basque center for applied mathematics

TWO MASTER THESIS PROPOSAL
NETWORKS group at the Basque Center for Applied Mathematics
http://www.bcamath.org/

Title: Near-Optimization with and Testing of Index Policies in Internet Routers.
Summary: The fundamental challenge in computer networks is the one of efficient use of network resources, such as buffers and bandwidth of the routers. Router optimization can be modeled as a queueing model and approached by means of dynamic programming, which usually requires long computational time and therefore it is not implementable. A particular Lagrangian relaxation method leads to a decomposition of the problem into single flows, which can typically be much faster to solve by the so-called Whittle index. This solution leads to a set of priority rules that give a higher priority of buffering and transmission to some flows than to others, which would be dropped if there is no buffer space. The objective of this work will be to compute the Whittle index for different variants of Internet protocols (especially TCP) and test its performance in a router by means of network simulator (ns3).

Keywords: Buffer management, Dynamic programming, TCP, ns3
Contact: Peter Jacko, Basque Center for Applied Mathematics. email: jacko@bcamath.org.
web: http://www.bcamath.org/jacko

Title: Modeling a sensor system for the trafic analysis in large bandwidth data networks.
Summary: In this project we will develop mathematical models for a sensoring system of the traffic in a large bandwidth data network. We will use queueing theory and markov chains in order to investigate the performance of sensor systems. Given the complexity of systems under consideration, exact analysis might be out of reach, and we will thus resort to numerical resolution. We will use advanced numerical methods to solve the mathematical models, and to obtain insights into the performance of the system. This project will be carried out in collaboration with the department of Electrical Engineering of the UPV-EHU.

Keywords: Traffic analysis, Markov chains, M/G/1/K model
Contact: Maaike Verloop Basque Center for Applied Mathematics. email: verloop@bcamath.org and
Urtzi Ayesta, Basque Center for Applied Mathematics. email: ayesta@bcamath.org
web: http://www.bcamath.org/verloop and http://www.bcamath.org/ayesta