IDEA GROUP PUBLISHING
701 E. Chocolate Avenue, Hershey PA 17033-1240, USA
Tel: 717/533-8845; Fax 717/533-8661; URL-http://www.idea-group.com
ITB8285

Chapter IX

Adaptable QoS Management Communication Architectures for User Perception

G. Ghinea
Brunel University, UK

J. P. Thomas
Oklahoma State University, USA

Distributed multimedia systems are characterised by a broad spectrum of quality of service (QoS) parameters which must be managed dynamically to ensure an acceptable user experience. Whilst there has been a considerable amount of work on QoS management itself, not the same can be said about the way that variations in QoS impact upon the user multimedia experience. We introduce the term quality of perception (QoP) to characterise the latter and, in this chapter, after a review of QoS-oriented communication architectures and protocols, highlight our experiences of using a specifically tailored adaptive communication protocol to provide an enhanced QoP.

INTRODUCTION

The concept of quality of service (QoS) in distributed multimedia systems is indelibly associated with the provision of an acceptable level of application

This chapter appears in the book, *Adaptive Evolutionary Information Systems* edited by Nandish V. Patel.

performance. Ultimately this performance is itself dependent on

1. the user's experience with the multimedia presentation which we define as quality of perception (QoP). QoP has two main components: a user's ability to analyse, synthesise and assimilate the informational content of multimedia applications, as well as his/her subjective satisfaction with the quality of such applications.
2. the service provided by the underlying network.

Such a user-biased multimedia system would be fundamentally based on a mapping linking user-centric QoP to low-level QoS parameters. Appropriate management of QoS parameters provides the potential of ensuring an optimum user experience in a distributed multimedia setting. The networking foundation on which current distributed multimedia applications are built either do not specify QoS parameters (also known as best-effort service) or specify them in terms of traffic engineering parameters such as delay, jitter, and loss or error rates. However, these parameters do not convey application-specific needs such as the influence of clip content and informational load on the user multimedia experience. There is thus an architectural gap between the provision of network-level QoS and application-level user-centric requirements of the distributed multimedia applications. This gap causes distributed multimedia systems to inefficiently use network resources and results in poor end-to-end performance, which in turn has a direct negative impact on the user experience of multimedia. In this paper we review previous work done in both these domains. This includes previous approaches to map user-centered preferences to network parameters. We propose and implement an integrated approach to this problem. In our approach we first map the user-centered parameters of a multimedia presentation to network QoS variables. We then review existing QoS-oriented communication architectures. Our mapping is implemented on an adaptable communication architecture that adapts to optimize the user experience of the multimedia presentation even as the underlying network services change due to congestion. Our results show that the mapping-based adaptable architecture does indeed provide a better experience for the user in terms of perception/enjoyment when compared to architectures that do not cater for the user.

COMMUNICATION ARCHITECTURES AND PROTOCOLS FOR MULTIMEDIA QOS

The layered communication architecture based on the OSI reference model as well as many of the network protocols in use today are ill-suited for supporting distributed multimedia applications. Traditional protocols such as TCP/IP were conceived at a time when the emphasis was laid on providing functionality for data