Short abstract

The Internet has experienced a fast evolution in the last years, mainly due to the widespread availability of new resources (such as social networks and video sharing websites) and the ever growing number of active users (on 31 January 2011, IANA allocated the last two unreserved /8 blocks of IPv4 addresses). Teletraffic engineering will play a key role in the future development of the Internet since the planning of cost-effective network infrastructures able to satisfy the customer requests (in terms of quality as well as costs) will be a major problem for the different ISPs. This issue, already addressed in the traditional telephone networks, is even more critical in the framework of the Internet due to the heterogeneous network technologies and the unpredictable, almost *chaotic*, nature of the traffic flows.

This talk provides a critical overview on different aspects related to traffic modelling and performance evaluation.

First, the concept of Quality of Service (QoS) is introduced, taking into account the network control mechanisms that can be used at different time scales and their effect on traffic flows.

Then different methodologies for network performance evaluation will be discussed, highlighting their use in different network scenarios and the underlying approximations. Some relevant traffic models (ranging from the traditional Poisson process to fractals) will be discussed, taking into account traffic sources in isolation as well as the effect of network feedbacks (namely, flow and congestion control mechanisms) on the throughput.

Finally, "network calculus" approaches will be discussed. On one hand, in the (deterministic) network calculus framework, worst-case bounds on backlog and delay can be easily derived when the amount of traffic is controlled by a token-bucket filter and resources are allocated in the routers along the path of the data (as in the IntServ architecture). On the other hand, stochastic network calculus can lead to much tighter bounds at the expense of small violation probabilities.