Chapter 14
Multi-Platform Video Streaming Implementation on Mobile Terminals

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ABSTRACT
Video streaming technique is at present the key factor of some multimedia services. The efficient implementation of multimedia services in mobile telephones is currently a major challenge. Today, the deployment of multi-platform multimedia software in high-end mobile telephones is also a challenge. In this chapter, we will review current and upcoming mobile multimedia services and programming frameworks for video streaming software deployment in mobile telephones. We will show that the multi-platform implementation of video streaming clients in mobile telephones remains a fallacy. However, we did make innovative progress regarding the critical challenge of mitigating the adverse effects of long lasting service disruptions impacting a video streaming service. For instance, if a service disruption lasts a long time, the Server will terminate the video streaming session; subsequently, such an event usually leads to a user re-initiating the terminated session from scratch which provokes a huge loss of performance for the streaming technique; furthermore, these types of disruptions tend to be sporadic and impossible to predict. We used JADE-LEAP for programming a multi-platform software solution for the video streaming service disruptions’ challenge by utilizing the internal service of JADE-LEAP which automatically controls the availability of the mobile telephone (that is, the service disruption). We implemented a novel mechanism (protocol) using that internal service to mitigate the adverse effects of video streaming service disruptions. It improved the user experience spectacularly reducing the jitter and minimizing video communication latency.

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INTRODUCTION

Multimedia communication (Pagani, 2009) tends to be delay sensitive, bandwidth intense and loss tolerant; furthermore, it must also satisfy the user experience. A multimedia system processes and communicates with independent pieces of information (video, audio and text) in order to eventually synchronize them. The overlapping of these processing and communication tasks is a technique whose objective is to achieve an efficient use of bandwidth and to hide latency. Ming (2000) named Media Streaming as the application of streaming technique to multimedia communications; it consist on the overlapping of the processing of the information pieces in the hosts (terminals) and the communication of their associated streams in the network. An up to date overview of Media Streaming have been edited by Zhu et al. (2011).

Mobile devices has experimented an important evolution in the last recent years. On the one hand, mobile manufacturers offer high-end mobile telephones with on chip Wireless Network Interface Cards (WNIC) like Bluetooth, Wireless Fidelity (WiFi), Global Positioning System (GPS) and Third Generation (3G) Wireless networks. On the other hand, mobile telco operators have improved their networks to facilitate the access to Video on Demand (VoD) servers (Qadeer & Ahmad, 2009) and to satisfy the user requirements (Pagani & Schipani, 2005). Savo (2006) identified some general challenges that must be taken on to satisfy those user requirements. On the one hand, the dynamic adaptation of the wireless channel and Medium Access Control protocol to the number of active users in a wireless Access Point (AP). On the other hand, the design of routing algorithms, transport protocols, security procedures and mobility management. Apostolopoulos and Trott (2005) remarked that the efficient implementation of wireless video streaming service presents some important differences as compared to other services.

There are recent and interesting research works in mobile media streaming. A critical challenge in mobile media streaming is to mitigate the adverse effects of video streaming service disruptions (hence referred to as “service disruptions”). For instance, if a mobile telephone suffers a long lasting loss of communication, i.e. a service disruption, the Server will terminate the video streaming session; thus the user starts a new video streaming session from scratch and the Server has to repeat again the delivery of the video from the beginning which implies a huge loss of performance. Different authors have identified potential scenarios and reasons for service disruptions. Video and signaling packets are frequently delayed, lost or even discarded (Tse & Viswanath, 2005; Ippolito, 2008). The mobile telephone disconnects while it is roaming (Gupta & Williams, 2006), it is moving in a boundary of the coverage area (WiFi) or it is stopped in a radio degraded zone (Suárez & Menza, 2007). The mobile telephone changes its Internet Protocol (IP) address (Bolla & Mangialardi, 2009) while it is receiving video frames: they proposed the adaptation of Real Time Streaming Protocol (RTSP) to avoid the VoD Server will terminate the streaming session and starts a new session from scratch when the mobile device changes its IP. This is a very interesting work but its implementation in commercial VoD servers is improbable.

We implemented an automatic and multi-platform software mechanism to mitigate the adverse effects of service disruptions. One important obstacle was the absence of practical multi-platform Software Development Kits (SDK). Specifically, we tried to minimize the adverse effects of the Jump distance and Time off problems presented by Costa and Cunha (2004). We considered a test scenario in which the mobile telephone was connected to a WiFi AP or a 3G mobile network Base Station (BS) and the VoD Server was inside wired Internet. We used the pure RTSP (Schulzrinne & Rao, 1998) because it has been the official standard protocol for video streaming. We also