnessing the explosive growth of broadband video consumption, and this growth is transforming the Internet.

Broadband video as percentage of Internet traffic

Cisco has reported that by 2014, the sum of all forms of video (TV, video on demand, Internet video, and peer-to-peer) will exceed 91 percent of global consumer traffic and that for the first time in the last 10 years, peer-to-peer traffic will not be the largest Internet traffic type, surpassed by Internet video.

When Wired magazine published “The Web is Dead. Long Live the Internet”, they included a Cisco fill-diagram showing the proportion of total United States Internet traffic by category from 1990 to 2010. The article’s conclusions about the web are dubious, but the chart is accurate and illustrative of the impact broadband video consumption is having on the Internet (see figure 1).

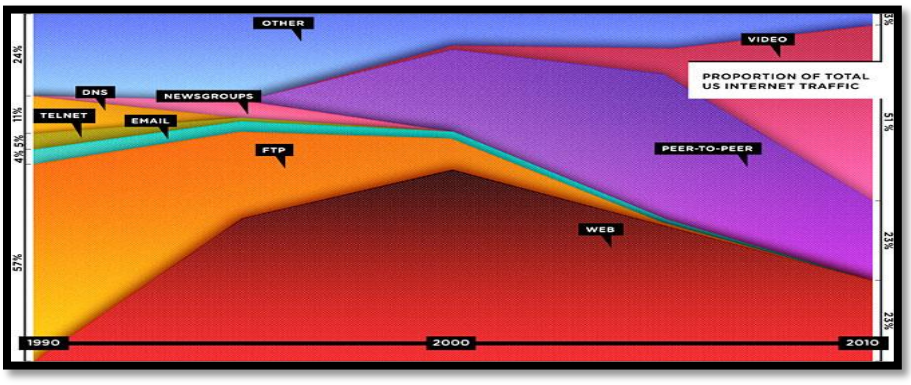

Figure 1 Proportional Representation of total US Internet Traffic, 1990-2010

Broadband video and primetime television

Consumer patterns of broadband video consumption are converging with that of traditional broadcast television consumption. Sandvine has reported that:

> *"...Netflix represents more than 20% of downstream Internet traffic during peak times in the U.S. -- and is heaviest in the primetime hours of 8 to 10 p.m."*

Broadband video and mobile devices

Figure 2 is from a Cisco report, showing that by 2014, smartphones and portables will account for 91 percent of all mobile data traffic, and video will account for 66 percent of that traffic.

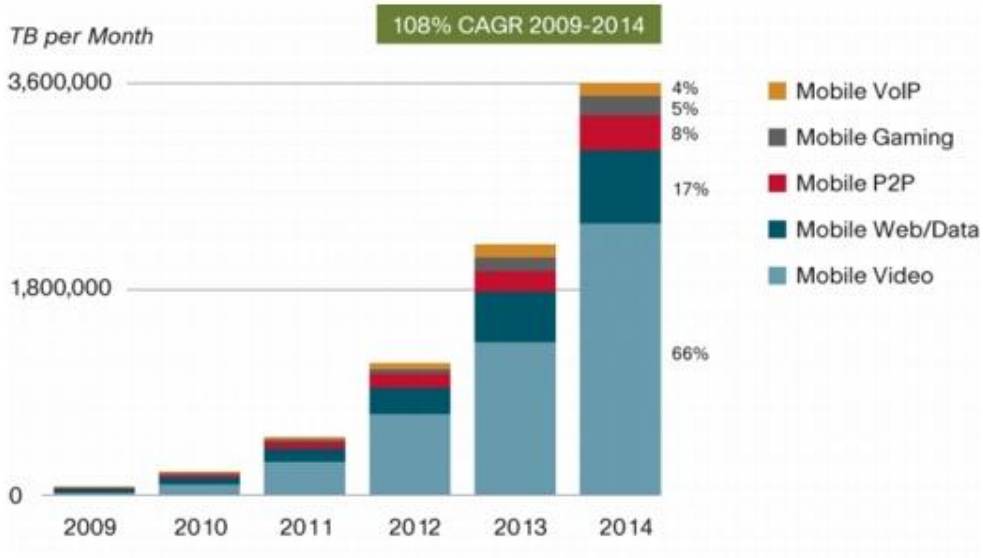

Figure 2 Mobile data growth (Cisco)

Note the significant percentage of this growth which is coming from broadband video. This directly relates to the need for cross-platform broadband video standards.

> *The growth of broadband video across multiple device form factors is having a transformative effect on the Internet. To manage and facilitate this growth requires industry adoption of cross-platform standards for broadband video.*

Broadband Video Standardization

In 2008 Microsoft began an internal project to discuss what standards were needed to facilitate innovation and the large scale growth of broadband video.

This project, codenamed “Athens”, found

- The diversity of encoding formats hampers broadband video delivery to embedded platforms and make monetization of long tail content difficult

- Adaptive HTTP streaming is of critical importance for a quality consumer experience of video delivered over an unmanaged network.

- Content protection will remain important for video delivery, and that - for a variety of business and technical reasons – multiple DRM technologies will coexist. As a result, DRM-interoperability is an absolute must.

