Title: Traffic optimization on networks

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Description:

The objective of this research project is the proposal of intelligent routing algorithms in graphs which improve the communication rate avoiding congestion. The application of these algorithms will be on Internet information traffic simulators and other important physical systems.

The motivation of this work lays on the fact that Internet is a complex network, with properties which differentiate it from the traditional regular and random networks. In fact, most of the networks found in nature, and some technological networks such as Internet and WWW, are complex networks.

The study of complex networks has become in the last years an important multidisciplinary research field, where converges the interest of sociologists, biologists, physics and engineers, among many others. Some of the most remarkable properties of complex networks are the scale-free degree distributions, the high clustering coefficients (i.e. the existence of more triangles than expected in random networks), the assortativity (i.e. the correlation of nodes of high degree to connect with similar nodes), the hierarchical structures, and the communities' structures.

All these properties generate particular behaviors of the dynamics which take place on complex networks, sometimes difficult to explain. In particular, in this research project the complex network is Internet, the dynamics is the routing of packages, and the object of study is the congestion of the network in order to find new routing algorithms capable of avoiding it.

The working plan is the following:

1. Introduction to the problem: study of the basic bibliography on complex networks, in particular the simulation of dynamics on graphs.

2. Analysis of the existent algorithms and protocols.

3. Learning of our development tools: we have a large library for the treatment of complex networks, in which the new algorithms should be integrated.

4. Design, implementation and test of the new routing algorithms.

5. Analysis of the real traffic at the Internet backbone level.

References:

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