

# LinkedTV: Web and TV seamlessly interlinked using semantic technology

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## 1 Introducing LinkedTV

This paper reports on the LinkedTV EU project <sup>3</sup>. LinkedTV is building technological solutions for a new type of television (or audio-visual) experience where Web and TV content can be seamlessly interlinked based on the concepts present within that content. The project addresses how the Web and TV is converging in end devices, and particularly this paper focuses on its R&D activities and goals, the project demonstrator and how LinkedTV can benefit itself and others through project networking. We highlight four of our key R&D activities:

*Media Analysis:* The media analysis activity of LinkedTV has been detailed in deliverable D1.1 <sup>4</sup>, and addresses the topics of: Visual information pre-processing and representation, Visual object and scene labelling, complementary text and audio analysis, event and instance-based labelling of visual information, and user assisted annotation. The focus is on determining the appropriate fragmentation of audiovisual material (shot and scene detection) and supporting the media annotation process (visual concept detection, labelling).

*Media Annotation:* The media annotation activity has defined an Ontology for LinkedTV in deliverable D2.2 <sup>5</sup>, and develops approaches and services for the automated semantic annotation of audiovisual material, focusing on conversion of media analysis outputs to RDF and Named Entity Recognition over TV programme transcripts, using the TV2RDF service <sup>6</sup> to align all annotations to the LinkedTV ontology model.

*Media Enrichment:* Linked Media is about mining, retrieving and discovering additional online content to enrich specific media fragments of the seed video program being watched by the user. Different methods ranging from structured queries on XML or RDF data, API calls to public Web services through to site-specific Web mining over HTML are applied to extract conceptual annotations

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<sup>3</sup> LinkedTV ([www.linkedTV.eu](http://www.linkedTV.eu)) is funded by the European Commission through the 7th Framework Programme (FP7-287911). The work described here is the result of collaboration among all partners of the LinkedTV consortium.

<sup>4</sup> <http://linkedtv.eu/deliverables>

<sup>5</sup> <http://linkedtv.eu/deliverables>

<sup>6</sup> <http://linkedtv.eurecom.fr/metadata/>

of online media and match them to the seed video fragments based on concept similarity.

*LinkedTV Player:* Client applications are necessary to request these annotations and enrichments from the LinkedTV Platform and present them to the user. LinkedTV has developed a multiscreen toolkit where an application can be independent of how many screens are involved and can in fact dynamically react to changes in the amount and types of screens attached to the application. As the annotated TV program plays on one screen, one or more other screens can access and display active concepts (from the annotation) to the user and on interaction the user can browse related links for each concept. In the current player implementation, the detected entities showed on the second screen will always be grouped into three different layers by dividing entities based on “who, what, where” to identify respectively persons, objects and locations.

## 2 Project demonstrator

LinkedTV can be demonstrated by showing a TV program on a large (main) screen and letting users interact with information about concepts in the running TV program on a tablet (second) screen. We also have access in LinkedTV to many other demonstrators, tools and services, as listed at <http://linkedtv.eu/demos> and <http://www.linkedtv.eu/demos-materials/tools-and-services/>. In particular, browsing the semantic annotations of the TV programming stored on the LinkedTV platform <sup>7</sup> and editing the automated annotations and enrichments through the Editor Tool <sup>8</sup> demonstrate the ability of LinkedTV to automatically semantically annotate and enrich TV as well as allow Editors to control and correct those annotations and enrichments.

## 3 Project networking

LinkedTV offers tools and services for the analysis and annotation of multimedia assets, hyperlinking of annotated media to related Web content, personalisation of enrichments according to user models, and enriched media playback across multiple screens, as outlined above.

We are interested in comparing our current approaches to contemporary R&D approaches in other projects to media analysis, semantic annotation and media hyperlinking, as well as discussing with Semantic Web researchers other uses for the RDF we produce in LinkedTV, not only to build other types of client application on top of the data but seeking means to use our automatic annotation and enrichment results as a benchmark for others. Finally, we are keen to promote our concept of Linked Media to other projects working with multimedia assets, where those assets could be semantically annotated with Linked Data concepts and the descriptions published, allowing LinkedTV and others to re-use that data in their media applications.

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<sup>7</sup> <http://api.linkedtv.eu/>

<sup>8</sup> <http://editortool.linkedtv.eu>