Chapter 4
Wireless Multimedia Content Distribution Architecture

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ABSTRACT

Wireless video streaming, and specifically IPTV, has been a key challenge during the last decade, including the provision of access to users on an always best connected basis using different wireless access networks, including continuous seamless mobility. There are different proposals including IP based video streaming, DVB-H, or MediaFLO to carry out IPTV and video streaming on demand to users in a wireless environment, but one of the most relevant elements is the architecture of the service, with all the components of the delivery process. In this work the authors propose an alternative architecture based on a wireless Content Delivery Network, optimized to distribute video to mobile terminals in order to create a triple screen platform; considering that the main available wireless access networks are WiFi, WiMAX, and 3G, this work focuses on the last two. Surrogates within the CDN architecture act as video streaming servers, while the origin servers in the content providers carry out the transcoding process in order to be compliant with individual client requirements.

INTRODUCTION

There is an increasing demand for mobile users to access to live videos of sport events; TV programs; User Generated Content (UGC) or even movies through their handheld terminals (e.g. smartphones or tablet PC). However, since mobile terminals are diverse in resource and quality, ie: they have different screen sizes, computation powers, battery, and available network bandwidths, it is difficult to stream live video to those diverse mobile terminals efficiently in terms of provider's and user's benefits. For efficient live video streaming to heterogeneous mobile terminals, it is required

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that each mobile terminal receives streamed video with the best quality within its capabilities and in the video format to easily play back the video with the most adequate QoS/QoE that could be provided(Ahmed, et. al., 2005).

3G wireless systems and WMAN WiMAX networks have been designed for advanced multimedia communications that can be enhanced with high quality voice, images and video. UMTS is among the first 3G mobile systems to offer wireless wideband multimedia communications over IP, used by different services (Agilent, 2006). Mobile IPTV is a technology that enables users to transmit and receive multimedia traffic including, video, audio, text and graphic services over core IP networks and heterogeneous wireless access networks with support for Quality of Service/Quality of Experience (QoS/QoE), security, mobility, and interactive functions, including mobile and nomadic users (Bonastre, O, 2009).

Wireless IPTV aims to make the traditional IPTV and related services available to users anywhere, anytime, on any device, and through any network. This goal requires advanced technology where networks, services, and content are highly adaptive, and thus able to respond to the needs of consumers in different use situations, accounting user's preferences and the limitations in capabilities of the mobile devices and networks. Additionally, there are usually no QoS guarantees available in currently used IP networks, which can cause big variations in the transmission capability of the network. In fixed networks this problem can be taken care of by over provisioning, but in wireless networks this is difficult. Also the mobility of the terminals affects the connection, especially if it includes switching from one network technology to another or between networks belonging to different administrative domains. (Braet et al, 2008; Cha, et al, 2006).

Basic components for adaptive media transmission over wireless networks are a source encoder, transmission unit, transport network, network monitoring mechanism, client and feedback or control channel. The active parts in wireless IPTV service are (Cha et al, 2008; Etoh et al, 2005):

- The clients: The one choosing the program through a certain interface and receiving the media streams.
- The content providers: that can deliver the media either on demand or not
- The NOP: this entity is usually separate from the content providers. Its task is mainly co-ordination, control and charging.

Heterogeneous broadband networks, wired and wireless enable seamless mobility and multimedia session continuity to achieve the paradigm of Always-Best-Connected, e.g. with the interaction defined in IEEE 802.21 standard. Video streaming and particularly TV is becoming the service that justifies the deployment of more broadband networks as there could be revenue: operators may define new business models in order to deploy mobile video streaming TV (e.g. link between IPTV and social networks). (Taniuchi et al 2009; Monpetit et al 2009)

Media streaming over wireless links is a challenging problem due to both the unreliable, time-varying nature of the wireless channel and the stringent delivery requirements of media traffic. Recent advances in video compression and streaming as well as in wireless networking technologies (next-generation cellular networks and high-throughput wireless LANs), are rapidly opening up opportunities for media streaming over wireless links. However, the erratic and time-varying nature of a wireless channel is still a serious challenge for the support of high-quality media applications. To deal with these problems, different protocol architectures have been proposed (Li et al 2008). These proposals focus on the use of content distribution mechanisms adapted to wireless networks, trying to overcome the time-variations of the wireless channels, mobility, handovers, reduces bandwidth and mainly the non-multicast nature of certain IP networks. Web caching and