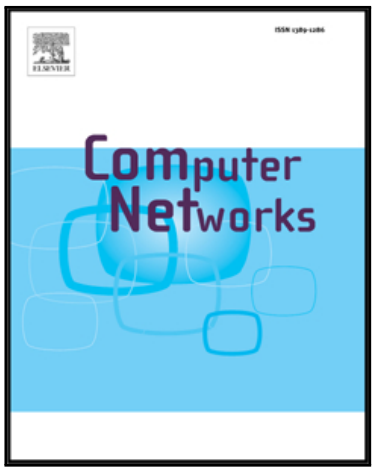

Towards Optimal Buffer Management for Streams with Packet Dependencies

Gabriel Scalosub

PII: S1389-1286(17)30365-1
DOI: 10.1016/j.comnet.2017.09.014
Reference: COMPNW 6313

To appear in: *Computer Networks*

Received date: 4 May 2017
Revised date: 25 September 2017
Accepted date: 26 September 2017

Please cite this article as: Gabriel Scalosub, Towards Optimal Buffer Management for Streams with Packet Dependencies, *Computer Networks* (2017), doi: 10.1016/j.comnet.2017.09.014

Towards Optimal Buffer Management for Streams with Packet Dependencies

Gabriel Scalosub*

Department of Communication Systems Engineering
Ben-Gurion University of the Negev
Beer-Sheva 84105, Israel
Email: sgabriel@bgu.ac.il

Abstract

We study the problem of managing a FIFO queue where traffic is an interleaving of multiple streams that have inter-packet dependencies. This situation is common when dealing with multimedia streaming traffic, where large data frames are fragmented into smaller IP packets sent independently through the network. The main difficulty in such systems is to decide which packets to discard in case of overflow, where the system's goal is to maximize the goodput, namely, the number of frames that are successfully delivered. Previous results for this problem in the presence of bounded buffers obtained a competitive ratio which was exponential in the number of packets each data frame is decomposed into. We show both randomized and deterministic algorithms with polynomial competitive ratio in all system parameters thus exhibiting an exponential improvement over the best previously known algorithm for the problem.

Keywords:
online algorithms, competitive analysis buffer management, queue management, FIFO, priority queueing, packet dependencies, QoS

1. Introduction

A substantial amount of Internet traffic nowadays consists of application-level data frames that are fragmented into smaller IP packets which are then forwarded through the network. Various protocols at different layers exist for ensuring the sound delivery of these packets (such as TCP), in order for the received data to be useful for the application. However, many applications, such as real-time multimedia streaming, cannot make use of such protocols due to strict delay constraints imposed on the traffic, which render retransmission of lost packets futile. These applications usually use connectionless protocols (such as UDP), and if too many of the data frame's packets are lost, the entire frame cannot be decoded at the receiving end, and is considered lost, although network resources have been used to deliver some of its constituent packets. Current

*Corresponding author. Phone: +972-8-647-7230