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Juan Echagüe, Vicent Cholvi, Dariusz R. Kowalski

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Effective use of congestion in complex networks

Juan Echagüe^a Vicent Cholvi^b Dariusz R. Kowalski^c

^a*Departamento de Ingeniería y Ciencias de los Computadores, Universitat Jaume I, 12071, Castellón (Spain).*

^b*Departamento de Lenguajes y Sistemas Informáticos, Universitat Jaume I, 12071, Castellón (Spain).*

^c*Department of Computer Science, University of Liverpool (UK).*

Abstract

In this paper, we introduce a congestion-aware routing protocol that selects the paths according to the congestion of nodes in the network. The aim is twofold: on one hand, and in order to prevent the networks from collapsing, it provides a good tolerance to nodes' overloads; on the other hand, and in order to guarantee efficient communication, it also incentivize the routes to follow short paths. We analyze the performance of our proposed routing strategy by means of a series of experiments carried out by using simulations. We show that it provides a tolerance to collapse close to the optimal value. Furthermore, the average length of the paths behaves optimally up to the certain value of packet generation rate ρ and it grows in a linear fashion with the increase of ρ .

Key words: Complex Networks, Routing Strategies, Congestion Control
PACS: 89.75.Fb, 89.75.Hc, 89.75.Da

1 Introduction

Many networks use routing strategies that, either implicitly or explicitly, are weighted in nature. Examples are communication and computer networks, where the link weights are determined by predestined traffic protocols, vehicle transportation in road networks, etc. The main idea of such weighted routing is to assign a (possible different) weight to all the links in the network, and then to select a path that minimizes the sum of the weights assigned to the links that form the path.

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