



LINKEDTV



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Television Linked To The Web

What is LinkedTV?

Television is changing. In fact, we think by the end of this decade it will be radically transformed. Linear broadcast channels will be stuff of the past: influenced by the Web and the fact TV will be watched on any type of screen (not just the „TV set“), we will browse and search our way to the audio-visual content we want to see. We won't just consume, we'll interact, mainly by sharing our experience with others, but also with dedicated programming we'll be interacting with the content itself.

The core of „television“ will survive – the daily news programme, the live sports events – but the experience we have with TV will change. Today, TV and the Web remain very different experiences. Their integration is weak – typically no more fine-grained than at the level of the programme itself. Our Web-enabled televisions could provide us so much more information about what we see in the TV program but they don't, because they don't know what is in the TV programme.

Linked Television is the seamless interweaving of TV and Web content into a single, integrated experience. It's watching the news and getting background information on the stories at your fingertips; it's seeing a painting in a TV program and identifying the artist and the museum where it hangs. It's making this possible and cost-effective for the content owners and broadcasters by automating the programme enrichment, and personalising the links to each viewer.

By building on Web and broadcast specifications and standards, Linked Television is intended to become a solution for the whole industry, not a proprietary fragment. As Web and TV converge, linking between them will be not just possible, it will be necessary, in order to provide new, interactive services around audio-visual material. Our Public Showcase provides an insight into this new experience and the tools we provide to enable Linked Television. Please have look on <http://showcase.linkedtv.eu>.

Work performed and achievements so far

With 42 months of R&D completed by 12 partners across Europe, the LinkedTV project is enabling a new generation of mobile and TV applications that can interweave TV and Web content for the benefit of consumers. In an overview, LinkedTV offers:

- A set of accurate multimedia analysis algorithms that can be adapted in number and kind to customer needs
- Enrichments using knowledge from online domain ontologies and other web resources based on a customer defined whitelist
- A dedicated tool for verification of annotations and enrichments by an editor
- A toolkit to easily create companion applications aligned to TV programs
- Optional personalisation features to further improve the LinkedTV experience
- A seamless end-to-end workflow with video ingest and administration dashboard

The LinkedTV solution for content owners

Current studies about TV consumption and also our own **user trials** show that while watching a TV programme an increasing number of viewers use a secondary device like a mobile phone or a tablet in parallel. Most of the times the parallel usage is not related to the TV consumption but often the initial reason for picking up the secondary device is due to the TV programme, either because the current part of the show is not interesting enough for the viewer, or because of an advertising break or just because a question related to the programme came into the viewer's mind. In any case, if the viewer gets distracted from the main (first) screen, there is a high risk that the attention for the TV programme gets lost and the viewer starts to check emails, follows his social networks or browses through the Web.

LinkedTV addresses this disconnection between TV and Web screens by providing content owners like broadcasters with the ability to create cost efficient companion applications for their TV programme either on the main screen directly or on the second screen. With the companion application the viewer gets more detailed information on the current part ("chapter") of the TV programme, he/she can bookmark or share chapters of personal interest and can even navigate within the TV programme if the application is offering the TV programme as a catch-up-service for on-demand consumption. For the creation of the necessary information about the programme and customization of the companion application LinkedTV offers a video enrichment process and a dedicated developer toolkit.

The first step of the process towards LinkedTV content enrichment is the **content analysis**. Analysis tasks that are being addressed in LinkedTV include the (semi)-automatic decomposition of the audio-visual content (e.g. temporal segmentation), the association of content segments with object and/or scene labels, text and audio information analysis, and event and instance-based labelling of content segments. In particular, **media annotation** services label distinct fragments of the video content with the concepts that are relevant to that fragment.

Those annotations on media fragment level are the basis for the next step, the **linking to related content**. It computes for each concept annotated to a media fragment a set of links to related Web content and online information about that concept. A set of services fine-tuned to collect the most relevant Web links have been developed in LinkedTV, covering information cards for concepts as well as supporting extracting links from trusted sites on provided whitelists.

A dedicated **Editor Tool** gives journalists and editors full control over the system generated metadata and supports them in curating the links for their target audience easily and with minimum effort.

Based on an innovative approach to **user profiling** that supports both implicit and explicit capture of user preferences, the annotations and enrichments can be altered to allow for a **personalised user experience**. A considerable tool set and a dedicated workflow for extracting, learning and modelling of user information, usage and behaviour has been developed.

The process is orchestrated by the **LinkedTV platform**. The platform ingests audio-visual content and triggers the process of content analysis, annotation, linking to related content (enrichment), storage of the resulting richer content metadata and provision of access to the related content from LinkedTV applications. At the end of the process the video content is enriched by enhanced metadata that can either be presented to end consumers in a companion LinkedTV application and / or stored in an existing editorial or content management system of the customer for other or additional usages.

For the creation of **innovative LinkedTV applications** a developer toolkit enables the implementation of HTML5-based applications that run and sync across multiple devices and screens. The **multiscreen toolkit** provides full access to all LinkedTV Platform data and functionality and supports all key interaction modalities, thus simplifying the provision of the Linked Television experience to a customisation of the application UI and UX.

Based on the multiscreen toolkit **two scenarios** have already been implemented in the LinkedTV project with broadcasters RBB and AVROTROS. **LinkedCulture** the Dutch TV program Tussen Kunst and Kitsch (similar to the BBC's Antiques Roadshow) enriched with further information about the art objects on show and topics in discussion, satisfying viewers' interest.

The **LinkedNews** shows how local German broadcaster RBB's daily news programme is enhanced by links to relevant information about the subjects in the news, answering questions potentially raised by the new bits of information and even uncovering further details not mentioned in the programme itself.

Both applications as well as the LinkedTV solution for video annotation and enrichment were successfully presented to an interested audience at the International Broadcast Conference (IBC) 2014 in Amsterdam.

Conclusion

Now, at the end of the project, LinkedTV provides disruptive technology for a market already rapidly changing due to ubiquitous online access to audio-visual content, multiple screens, social networking and convergence with the Web. Hence, the LinkedTV solution, a combination of end-to-end Platform and front end Player, covers several domains in the (new) media industry, from content (rights) owners to distributors, network operators and hardware manufacturers. Since LinkedTV re-uses open Web technologies, its solution can be directly taken up by online media channels, but also is adaptable to other specifications re-using part of the Web technology stack such as HbbTV. We believe LinkedTV could become an additional content layer for TV, accessible from the „red button“ of interactive TV or via a mobile application on a synchronised companion device.

Contact and project details

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For more information, please visit our website: <http://www.linkedtv.eu>