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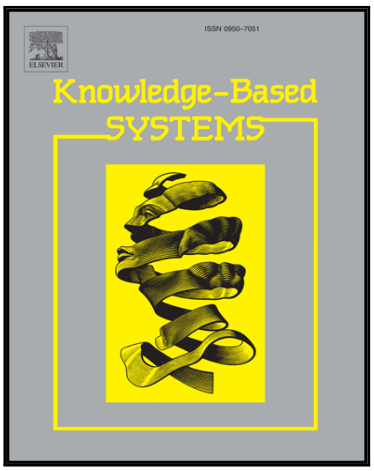

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Guofang Nan, Shunyao Wang, Zhiyong Li, Runliang Dou

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A Novel Pricing Strategy for Mobile Broadband Carriers Using Two-Stage Stackelberg Model

Guofang Nan, Shunyao Wang, Zhiyong Li, Runliang Dou*

College of Management and Economics, Tianjin University, Tianjin, 300072, P.R China

Abstract

The mobile data traffic experienced an explosive growth in the last decade. However, the revenues of mobile broadband carriers do not improve correspondingly. Recently, more and more content and application providers begin to deliver Internet service to users directly and gain great profits without constructing the broadband network. In this paper, we present a new business strategy that involves a priority-based pricing policy for users and a cooperation strategy for content providers and mobile broadband carriers. We propose a two-stage Stackelberg model in a duopolistic mobile network market. We find that the equal data arrival rate to the mobile broadband carriers is only one stable state in the follower game. However, both the equilibrium outcome in the leader game and the preferred strategy profile of social planner depend on customers' preference and the revenue rate of content providers. We outline the condition under which mobile broadband carriers and social planner obtain a win-win result. More specifically, when revenue rate is sufficiently low, the carriers should adopt the non-intellectualized pricing model if the arrival rate of H-type consumers (i.e., hating to delay) is more than that of L-type consumers (i.e., indifference to delay), and pursue the intellectualized pricing model if the arrival rate of H-type consumers is less than that of L-type consumers. Otherwise, the carriers' optimal pricing strategies may deviate from the social welfare maximizing ones. Hence, the social planner should take some regulatory policies to avoid the deviation.

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Keywords: Data traffic pricing; Differentiated services; Duopoly; Stackelberg game; Traffic prioritization.

1. Introduction

Over the last few years, with the rapid development of high-speed mobile network and the growing popularity of smart devices such as smartphone or wearable devices, the demand for data traffic of telecommunication network has experienced a dramatic growth. According to a report by Cisco, monthly global mobile data traffic reached 7.2 exabytes at the end of 2016, up from 4.4 exabytes per month at the end of 2015, and by 2021 it will be 49 exabytes[1]. Nonetheless, the remarkable growth in data traffic does not benefit mobile broadband carriers (MBCs) dramatically. On one hand, MBCs have to invest heavily in expanding bandwidth to cope with the increasing demand for data traffic. On the other hand, they still employ traditional operating patterns in data traffic business which may not contribute greatly to their profits. As a result, MBCs are caught in a dilemma where their profits do not grow at a high rate as the data traffic does.

Traditional MBCs only sell their bandwidth in delivering data flows, but do not provide differentiated services to meet users' various delay and congestion guarantee requirements. Normally, an identical price is offered to users regardless of whether they read news online, play games, or download movies. This results in inefficient utilization of bandwidth and poor profitability for MBCs. To turn things around, MBCs could possibly offer different priority

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