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Guest editorial

IP is clearly emerging as the networking paradigm for the integration of the traffic flows generated by a large variety of new and old telecommunications applications (telephony, Web browsing, electronic mail, file transfer, remote login, multimedia multicasting, e-business,...), whose performance requirements may be extremely different from one another. This situation has generated a great interest in the development of techniques for the provision of Quality of Service (QoS) guarantees in IP networks. Two proposals have already emerged from the IETF groups, named Integrated Services (IntServ) and Differentiated Services (DiffServ), but research and experiments are continuing in order to identify the most effective architecturesand protocols for different networking scenarios.

The Italian Ministry for University and Scientific Research has been funding a research program on these topics, named "Techniques for quality of service guarantees in multi-service telecommunication networks" or MQOS for short, in the years 1999 and 2000. At the end of its activity, the MQOS program organized the *International Workshop on QoS in Multi-service IP Networks* (QoS-IP 2001) in Rome (Italy), in January 2001, for the presentation of high-quality recent research results on QoS in IP networks, and the dissemination of the most relevant research results obtained within the MQOS program. The QoS-IP 2001 proceedings were published as volume 1989 of the LNCS series by Springer, and they contained two invited papers as well as 26 papers selected from an open call.

This special issue of Computer Networks contains extended and improved versions of the 10 best papers presented at QoS-IP 2001. These papers provide a clear view of the state of the art of the research in the field of QoS provisioning in multi-service IP networks, spanning topics from architectural issues to algorithmic and performance issues, considering wireline as well as wireless networks; we expect that these papers will be a valuable reference for years to come.

The paper "Design and implementation of scalable edge-based admission control" by P. Yuan, J. Schlembach, A. Skoe, and E. Knightly, describes a distributed admission control scheme that uses passive measurements performed at egress routers, so as to achieve scalability, and reports results collected from a testbed implementation of the scheme.

The paper "Implementation schemes for multicast bandwidth brokers in multidomain networks" by A. Borella, G. Cancellieri, E. Pagani, and G.P. Rossi, describes new approaches for the provision of QoS guarantees to multicast traffic flows in DiffServ IP networks, focusing on QoS multicast routing algorithms, and on call admission control algorithms for the implementation of distributed bandwidth brokers for multicast traffic.

The paper "Input-queued router architectures exploiting cell-based switching fabrics" by M. Ajmone Marsan, A. Bianco, P. Giaccone, E. Leonardi, and F. Neri, discusses input queued and combined input/output queued router and switch architectures, with special attention to scheduling algorithms for variable size packets, showing that input queued and combined input/output queued architectures can provide performance advantages over output queued architectures.

The paper "Enhanced weighted round robin schedulers for accurate bandwidth distribution in packet networks" by A. Francini, F.M. Chiussi,

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R.T. Clancy, K.D. Drucker, and N.E. Idirene, presents enhancements of existing weighted round robin schedulers that combine a simple implementation with the possibility of a hierarchical structure, a combination of best effort and guaranteed bandwith flows, and a reduced burstiness in packet transmissions.

The paper "Analysis and simulation of WF^2Q+ based schedulers: comparisons, compliance with theoretical bounds and influence on end-to-end delay jitter" by N. Ciulli and S. Giordano, discusses the characteristics of different implementations of WF^2Q+ schedulers, using both analytical results and simulation, proving that alternate implementations lead to differences in performance.

The paper "Quality of service support over multi-service wireless Internet links" by G. Xylomenos and G.C. Polyzos, discusses the adaptation of link-layer protocols to QoS requirements of applications and to transport layer protocols, proposing the use of a multi-service link-layer architecture, which is shown to provide very good performance through simulation experiments.

The paper "GPRS + IntServ/RSVP: an integrated architecture" by G. Priggouris, S. Hadjiefthymiades, and L. Merakos, describes an architecture to provide QoS guarantees in the GPRS core network using the IntServ approach.

The paper "Wireless resource management using genetic algorithm for mobiles equilibrium" by M. Moustafa, H. Habib and M. Naghshineh, discusses the use of a special class of optimization techniques, known as genetic algorithms, to jointly optimise the bit rate and the power of the wireless terminals in a cell of a cellular mobile communication system, showing that significant gains are possible with respect to the case in which the optimization considers just one of the two metrics.

The paper "TSpec enforcement for MPEG video transmission over the next generation Internet: an analytical framework" by A. Lombardo and G. Schembra, describes an analytical model to evaluate the impact of feedback on the output rate of MPEG encoders operating in an IntServ network.

A methodology for the performance analysis of TCP Reno flows is presented in "An analytical framework for the performance evaluation of TCP Reno connections," by C. Casetti and M. Meo. The proposed methodology stems from a Markovian model of a single TCP source, and eventually considers the superposition and interaction of several such sources using standard queuing analysis techniques. The results are validated by means of simulation, and show the capability of the model to accurately predict performance indices such as throughput, queuing delay and segment loss probability in different traffic settings.

The preparation of this special issue has benefited from the hard work of many people: the paper authors and reviewers in particular. We wish to thank all of them for their cooperation and timeliness. Many thanks are also due to Ian Akyildiz and Harry Rudin, Editors-in-Chief of Computer Networks, who suggested the possibility of this special issue and were of enormous help during its preparation.

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