Chapter XXXVI
A Model for Providing Mobile Multimedia Services Over 4G Networks

Kashinath Basu
Oxford Brookes University, UK

Muhammad Younas
Oxford Brookes University, UK

ABSTRACT

A significant proportion of the traffic on the 4th generation of mobile networks (4G) will be interactive multimedia traffic. This chapter presents the development and evaluation of an edge device model for the lu interface of a 4G network for mapping the Quality of Service (QoS) requirements and traffic characteristics of aggregated IP traffic flows belonging to multiple classes of continuous media (Audio and Video) sources and data classes from the core network onto a single ATM Virtual Channel (VC) at the access network. This model was developed as part of a wider range of research activity focused on supporting QoS in future mobile networks.

INTRODUCTION

Traditionally, multimedia services over the Internet have been restricted to the wireline environment and accessed primarily via desktop and laptop computers. However, the current trend of ubiquitous and pervasive computing is to provide mobile users with the same level of multimedia experience as available over a wireline infrastructure adhered specifically for the mobile computing environment. This includes services such as smart mobile phones, mobile TV, and audio and video sharing applications (e.g., iTunes, Napster, YouTube, Skype, etc.) that have become increasingly popular among a large population of users.

According to 3G, NTT DoCoMo plans to develop next generation phones which will be equipped with the latest version of Microsoft Windows Mobile operating system ("NTT DoCoMo", 2007). Such phones will enable user's interaction with PC through applications such as Outlook Mobile and Internet Explorer Mobile. In addition to accessing wireless LAN networks for IP telephony, these phones will provide users with touch screen facilities for operating innovative functions. For example, users will be able to access YouTube Mobile content and Mobile TV channels through streaming media software. Further the recent mobile phone provides facilities for music, 3D games, video, and high-speed Internet access. It comes with high resolution colour screen to facilitate enhanced-quality multimedia.

These multimedia services and applications require adequate level of QoS guarantees from the network in terms of the key QoS parameters, viz. delay, jitter, bandwidth, loss, and so forth, to maintain the perceptual quality and the integrity of the content. Over the years, the wireline Internet infrastructure has evolved from a passive, best-effort, QoS-less data transfer pipe to a real-time, QoS-sensitive, multiservice delivery platform capable of servicing the QoS requirements of different types of medias. During this transformation phase, the two very inherent and powerful characteristics of the Internet: its packet switching architecture and the uncomplicated IP protocol as its delivery protocol data unit (PDU) have been preserved.

With the spread of multimedia services over the mobile computing domain, there has been a need to introduce similar level of QoS support in the mobile networking arena. Typically, a mobile network system can be broadly classified into three sections: the radio network, the access network and the core network. In 2G networks viz. GSM or cdmaOne, the entire end-to-end infrastructure is circuit switched. Although this has been adequate for voice services, it cannot support QoS- enabled multiservice data delivery and is limited to data rate of only around 9.6 kbps. The roll out of the GPRS service introduced the IP infrastructure at the core level network solely for data delivery and runs in parallel with the existing circuit switched core for voice. The use of GPRS along with sophisticated encoding methods over the Internet in the GPRS/EDGE service supports data bandwidth of up to 384 kbps. Although this is a significant improvement over basic GSM's data rate, it is still inadequate for next generation of multimedia services involving high quality video and audio services. A major disadvantage of this 2.5G network was that data transfer over the air interface was still like a circuit switched call and therefore part of the efficiency of the packet switched core was lost over the air interface. The 3G network extended the parallel packet switched infrastructure to the access and air interface level. It increased the multiservice capability of the mobile networks by introducing WCDMA technology at the air-interface and ATM at the access level (RAN) to obtain a speed of around 2mbps and above (Halonen, Romero & Melero, 2003). A major advantage of using ATM at the access level is its inherent ability to support multiservice using virtual circuits (vc). These circuits may be switched or permanent and could be configured individually based on the traffic descriptors and QoS parameters required for the particular call. Therefore a video call from a user's mobile device could be configured with more resources such as adequate bandwidth and real-time support than a web browsing call. However, maintaining a separate virtual circuit for each session is both expensive and wastage of resources at both the access (UTRAN) and core levels. Moreover, it will also create scalability problems especially as more new generation of multimedia services are introduced over the mobile domain. The wireline Internet has undergone through similar problems in the recent past and has successfully addressed these issues by providing coarse grained service at the class level instead of individual call level where a class can be a group of streams sharing common characteristics viz. media property, application type, destination, and so forth. Similar

Related Content