Chapter 12

Quasi-Optimal Resource Allocation in Multispot MFTDMA Satellite Networks

Sara Alouf
INRIA, the National Institute for Research in Computer Science and Control
06902 Sophia Antipolis, France
E-mail: Sara.Alouf@sophia.inria.fr

Eitan Altman
INRIA, the National Institute for Research in Computer Science and Control
06902 Sophia Antipolis, France
E-mail: Eitan.Altman@sophia.inria.fr

Jérôme Galtier
INRIA, the National Institute for Research in Computer Science and Control
06902 Sophia Antipolis, France
E-mail: Jerome.Galtier@sophia.inria.fr
France Telecom Research and Development,
06921 Sophia Antipolis, France
E-mail: Jerome.Galtier@rd.francetelecom.com

Jean-François Lalande
INRIA, the National Institute for Research in Computer Science and Control
06902, Sophia Antipolis, France
E-mail: Jean-Francois.Lalande@sophia.inria.fr

Corinne Touati
Institute of Information Sciences and Electronics
University of Tsukuba, Japan
E-mail: corinne@osdp.is.tsukuba.ac.jp
1 Introduction

We consider a multispot geostationary satellite system for which a manager assigns satellite uplink MFTDMA (Multifrequency Time-Division Multiple Access) slots to service providers (operators). The service providers themselves operate a park of terminals distributed on the satellite area of cover. Concerning the radio channel, the satellite divides the time and frequency spectrum into time slots. Geographically, the terminals are distributed on zones, themselves being included in spots. A spot is an area covered by a satellite beam, as illustrated in Figure 1.

Figure 1: Illustration of a spot and an antenna beam.

Radio interference imposes constraints on the slots that can simultaneously be assigned in different spots that have the same frequency. A slot cannot be assigned simultaneously to more than one zone in a spot. Spots are given colors (bands of frequencies) and spots of different colors do not interfere, but spots of the same color do, and a slot can be assigned to an operator in a given zone only if the interference it experiences with the other active zones is below a given threshold. Slot assignment is static but can be changed once per hour (due to changes in demands, or to changes in atmospheric conditions, on the other hand). Every hour, the demand of the service providers is re-evaluated and a new allocation could be generated. Due to real-time constraints, solutions are needed within a few minutes.