

Enriched personalized multi-screen content for social connected TV

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ABSTRACT

The FIcontent project aims at establishing the foundation of a European infrastructure for promoting and testing novel uses of audio-visual content on connected devices. The developed Social Connected TV Platform will bring attractive new application and content concepts to the TV by making use of personalization and recommendation technologies enabled through the means of future Internet technologies and by integrating Web-based services and information sources for an interactive socialized multi-screen experience. Using the example of two specific enablers, the Second Screen Framework and the Content Enrichment Enabler, we are conceptually demonstrating our technical solutions, innovative use cases and new business opportunities. These use cases will be iteratively improved and upgraded during regular iterative cycles based on feedback gained in lab and field trials at FIcontent experimentation sites.

Author Keywords

Multi-screen; interactive content; enrichment; personalization; connected TV; HbbTV

ACM Classification Keywords

H.5.m Information Interfaces and Presentation (e.g. HCI): Miscellaneous

I. INTRODUCTION

Internet delivered video is at the tipping point of becoming a mass-market driver for connected TV solutions. The massive growth of consumed Internet video was enabled by widely available broadband access in households providing sufficient and affordable bandwidth. Internet services became commodity. Our approach implements a multi-screen capable, interactive content solution utilizing open standards such as Hybrid Broadcast Broadband TV (HbbTV) [1], HTML5 and incorporates technical key components developed and provided through open European platforms FIcontent [2] and FIWARE [3]. The solution focuses on open and standards-based technologies

that enable advanced TV usage concepts based on interactive content formats within connected TV environments and bridging them to second-screen and multi-screen use cases. This approach builds on three main pillars, which are (1) interactive content, (2) personalization and (3) open standards e.g. HbbTV. The first represents a content perspective that provides additional information related to video content, adds an interactive layer for clickable objects and a means to distribute and share with others. Personalization features are provided through a personal content reception across multiple screens and associated recommendations for specific content, interactive items within the content and linked related information.

Section 2 introduces related work, section 3 the FIcontent-initiative and Section 4 explains Social Connected TV Platform as well as two specific technologies, called enablers. Section 5 introduces innovative use cases and business opportunities resulting from the combination of both enablers. Finally, section 6 concludes with a conclusion and outlook.

II. RELATED WORK

In Germany alone, 14.5m internet enabled TV devices were sold by mid-2013[4], these TVs can combine traditional DVB access with over the top services from the open Internet. Devices for video consumption became more powerful, ubiquitous and easy to use – 34% of German households use a Connected TV as main screen [4]. Furthermore, open Web standards and tools evolved massively. HTML, JavaScript and CSS are omnipresent and some of the key drivers for the success of web applications and services. On the other hand, services evolved empowered by the availability of smartphones and tablets. Mobile apps exploit the features of smartphone devices and thus, establish the basis for a new type of application – multi-screen apps. As traditional mobile app features can hardly be ported onto TV due to the need for a remote control, the viewing distance, lean-back mentality and passive consumption, there is a need for distributed apps exposing their features on the screens or devices, which they are made for. The W3C Web and TV Interest Group [5] tries to identify relevant use cases of interest for Connected TVs, such as “TV Triggers 2nd Screen” or

“Multiscreen Advertisement”, and aims to solve these issues by suggesting appropriate specifications.

Since video is made for the big screen, related actions need to be placed on personalized, easy to control devices such as smartphones and tablets. First frameworks addressing these challenges are available; however, they are often limited to specific devices, operating systems or access technologies. Webinos [6] is an EU funded project aiming to deliver a platform for web applications across mobile, PC, home media (TV) and in-car devices. Parts of this project are transferred into the FI-PPP infrastructure.

