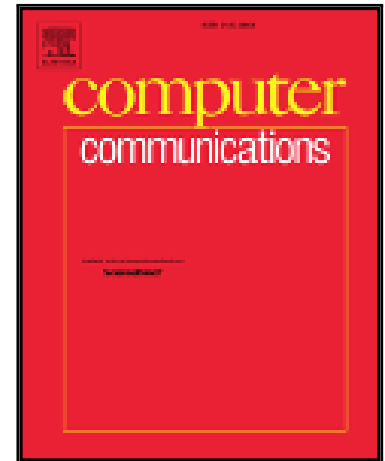


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Reducing the Reconfiguration Cost of Flow Tables in Energy-Efficient Software Defined Networks

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Abstract

Software-Defined Networking (SDN) is a new networking paradigm that is attracting the attention of the research community due to the flexibility provided by the separation between data and control planes. In particular, the SDN scenario introduces new aspects to be considered when formulating the energy-aware routing problem, such as the reconfiguration cost of flow tables. In this paper we introduce and investigate the problem of minimizing the power consumption of an SDN network while also reducing the number of rules that have to be modified in the flow tables of SDN nodes. An optimization problem formulation and a GA (Genetic Algorithm) based heuristic are presented to tackle this two-fold problem. The performance analysis, carried out over different realistic network topologies, highlights that GA is able to increase the power saving opportunities up to the 20% more than other energy-aware routing solutions proposed in the literature, while reducing the number of rules that have to be modified up to 100 times.

Keywords: Software-Defined Networks, Energy-Aware Routing, Genetic Algorithm.

1. Introduction

The reduction of the energy consumed by the Internet is one of the hot topics in networking research area during recent years [1]. The most promising approaches to improve the energy efficiency of ISP networks are based on the activation of low-power states for network devices during off peak traffic hours [2, 3]; the overall network routing is able to satisfy traffic requests and QoS constraints, with a reduced number of active devices, i.e., nodes and/or links.

Recently, the emerging Software-Defined Networking (SDN) paradigm is also gaining attention on energy efficiency issues [4], especially for data center environments [5] or hybrid IP/SDN scenarios [6]. The presence of a logically centralized device which is responsible for all the control decisions in the network increases the opportunity for the deployment of energy-aware solutions;

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