Chapter XV
Broadband Satellite Multimedia Networks

Paolo Chini
Università degli Studi di Siena, Italy

Giovanni Giambene
Università degli Studi di Siena, Italy

Snezana Hadzic
Università degli Studi di Siena, Italy

ABSTRACT

Nowadays there is an increasing need of broadband communication anytime, anywhere for users that expect to receive multimedia services with support of quality of service. In such a scenario, the aim of this chapter is to present the possibility of the satellite option that is particular attracting to bridge the digital divide in those areas where terrestrial solutions are unfeasible or too expensive. This chapter provides first a survey of the ETSI standardization framework for satellite networks. Then, resource management schemes for both forward and return link are described. Finally a suitable case study is provided for the integration of a DVB-S/DVB-RCS satellite system interconnected with a WiFi segment for local coverage; examples and results permit to understand different resource management implications.

INTRODUCTION

Satellite communication systems represent an adequate solution for providing high bit-rate services to users over wide areas. Important advantages of the satellite approach are: (*i*) easy support for both broadcast and multicast high bit-rate multimedia services; (*ii*) backup communication services for third-generation (3G) cellular users on a global scale; (*iii*) efficient support of high-mobility users (e.g., users on trains, planes, etc.). For many isolated areas on earth, satellites are the only solution to be connected to local Internet service providers.

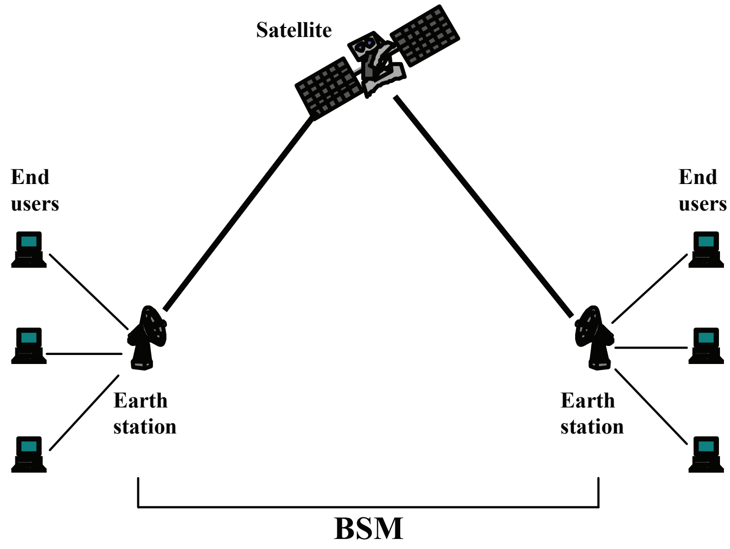
When interconnected together with local or geographical networks, satellites can be the bottleneck of the entire system because of the delay and throughput that they entail. For these reasons, getting the maximum performance out of the satellite segment is very important.

The ETSI TC-SES/BSM (*satellite earth stations and systems / broadband satellite multimedia*) working group had the task to focus on IP layer interworking for satellite networks. This working group has defined a reference *broadband satellite multimedia* (BSM) network architecture as in Figure 1. The interest here is on *geostationary orbit* (GEO) satellites. They are on an equatorial plane at an altitude of about 35,800 km. They have synchronous motion with respect to a point on the earth (i.e., 24-hour orbital period), so that they are stationary with respect to a user on the earth. Three GEO satellites would be enough to cover all the earth except Polar Regions. Due to their distance from earth, communications with these satellites is affected by a significant delay for the propagation of the electromagnetic signal (at least 250 ms for each hop).

From the protocol stack standpoint, a BSM network can involve different layers (ETSI - TR 101 985, 2002):

- The BSM network interconnects with ground network elements at layer 2, like a *bridge*.
- The BSM network interconnects with ground network elements at layer 3, so that the satellite earth stations are *routers*.
- The BSM network operates at a layer above the 3rd one: the satellite earth stations are *gateways*. In this case, these stations can perform a more accurate routing based not only on the IP datagram header, but also on information of the higher layer headers. The earth station can implement special functions, like *performance enhancing proxies* (PEP) that are important in order to improve the *transmission control protocol* (TCP) performance in satellite networks (note that a significant problem in the provision of TCP/IP services through GEO satellites is the propagation delay of the signal from the earth station to the satellite and back).

Figure 1. BSM reference network architecture



Related Content

Ubiquitous Access to Adaptive Hypermedia
Chris Stary (2009). *Handbook of Research on Mobile Multimedia, Second Edition (pp. 347-363).*
www.irma-international.org/chapter/ubiquitous-access-adaptive-hypermedia/21015

Information Security Threats to Network Based Information Systems
Sumeet Gupta (2009). *Encyclopedia of Multimedia Technology and Networking, Second Edition (pp. 691-696).*
www.irma-international.org/chapter/information-security-threats-network-based/17467

A Chunkless Peer-to-Peer Transport Protocol for Multimedia Streaming
Roberto Cesco, Riccardo Bernardiniand Roberto Rinaldo (2011). *Streaming Media Architectures, Techniques, and Applications: Recent Advances (pp. 337-360).*
www.irma-international.org/chapter/chunkless-peer-peer-transport-protocol/47525

Rapid E-Learning in the University
Ivy Tanand Ravi Chandran (2009). *Encyclopedia of Multimedia Technology and Networking, Second Edition (pp. 1200-1205).*
www.irma-international.org/chapter/rapid-learning-university/17537

An Open E-Learning Specification for Multiple Learners and Flexible Pedagogies
Colin Tattersall (2009). *Encyclopedia of Multimedia Technology and Networking, Second Edition (pp. 1100-1105).*
www.irma-international.org/chapter/open-learning-specification-multiple-learners/17523