III. The Ficontent initiative within FI-PPP

The Future Internet Public Private Partnership (FI-PPP) has developed in the context of the European Union’s FP7 research-funding program over the period 2011-2015. Its overall goal is to advance Europe’s competitiveness in Future Internet technologies and support the emergence of Future Internet-enhanced applications of public and social relevance. The FI-PPP follows an industry-driven, user-oriented approach that combines R&D on network and communication technologies, devices, software, service and media technologies and their experimentation and validation in real application contexts. Major European and global companies and leading research centers aim at developing and experimenting cutting-edge ICT platforms devoted to applications and services in the areas of Social Connected TV, Smart City Services, and Pervasive Games across Europe. Any European stakeholders, particularly developers and SMEs, willing to innovate and boost their business can access and use these open platforms. The core activity related to the solution proposed here is to deliver a common technical platform that application providers can use to build, host and operate content applications for multi-

screen environments. The Social Connected TV platform is a catalogue of homogeneous technology components and APIs that use server-side enablers, services developed for Social Connected TV as well as tools and services to simplify the process of building, deploying, monitoring and managing content-related applications on top of open infrastructures.

IV. Social Connected TV Platform

The Social Connected TV Platform (SCTVP) is one of three Future Internet Platforms, in this case leveraging social multimedia technologies for Internet-enabled TV devices. This platform offers various specific and generic enablers focusing on innovative and interactive content presentation on connected TVs. The Social Connected TV Platform Core intends to offer functionalities to enhance connected TV services with multi-screen interaction, a personalized TV experience and user tracking as well as privacy protection mechanisms. Figure 1 summarizes the SCTVP Core and some scenarios and reference services. It shows different components and relations between the components. The figure shows two layers: The first one is the Core Platform – framed with the green dashed box. It consists of Specific Enablers (SE) and Generic Enablers (GE). SEs are technology components, developed by SCTVP partners that will be available to third party developers and SMEs via an API. Some of the SEs require a set of GEs. These Generic Enablers are technology components provided by the FI-WARE project. Some GEs are used for the implementation of the scenarios.

Using the examples of two Specific Enablers, the Second Screen Framework and the Content Enrichment Enabler, we want to explain business opportunities, possible use cases and benefits for end customers when developing services on

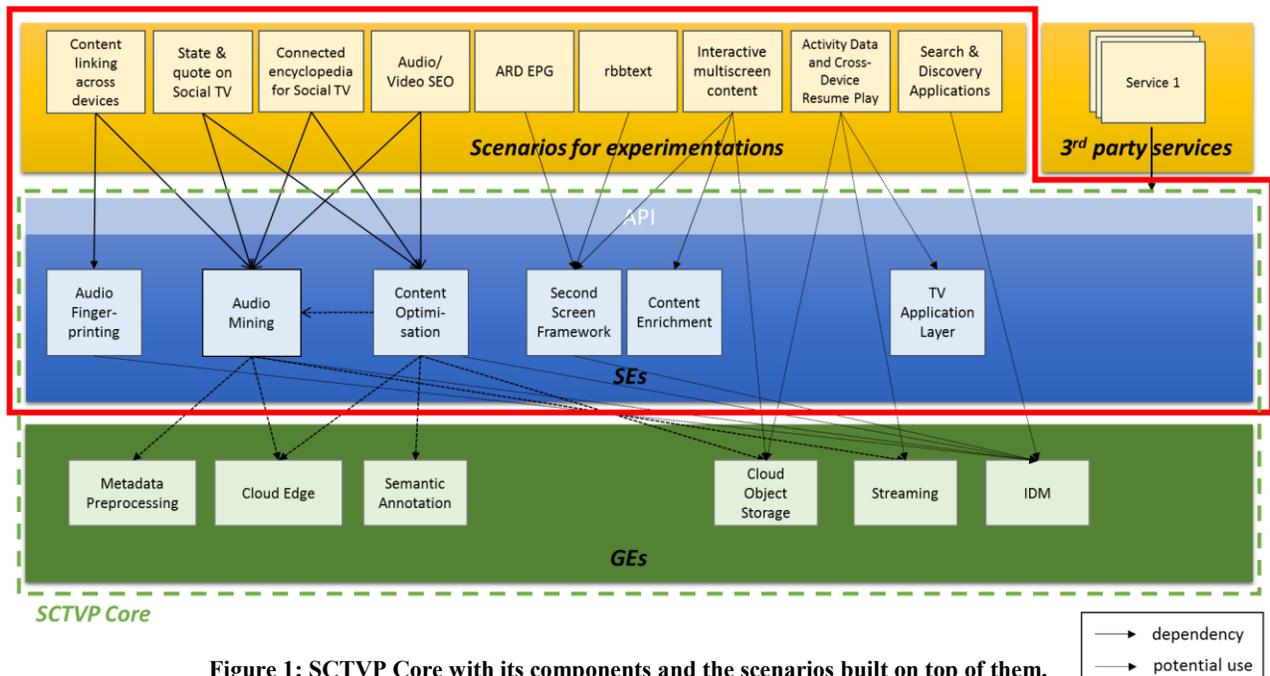


Figure 1: SCTVP Core with its components and the scenarios built on top of them.

the base of the Social Connected TV Platform.