DRM-interoperable Container Format

The Athens team developed the "Protected Interoperable File Format" (PIFF), which included a proposed common scrambling or encryption algorithm. This is a fragmented movie code point of the ISO Base Media File Format (ISO/IEC14496 Part 12), with new boxes defined to facilitate DRM interoperability.

Based on the argument that a royalty free DRM-interoperability container format would facilitate innovation, we received approval to release the PIFF specification under Microsoft's Community Promise Agreement.

We also proposed the PIFF container format to the Digital Entertainment Content Ecosystem (DECE) industry forum, where it was adopted as the basis of their Common File Format (CFF), utilizing the PIFF common encryption algorithm ('cenc').

Adaptive HTTP Streaming Standard

To facilitate broad industry innovation on an adaptive HTTP streaming standard, Microsoft also published the "Smooth Streaming Transport Protocol" (SSTP) – the protocol used by IIS smooth streaming - under the Microsoft Community Promise.

Subsequent to the published SSTP specification the 3rd Generation Partnership Project (3GPP) developed an "Adaptive HTTP Streaming" (AHS) specification; and a liaison agreement between the Open IPTV Forum (OIPF) and the 3GPP led to the creation of an OIPF "HTTP over Adaptive Streaming" (HAS) specification.

Because of the fragmented adaptive HTTP streaming market, both proprietary and attempted standards and because a single standard is needed for mobile, PC and televisions –Microsoft worked with participants in both the 3GPP and OIPF to harmonize and extend these designs in MPEG, leading to the "Dynamic Adaptive Streaming over HTTP" (DASH) specification. We believe DASH has a good chance of becoming the umbrella spec that unifies the industry in multimedia delivery over Internet.

The MPEG DASH specification should be issued as a draft international standard by February 2011.

Digital Rights Management Standardization

The word "open" is one of the most commonly misappropriated words in the English language, especially as it relates to industry standard agreements. This is most evidently true when the standard in question is for digital rights management. This is because digital rights management systems always contain a proprietary component.

A digital rights management system can be thought of as consisting of the following five components:

- A detailed encryption algorithm
- Specification(s) on how to apply encryption to particular digital object(s)
- A rights expression language
- A key management system
- A licensing regime with compliance and robustness rules

Standardization of some of these components can be very difficult (see Figure 3).

The Licensing Regime

The licensing regime is always present, and always proprietary. It is always present because without a licensing regime, there are no legal means of forcing a client implementation to honor the digital rights management rules.

The Key Management System

The key management system embodies the mechanism for controlling a client implementation. Without it revocation and renewability cannot be enforced. In fact, the key management system for an open standard DRM like OMA DRM incorporates a licensed (proprietary) component or "hook IP" from the licensing entity – in this case CMLA. As a consequence, standardizing the key management system in a way which is broadly adopted, though not impossible, is extremely difficult.

The Rights Expression Language

The rights expression language (REL) has a tight relationship to the licensing regime compliance rules, so standardizing the REL in a way that will be adopted by the industry is not impossible, but difficult.

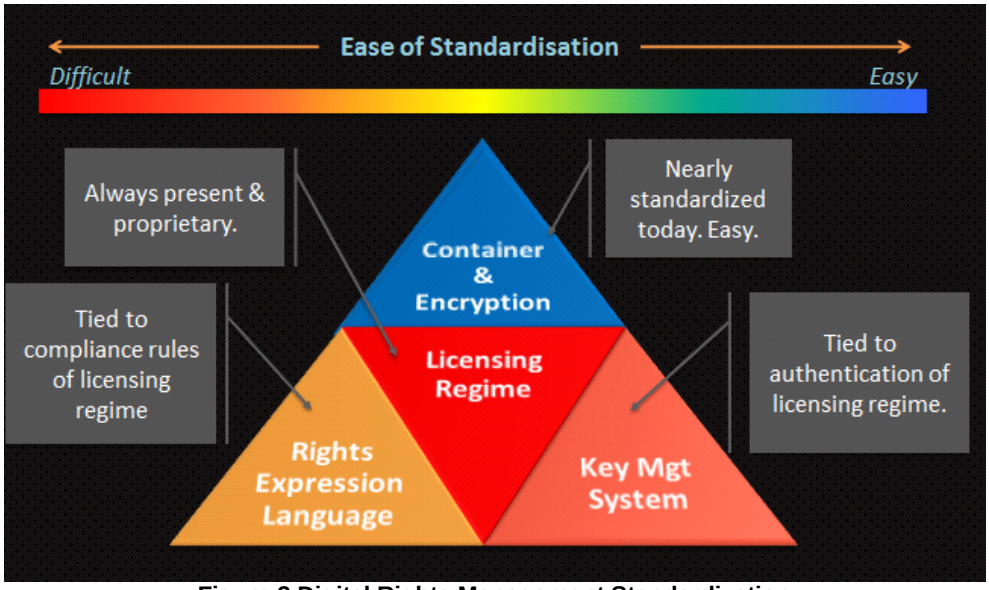

Figure 3 Digital Rights Management Standardization

The Encryption Algorithm

Only the encryption algorithm itself and the application of it to a particular video format are easy to standardize. This is the reason why efforts are underway in multiple industry fora to define a common scrambling or encryption algorithm for broadband video – such as the DVB CPT, DECE, and in MPEG.

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