

Mobile-centric Approach for Mediating and Controlling Distributed Digital Content

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Abstract— Consumer electronics (CE) devices equipped with Universal Plug and Play (UPnP) functionality are finding their way to consumers' homes. As these devices start including more advanced functionality such as storage capacity and online service connectivity they might become the true “media centers” of connected homes. We propose that a mobile media control device would perform intelligent content versioning and metadata caching, which enables efficient mediating of content between the Internet and the home environment. Moreover, the proposed solution could be applied in mobile advertising so that the mobile device would mediate content from online advertisers to CE devices.

Keywords: Home networking, Universal Plug and Play, Content management

I. INTRODUCTION

The amount of personal content is constantly increasing due to the growing digitalization of our everyday lives. Availability of affordable content capturing devices in the market, ability for users to share their content via online services, increasing amount of freely available content (e.g. online video sites), and online music stores have clearly brought more and more digital content available to users. However, content has also become increasingly scattered: users can have digital content stored e.g. in their computers, personal video recorders (PVR), mobile devices, and various online services. In addition to their own content, users might even have access e.g. to friends' online image libraries. Distributed content sources bring many challenges, since currently there is not a unified or standard way for managing content collections spread among different devices and Internet locations with a single user interface.

Universal Plug and Play (UPnP) home networking technology, driven by the Digital Living Network Alliance (DLNA) standardization body, is an emerging technology that is currently trying to find its way to consumers' homes. UPnP allows users to share their media items between the network-connected devices in the home network. UPnP media renderer devices connect traditional consumer electronics (CE) devices such as televisions and stereos to the home network, whereas UPnP media server devices are equipped with storage capacity and can deliver content to other home network devices. UPnP

devices also enable connectivity to online content sources (either free or commercial). These content sources include e.g. streaming radio channels or marketplaces for purchasing commercial videos. Recently, mobile devices that support UPnP connectivity have emerged to the market. [1]

We believe that the conventional approach, where the rendering, storing, controlling and delivery of content is integrated to a single home network device, is suboptimal in many ways. The major drawback is that it lacks the aspect of mobility: the users do not have access to their content sources when they are not at home.

We propose a mobile-centric approach to complement the living-room centric way for controlling and managing a media item collection. In our solution, the mobile device acts as a front-end user interface for controlling content collections distributed in various locations, and also brings these content sources together in a unique way by utilizing the peculiar advantages of mobile devices. The approach is illustrated in Fig. 1.

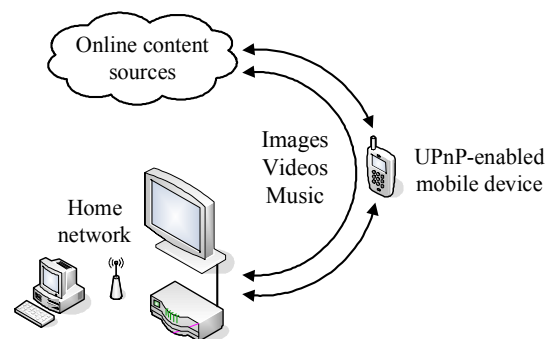


Figure 1. Mobile-centric approach for managing home and online content

II. MOBILE DEVICE AS A FRONT-END USER INTERFACE TO ALL DIGITAL CONTENT

We propose a solution where the mobile device acts as a front-end user interface for managing content from distributed sources (including content stored to the home environment and online services). In the proposed solution, content versioning and metadata caching make it possible to provide an efficient visual user interface for managing distributed digital content

without the need to store all the content locally to the device. When acting as a single media control interface, the UPnP-enabled mobile device also brings various content sources together in a new way that can be demonstrated with the following use cases.

A. Use Case: Mobile Device Mediated Online Service Integration to the Home Environment

Online video and photo sites are commonly used for discovering interesting content. Finding video content about topics of interest or periodically checking friends' photo blogs for new content are popular use cases.

We demonstrate a mobile device prototype solution that can be used to visually discover content from various online content services in an integrated way, and integrate the sources to the home environment. With our solution, users can create and customize "virtual content channels" based on Internet content, and mediate them to UPnP devices such as televisions and stereos. The contents of these channels can be automatically controlled and updated by the mobile device.

B. Use Case: Mobile Device Mediated Targeted Advertising

Mobile advertising has been a popular research theme during recent years. So far, the main challenge has been gaining acceptance from consumers to receive advertisements to their mobile devices [2]. On the other hand, consumers are accustomed to viewing and listening to advertisements from traditional CE devices, such as the television or radio.

Being a personal device, the mobile device can bring many advantages to advertising. For example, the mobile device can gather data about the user and provide them to advertisers for advertising personalization and recommendations [3].

Targeted advertisements could bring more value to advertisers due to increased efficiency.

We propose a mobile-centric solution where the mobile device is used as an advertising personalization device, but instead of displaying advertisements on the screen of the mobile device the UPnP-enabled mobile device can intelligently mediate advertisements from online advertisers to home environment devices that have traditionally been used for advertising (see Fig. 1). The proposed solution works as follows:

- The mobile device gathers personal and context data about the user and delivers it to the advertisers for advertisement personalization.
- The online advertisers deliver links to targeted advertisements to users' mobile devices. The advertisements can be in the form of images, video, audio, or text.
- The mobile device mediates advertisements to home network rendering devices via UPnP connectivity.

III. DEMONSTRATION

A poster will accompany the research prototype. A table and a LAN connection are needed for the demonstration.

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