The Second Screen Framework allows HbbTV applications to communicate via a permanent bi-directional connection with a second screen application using a centralized server system in order to exchange messages between these two target devices. The end customer can simply connect a smartphone or tablet to a connected TV by capturing a QR-Code and so open the second screen application directly in the browser of the mobile device. Both applications (first and second screen) need to be based on common web technologies, such as HTML, JavaScript and CSS. Since the solution is compliant to HbbTV, it enables content providers to develop additional services for broadcast related content. All functionalities are provided via JavaScript APIs and thus can be easily integrated into new and existing web applications.

The Content Enrichment Enabler reflects critical functionalities, which will be the basis for video related services and applications in Future Internet environments. As a part of a common infrastructure for future media, content distribution and utilization, this enabler serves all major functions required to enrich content in multiple ways, including object identification, content annotation, content recommendation and linkage to any web-enabled supplemental information or media (audio, video, text, images, animation, PDF, contact information, social media integration, video-to-video navigation, content interaction). Furthermore, it provides interfaces to incorporate Web 2.0 capabilities and community functionalities. Thus, the enabler acts as a common building block in future video and multimedia infrastructures, to allow seamless, platform independent and convenient enrichment of any type of video content using any type of device for a range of application cases covering UGC, professional content as well as edutainment.

V. Concept & Opportunities

The combination of these two enablers resulting in single use cases brings a huge benefit for current video services on connected TVs. The Content Enrichment enabler allows specific items in videos, for instance an object in a movie to

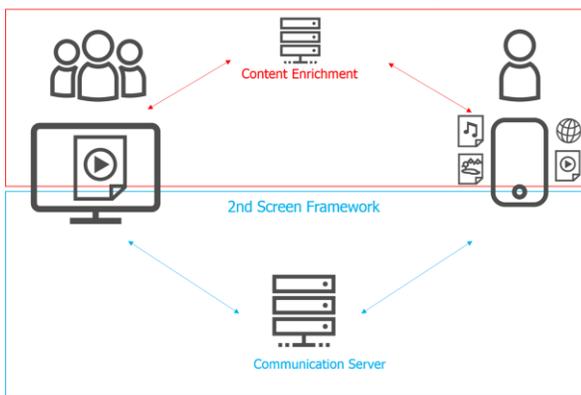


Figure 2: Multi-Screen Interactive Content

be annotated – not only allocated to a period on the playback time, but also to the position in the according frame [8]. This object annotation can follow its track and so mark the item the whole time it is visible. Visualizations on TVs can show labels displaying the name of the annotated object, overlay bounding boxes and/or indicate actions, for instance to get additional information about this item press a number on the remote control. These actions can also link to external web services or other videos displaying specific items. The user can now get more information and delve deeper into the selected topic.

The Second Screen Framework connects smartphones and tablets to connected TVs in order to push selected content to a companion device. Selecting content and interacting with a web application on second screen devices is much easier and more convenient than on TV sets, as you can avoid the usage of the remote control and instead use touch gestures, which are common for users of mobile devices. Combining the functions provided by Content Enrichment particularly the interactive video description generated with the enabler, the second screen communication capabilities and annotated video objects or scenes allows content consumption to be spread across multiple screens. In our particular environment, enriched content with descriptions and related content for specific objects in the video, the whole range of available objects or the entire video representation can be pushed to the second screen. The main video content still remains on the first screen, which is e.g. an HbbTV enabled TV. The concept avoids interruption of the shared TV watching experience common in multi-user households (e.g. families), but allows an opt-in personalized viewing experience. Related content on object basis is available on demand, and can be explored on personal devices, e.g. tablet or smartphone. Reversely, the concept allows related additional content from the second screen interactive content application to be pushed back to the TV for a better viewing experience. Figure 2 illustrates the concept of interactive multi-screen content. Using this technology, service providers can establish interactive applications for different purposes. It can be used to introduce the latest additional information, for instance displaying statistics of a selected soccer player. An

