Exploring the Use of Web-Based Video in Consumer Networks

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***Abstract*—This paper suggests a new ontology approach to search for the targeted contents easily including the several technical issues as well as the related standard status.**

I. INTRODUCTION

Web-based video is rapidly expanding. More and more, online videos are being used for advertising, enterprise collaboration, entertainment, product reviews, and other applications. As prices drop for consumer electronics, amateur and professionals alike are creating increasing numbers of high quality videos. As a consequence, social networks are sprouting up around web delivered media.

In recent years, online videos have become omnipresent. Online videos appeal to web audiences, as they allow capabilities beyond those of traditional television in that more people can distribute videos, and social networking allows others in the community to comment and even reply with additional video footage. Expectations are quickly evolving to the point where people want to publish and view videos at any time and from any device.

These rapid changes are posing challenges to the underlying technologies and standards that support easy contents searching and browsing. IP-enabled device is a new generation of consumer electronics such as IPTV and smart phone. It is because of IP features such as interactivity, web contents explosion and internet usability. Browsing and searching web contents on internet are not a big deal in IP-enabled devices and most difficulties of web-based video search on the web are succeeded to consumer electronics environments.

As a standard perspective, the World Wide Web Consortium (W3C) has been involved with "Video in the Web" [1] since 1996 and organized three workshops around this topic: Real Time Multimedia and the Web, Television and the Web, and Video on the Web. All of these activities targeted for IPTV business since IPTV was maturing quickly regarding the business opportunity of web-based video.

In Section II, several technical issues regarding web-based video are described, and the new ontology approach based on the W3C standard is suggested in Section III. Then, Section IV concludes the paper.

II. TECHNICAL ISSUES FOR WEB-BASED VIDEO

Several technical issues that have to be addressed when adopting web-based video in real commercial services are described in this section. This paper does not cover all of technical issues. Rather three of issues are selected and described according to the priority of W3C standard trend.

A. Heterogeneous metadata for web-based video

Metadata is a traditional topic and, as it relates to video, generates a lot of interest from several perspectives. Its major uses are for content labeling and search/discovery. Anticipating the increases in online video and audio in the upcoming years, we can observe that it will become proportionally more difficult for viewers to find the content in which they are interested. Metadata is continuously updated by different users throughout the resources' lifetime via content creators, publishers, third-parties, and end-users. Some of the metadata will be automatically produced (face, text or object recognition) and others will be added manually. Some of the metadata will be part of the content (in the format container), some will be external to the content. Adding user generated metadata has the potential to tremendously increase the content's value. Of course, the quality of such metadata will vary widely, especially in non-trusted environments in the web. Unlike hypertext documents, it is more complex and sometimes impossible to deduce metadata about a medium, such as its title, author, or creation date.

Several more or less complex solutions already exist in this domain, including MPEG-7, SMIL, iTunes XML, Yahoo! MediaRSS, and CableLabs VOD Metadata Content. Not many online video distributors are currently making use of the full potential of metadata or facilitating the use of it by others, either in the professional world or in the world of user-generated video. That makes contents viewer really hard to search for the targeted web-based video.

B. Priced video codec for the priceless web-based video

Web-based video is a complimentary use for all. H.264 has been frequently used for video creation. However, H.264 has licensing requirements that are incompatible with open source requirements and is not a royalty-free codec. Therefore, individual content producers suffer from a lack of a universally supported set of codecs which makes it challenging to publish web-based video widely and to ensure that almost anyone can view it in commonly available devices.

The web-based video consumer experience includes widely available players, codecs whose functionalities provide a good viewing experience and other issues related to ease of use.

C. Addressing into web-based video

In order to make web-based video real first-class objects in the web, one should be able to link to and from media, the same way that authors can create hyperlinks between web pages. This would also allow for other uses to be implemented,

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such as video highlights, search results, mashing, or caching. It would provide an identifier that could then be reused to attach metadata. The ongoing discussion covers both spatial and temporal addressing, as well as a combination of the two.

