VOLUME DISCOUNT PRICING POLICY FOR CAPACITY ACQUISITION AND TASK ALLOCATION MODELS IN TELECOMMUNICATION WITH FUZZY QoS CONSTRAINTS

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In order to complete daily operations and to stay competitive at market, every firm has to use telecommunications networks. In today's telecom market, there exist several network providers and bandwidth brokers offering different pricing, discount and quality of service (QoS) schemes to their customers, which makes firms' capacity leasing and operation allocation problem much harder to solve. In this research, we analyze single period and single objective offline cost minimization problem of a firm under volume discounting pricing policies offered during bandwidth acquisition. The QoS levels guaranteed by network providers and the minimum QoS level which is needed for accomplishing operations without interruption are denoted as fuzzy numbers in order to absorb the imprecise nature of the real world telecom problems. The mathematical formulation of the aforementioned problem leads to a non-linear mixed integer programming model with fuzzy constraints. Thus, we propose a fuzzy set theory based novel heuristic algorithm procedure that have the capability of solving complex bandwidth vendor selection and task allocation problems by considering volume discounts offered by telecommunication capacity suppliers. Finally, the efficiency of algorithm is tested under several different test scenarios in order to find the optimal strategies for firms and to demonstrate the applicability of the methodology.

Keywords: Telecommunications, Pricing, Volume discount, Fuzzy QoS, Bin Packing, Heuristic algorithm

A Bandwidth Sourcing and Task Allocation Model in Telecommunications under Stochastic QoS Guarantees

In order to complete daily operations and to stay competitive at market, every firm has to use telecommunications networks. In today's telecom market, there exist several network providers and bandwidth brokers offering different pricing and quality of service (QoS) schemes to their customers, which makes firms' capacity leasing and operation allocation problem much harder to solve. In this research, we investigate single period and single objective offline cost optimization problem that a firm encounters when acquiring and using bandwidth at telecom market environment in which there exist several backbone providers offering different QoS levels. In addition, two important QoS parameters namely delay and jitter that are offered by network providers are modeled as random variable in order to handle the non-deterministic nature of telecommunications environment. Mentioned QoS parameters are integrated into proposed novel mathematical model via stochastic (chance) constraints. The deterministic equivalent of the suggested model turned out to be NP-Hard complexity. Hence, very effective heuristic algorithm is developed. The solution quality of heuristic is tested by provided lower bound method which relaxes integer decision variable and allows prorating. Finally, several problem instances ran by using heuristic algorithm in order to provide computational and managerial insight to the discussed sourcing and allocation problem.

Keywords: Telecommunications; Bandwidth Sourcing; Quality of Service; Stochastic Constraints; Heuristic Algorithm.