

PROJECT / Internet Traffic Measurements, Modelling and Statistical Analysis

SCALE III


Main Objective:

This project aims at making a significant contribution in the area of Internet traffic engineering by addressing important issues concerned with advanced traffic measurements schemes and statistical analysis, and traffic modelling and control. It gives continuity to the research that this interdisciplinary team has been carrying out since 2000 within the scope of projects SCALE POSI/CPS/34826 and PERMNET (POSI/CPS/42069). The project is expected to have a strong impact on the network dimensioning and resource management of the future Internet. Its workplan comprises the following five tasks:

Task 1 addresses the statistical analysis of Internet traffic. Following work started in project PERMNET, special attention will be given to the use of multivariate statistical analysis techniques to characterize the behaviour of Internet users and the dependencies between user behaviour, user location and network performance. The task will also address the characterization of traffic burstiness, given the lack of simple insightful procedures to reach, in practice, conclusions about traffic processes from burstiness descriptors.

In Task 2 we will continue work started in project PERMNET involving fast parameter fitting procedures for traffic models capable of capturing the scaling behaviour observed in Internet traffic. Besides improving the previously developed fitting procedures, we will focus on the derivation of fast online parameter updating algorithms and short-term model-based forecasting procedures for admission control and resource allocation.

Task 3 deals with traffic measurements and utilizes results from Tasks 1 and 2. Most measurement systems can be characterized by having minimal storage and processing at the measurement probes, which may result in large volumes of data being transferred to the collector. We will research two alternative solutions for this problem: the use of sampling techniques and system architectures where the probes provide a comprehensive description of the traffic (via a traffic model or a set of traffic descriptors). A system with these characteristics will be specified and developed.



In Task 4 we will address the impact of the high variability of Internet traffic due to unresponsive traffic on the throughput of long TCP flows. This is an important question for network operators, in particular to charge their heavy users and to regulate the traffic. We will derive formulas and qualitative results for the performance of long flows. Task 5 will study bounds and approximations for IP traffic processes and performance measures. Following work started in project PERMNET, we will address the approximation of IP traffic through packet level ON-OFF models, by combining information on the packet size distribution and packet interarrival process. In addition, we will derive stochastic bounds for performance measures of Internet networks with non-Poissonian interarrival times, emphasizing the sample-path approach, which is useful when comparing, via simulation, performance measures of the involved processes.

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Team: [Rui Jorge Morais Tomaz Valadas](#), Carlos Belo, [Antonio Manuel Duarte Nogueira](#), [Paulo Jorge Salvador Serra Ferreira](#), Daniel Zaragoza, [Susana Isabel Barreto de Miranda Sargento](#), Helder Manuel Lima Veiga

Groups: [Telecommunications and Networking – Av](#), [Network Architectures and Protocols – Lx](#)

Partners: CEMAT

Local Coordinator: [Rui Jorge Morais Tomaz Valadas](#)