III. Ontology for Web-based Video

A simple ontology to support the cross-community data integration of information related to media objects on the web, as well as an API to access this information, are developed by W3C recently. This ontology will help circumvent the current proliferation of video metadata formats by providing full or partial translations and mapping between the existing formats. The ontology provides a common set of terms to define the basic metadata needed for media objects, as there has been a proliferation of media metadata formats.

It is defined based on a common set of Extensible Metadata Platform (XMP) [2] properties which covers basic metadata. For example *identifier* is a common property that is supported in several existing metadata formats and is therefore part of the core vocabulary defined by the Ontology. Furthermore, the Ontology defines mappings between elements from existing formats and our list of properties, as shown in Figure 1. Ideally, the mappings should be semantic-preserving; however, this has not yet been fully achieved, because of the differences in the natures of the properties in the mapped vocabularies, as their extensions do not overlap exactly.

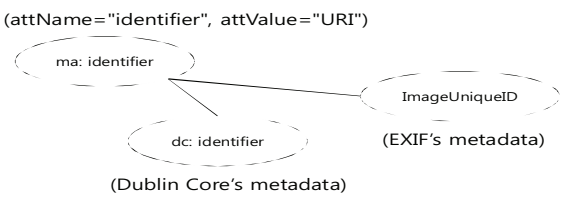

Figure 1, Mapping for similar metadata in several standards

For example, the property *dc:identifier* from *Dublin Core* and the property *exif:ImageUniqueID* defined in *EXIF* are both mapped to the property *identifier* in our Ontology, but the extension of the property in the exif vocabulary is more specific than that of Dublin Core. Mapping back and forth with our ontology as a reference will hence induce a certain loss of semantics. This is inevitable if we want to achieve a certain amount of interoperability. In total, the 28 metadata schemes used in the Web are analyzed and mapped with the XMP properties [3].

The Ontology is accompanied by an API that provides uniform access to all of the elements it defines. As depicted in Figure 2, we consider two scenarios where the API could be implemented: either in a user agent (scenario 1) or as a web service (scenario 2).

(i) Scenario 1: The API is implemented in a user agent (e.g., browser or browser plugin) and exposed as a JavaScript API (using the WebIDL JavaScript binding). The user agent includes the components for metadata access (possibly extraction) and mappings for a supported set of formats. The metadata sources (the media resource and/or metadata document(s)) must be retrievable and access (establish connection, retrieval) of the metadata sources is handled by the user agent.

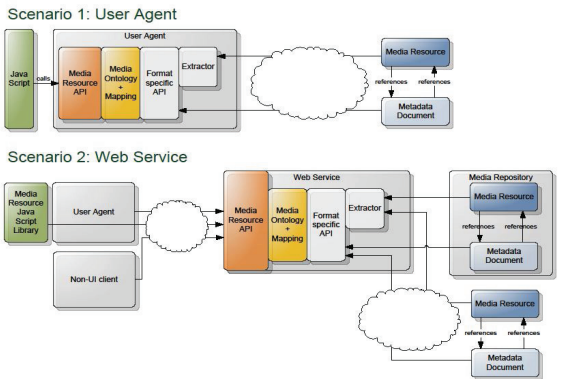

Figure 2, Two Scenarios of API Implementation

(ii) Scenario 2: The API is implemented as a Web service. Such an implementation would be typically used by a non-UI client, such as an agent harvesting metadata. However, the API could be also accessed from a user agent, and used the same way as described in scenario 1 by the help of a JavaScript library for accessing the web service. At the back-end of the web service, this scenario also allows supporting a media repository (e.g. content provider's archive database, movie store) from which the user agent could directly retrieve metadata sources and which might have a custom metadata format not supported by a user agent. In contrast to an integrated component (see scenario 1), an implementation of the API in a web service could do more complex mappings on the fly as a component integrated in a user agent, and can be more flexible (e.g., supporting additional formats).

IV. Concluding Remarks

This paper described which technical issues exist for videos on the web as they relate to a real business adaptation, and suggested the ontology media annotation for the possible solution based on W3C standard activities. By using the facilities proposed in this paper, Web-based video is able to raise the quality and interest of the consumer devices, especially IP-enabled smart devices browsing the Web.

Reference

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