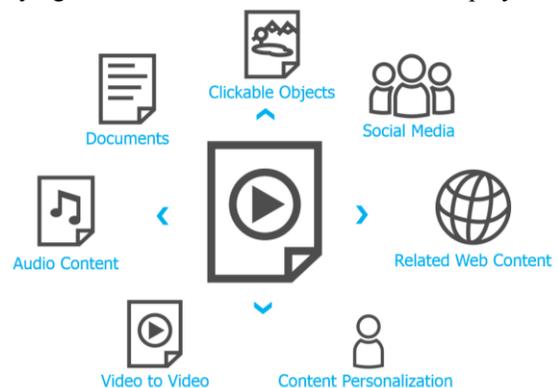


Figure 3: Content Enrichment features

overview of his latest goals related with relevant videos offers customers increased immersion. The external data can be aggregated through regular web services and so be up to date all the time. By selecting shown items on the second screen, users can push this information to their mobile devices and enjoy the game on the first screen without any interruption.

In case of edutainment content, an audience of students can watch educational films shortly introducing the main topics. If students did not understand facts of the case, they can individually learn topics that are more detailed by using their smartphones and without interrupting the video on the main screen. In contrast, if teachers assume more students did not get the idea, they can chose to watch more detailed explanation videos on the first screen. Through the Content Enrichment Enabler and the Second Screen Framework, a higher level of involvement is possible due to the interactivity and the freedom of choice. Interactive video-based user guidelines and iManuals will assist customers in learning to handle and operate new products. Hyperlinked chapters, detailed videos, real life moving pictures offer new navigation instruments and demonstrate the usage of items. Enriched video allow users explore and consume new topics individually and at their own pace.

The ecommerce industry will benefit from this infrastructure by offering potential customers direct access to external services related to products in movies or video ads. This infrastructure enables product placement in video content by linking to the respective vendor pages, it allows a stronger identification with the featured brand, as providers can for instance integrate mini games, background information or surveys. Moreover, enriched advertisement increases the range and the prominence of brands and products due to the viral component and ease of use. Using recommendation engines for HbbTV content, e.g. the TV Predictor [7], to predict personalized item annotations can help win over new customers. Unlabeled products, e.g. the jacket Daniel Craig wore in James Bond, can be linked to the best fitting product seller according to the customer's purchasing power. Linear TV programs can be related to similar contents in catch-up-TV and specific actors can refer to other films they are in.

Moreover, the ability to adopt this system for user-generated content brings advantages for personal use by integrating social components and uploading enriched videos to social networks, as friends and places can be easily marked in custom-made films, such as holiday videos, or by relating social feeds from friends with specific objects or persons in videos.

VI. Outlook

The use cases have shown that interactive multi-screen content provides a set of advantages in terms of an enhanced user experience when interacting with interactive video content in connected TV environments. Spreading

related content across connected devices fosters the personalized use of video content and related supplemental information, provides new ways of storytelling and allows for a more comprehensive preparation and presentation of the content story itself. Broadcasters, content producers and service providers can integrate these scenarios in new and existing developments and thus, benefit from a highly increased target audience engagement. Evolving open industry standards such as HbbTV 2.0 and upcoming proprietary technologies, such as SDKs of the TV manufacturers, will cover parts of those scenarios and provide the technical foundation to implement new services. The concepts discussed will be trialed at FIcontent experimentation sites in order to get end user feedback and to validate further technical requirements. These pan-European large-scale user experimentations will be conducted during the 2nd cycle of FIcontent experiments focusing on qualitative and quantitative user studies. The trials for the proposed interactive multi-screen content takes place at the Berlin experimentation site including tests at Fraunhofer FOKUS connected TV Lab infrastructure as well as on-air trials via DVB-T.

Through its open platforms and enablers, FIcontent offers opportunities for third party developers, SMEs and domain experts to get involved. FIcontent open APIs for components e.g. Content Enrichment will enable the creation of further services and applications on top. This also applies to FI-PPP phase 3 [8] participants and beneficiaries selected through the FIcontent Open Call [9].

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