Chapter XXIII
Video and Data Dissemination in Mobile Broadcasting Environments

Panayotis Fouliras
University of Macedonia, Greece

Christos K. Georgiadis
University of Macedonia, Greece

Athanasios Manitsaris
University of Macedonia, Greece

ABSTRACT

Data dissemination has already been identified as one of the most important aspects for mobile environments and particularly so for large volumes of data such as video, with the additional constraints of speedy, accurate, and isochronous delivery to thousands of users. With the adoption of mobile broadcasting standards this factor has increased in importance. In this chapter, we present the respective issues involved, technical as well as financial and regulatory. The reader is provided with a brief, yet concise, picture of the most important traditional broadcasting techniques and video broadcasting standards for the mobile environment. We then conclude with a detailed comparative evaluation in order to better understand the merits of each approach.

INTRODUCTION

The Internet explosion has led to a vast number of services available to millions of users, worldwide at low cost. Broadband connections are nowadays so common that they have popularized bandwidth-hungry services such as Video-on-Demand (VoD). The development of fast and cost-effective mobile devices and wireless communication networks has increased the potential

of VoD, often combining it with an array of new services (such as location-based). However, this new, exiting environment has also increased the challenges that have to be addressed in order to make old and new innovative services successful, both technically as well as financially.

In its simplest form, a VoD session starts from a client who selects a video object and then requests it to be downloaded from a video server. Essentially, this is a typical file transfer—the client must download the complete file in order to play the video. Although this is a very simple approach, the time required for downloading a video can be very long, depending on several factors such as video size, connection bandwidth, connection errors and possible packet retransmission and reordering. All this increases the waiting time for a client, often rendering this approach impractical.

Video Streaming, on the other hand, allows video playback while it is still downloaded and only a substantial fraction exists in the client's buffer. This approach solves the problem of long client waiting time and reduces memory and disk requirements, but introduces other problems, such as buffer underflow and jitter. Jitter—the variance in playback rate of successive packets—can have serious negative effects on the user perceived Quality of Service (QoS). Since this depends mostly on the variability of intermittent network conditions, it is not surprising that considerable research effort has been directed on real-time data dissemination.

Of course, any approach that seems promising cannot be considered practical, unless another important factor is considered: scalability. More specifically, a popular service such as VoD will manifest itself in a system which must be able to support many simultaneous requests not only for the same video at the same time, but also for the same video at different times or for different videos altogether. This can place a huge burden on any such system.

Using Near VoD (nVoD), requests for the same video at slightly different times can be grouped together in a single broadcast. Nevertheless, the network resources to cover all possible requests may be either too expensive (in which case certain clients will not be satisfied by the result) or significant resources will be underused (e.g., expensive bandwidth if designed to meet peak, rather than average demand). Additional problems arise if "richer" capabilities are to be offered such as Fast Forward, Rewind, and fast changes among different videos.

For this reason, the general rule is to broadcast only popular videos in order to satisfy the majority of the customers; the rest of the demands are serviced (if at all) by a secondary service, which uses a small portion of the total bandwidth.

In this chapter we are focusing on the dissemination of videos in mobile broadcasting environments. First we are identifying the key issues involved; then we are outlining the main research proposals and present the main standards for video broadcasting in the mobile environment in commercial use today. A comparative evaluation is presented next, followed by concluding remarks.

ISSUES

As stated earlier, streaming popular videos has been a challenging problem, since a large client population demands the same item to be delivered and played out within a short period of time. This period should be smaller that the time t_w a client is willing to wait after sending his request. Typically, there are on average a constant number of requests over a long time period for a popular video, which suggests that a single broadcast should suffice for each batch of requests. However, the capabilities of all entities involved (server, clients, and network) are finite and often of varying degree (e.g., effective available network and client bandwidth).