

Three Challenges for Web&TV



Position paper for the Fourth W3C Web&TV workshop, Victor Klos, TNO, the Netherlands

The web(browser) and the TV have a lot in common. Both are very suited to deliver content to users, as can be judged by the incredible amount of time people willingly interacting with these devices. However we would not have this Web&TV workshop if these media were completely compatible.

In an ideal world the experience of users enjoying content would adapt itself seamlessly irrespective of device or video distribution mechanism. Luckily for us, we are not in an ideal world. This position paper identifies three areas where work is to be done. (By no means it is to be inferred that other areas are done yet!)

Abstract

Both web (browsers) and TVs are enthusiastically used by people all over the world. These media have immense differences though: the web revolves around interactivity and sacrifices timing and synchronisation while the TV is all about presentation - on exactly the right moment.

Some current trends and industry efforts lead to interesting issues. Firstly, the work of HbbTV is aimed at integrating interactivity into the TV by use of web technology. Special effort is put into integrating companion screens and getting synchronisation right. There are still many details that need to be fleshed out and the resulting ecosystem is not open to anyone.

Secondly, having a browser that would become a TV will suffer from delay (and jitter) in the video delivery and of lack of synchronisation mechanisms.

Lastly, transferring the complete STB into the cloud solves quite some real operational headaches but introduces new issues as well; as the STB is rendered in the cloud, how do you tackle privacy and/or connection to the home network?

In summary, these are the three challenges that arise:

- How to do large scale, low delay (and low jitter) video delivery to the browser
- How to integrate synchronisation capabilities into the browser
- How to manage the home situation when the STB browser is in the cloud (both home network and privacy)

The entire topic of content rights is not touched at all.

Also, participants to the workshop are invited to make a clear distinction between 'web' indicating web technology and 'web' meaning an open, innovative realm where brilliant people create compelling apps.

Differences between Web and TV

Starting with the web browser: it is made for interactivity. People are active in front of it, busy reading, sharing and exploring. Most content is offered *on demand*, usually as a result of a user clicking or some event arising. The expected service levels can be described as 'best effort'. It is not that folks enjoy waiting, but it is part of the experience. Click on a link, click again after a couple of seconds of inactivity. Click on the video play button and wait a bit. And when it is playing and you jump to a different part, some delay is okay here too. And inaccuracy, as most players will wait with rendering until the next I-frame comes along or simply start an arbitrary number of seconds earlier in the video.

TV is designed from a broadcast point of view. One signal is transmitted to many many TV sets. And has to play everywhere exactly how it was meant to. Each frame, or field even, is specified in detail, including exactly *when* it should be decoded and when it should be displayed. With digital TV transmitted over cable, satellite or through the air (DVB-C, DVB-S, DVB-T) in a single direction only it must be a robust signal as well. Usually MPEG2-TS is chosen as the format for the bit stream. Timing is well defined; a whole number of timing mechanisms (PTS, DTS) are based on the Program Clock Reference (PCR) running at 27 MHz. In total, all MPEG2 specific headers take up to 5% of additional bandwidth compared to the leanest alternative (RTP).

What if the TV becomes a browser?

While the TV can easily embed a web browser, things only become interesting if in addition the interaction with the actual broadcast content is available. Work in this direction is mainly done within HbbTV, which itself bases its work on the Open IPTV Forum ([OIPF](#)), DVB and others.

HbbTV works by embedding (references to) applications inside the broadcast stream. An Hbb-enabled TV detects these apps, loads them and displays them. They are written in HTML and have access to some additional API's, like receiving StreamEvents (inserted by the broadcaster) and reacting to keypresses on the remote control. The TV also manages their life cycle, which may be non-trivial.

In the upcoming 2.0 release of the spec, companion screens (e.g. tablets) are supported as well as more advanced synchronisation. Apps may then be able to communicate and interact with the TV, with each other and with the back-end of the broadcaster. In combination with better synchronisation capabilities and existing support for stream events this allows for a genuinely interesting development environment.

When "transforming" the TV into a browser one meets the boundaries of what the content industry is comfortable with; while an open standard, the resulting system is not open to anyone at all: only broadcasters and CE manufacturers have a say in what apps to run.

Or change the browser into a TV

The video capabilities of modern browsers are impressive. Full screen HD is not a

problem at all. When an additional requirement is "without add-ons or plugins" things look less bright. A standardised video and audio codec plus container may still become a reality at some point. But even then two issues remain:

1. Delay: the Over-the-Top path introduces higher delays especially when using MPEG-DASH or similar video delivery protocols. This poses a problem according to [Stokking et al.](#)
2. Lack of synchronisation capabilities: currently the video DOM object has no clue of fine grained timing

WebRTC may present a partial solution to these problems. In first place it is meant to enable server-less communication between users, which is quite different from a large scale video distribution solution. Also it builds on a set of protocols that many IPTV providers are moving away from:

Moving to the cloud

The future of the Set Top Box (STB) is in the cloud, according to many speakers at the IPTV Seminar 2013 (<http://iptvseminar.com>). With real deployments in both the US and the EU by [ActiveVideo](#) and an advanced implementation by [Deutsche Telekom](#) it is shown that this is indeed a viable solution.

The benefits are described in terms of money and time-to-market. In the TV industry the consumer devices (STBs) are financed by the service operator. That operator has a strong urge to have these devices issued with the slowest CPU and the least amount of memory that is possible while creating an acceptable user experience. This is in stark contrast to the world of the web where people buy their own devices and value high end performance (and are willing to pay the up).

In this light it makes sense to use the cheapest device possible (built into the TV or as a HDMI stick) and still be freed from necessary hardware upgrades while at the same time have a highly manageable service upgrade path available.

Still, the cloud approach presents some other issues, like how to create Social TV apps in a privacy secure manner when there is no local client to commence an OAuth exchange. In addition, integration with local peers in the home network becomes complicated as it is unclear what the local network is exactly. How is this modelled? Do we need a 'virtual browser', a concept of a browser that lives in multiple places? Or should that become two browsers with some specific interconnection? How do STB vendors regard these matters?

Case: Social TV

In late 2007 TNO organised a field test of *ConnecTV*. A platform that allowed users to enjoy a TV viewing experience together from their own homes. Featuring buddy presence and follow-me this allowed for people to feel connected while watching TV. Results showed that people enjoyed that experience a lot. From a technical perspective, it was a pain to get right.

Technology has moved over 6 years ahead, so an interesting question arises; "has it become any simpler to create such a Social TV platform?". And if so, how would you approach this?

During the session I will sketch an outline of a technical solution which should give some insight too.

An important distinction

In the above we have seen challenges, issues, solutions and solution directions. What is important to realise it that during these discussions sometimes 'web' refers to web technology, and other times 'web' indicates that realm where inspired and skilful people forge brilliant new applications.

These can be very distinct concepts, and while discussing W3C progress to bring web and TV closer we should carefully realise what web we mean when.