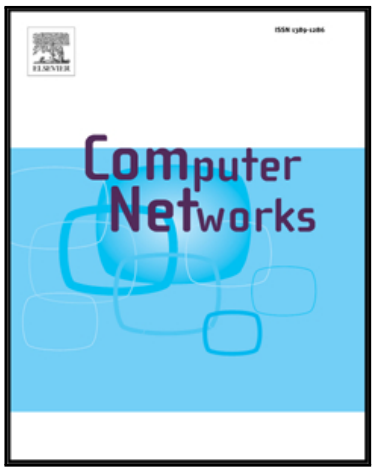

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Deadline-Aware Cooperative Data Exchange with Network Coding

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Abstract

Recent work shows that Cooperative Data Exchange (CDE) with network coding can significantly improve wireless performance, especially in data exchange scenario. Moreover, wireless networks are now capable of supporting time critical applications, e.g., video streaming. Such time-critical applications usually impose a deadline on the packet reception, i.e., beyond which, the packet is useless or invalid to the users. In this paper, we propose a deadline-aware CDE scheme with network coding, so as to maximize the total number of packets that can be timely received/decoded at wireless clients/devices. We first formulate the problem into an integer programming, and prove that it is NP-hard. For the case when the deadline of the packets is the same, we theoretically analyze the performance of two specific schemes. We then design an efficient heuristic algorithm to solve the general problem, which is based on an auxiliary graph model. Finally, simulation results demonstrate the effectiveness of the proposed scheme.

Keywords: Cooperative data exchange, time critical application, network coding

1. Introduction

In recent years, a growing demand on large file downloads and video applications at handheld wireless devices/clients has put an increasing burden on wireless communications. Because of the heavy load of the servers, it is impractical for wireless clients to download all the files from the servers. Inspired by the success of peer-to-peer (P2P) content delivery systems, one solution to address this issue is to allow wireless clients to cooperatively exchange the data among themselves, named *Cooperative Data Exchange* (CDE). Since introduced in [1], the CDE problem has attracted great attention in the research community. In

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