

Editorial
Guest editorial

The current Internet popularity and growth impose the necessity of optimal usage of network resources. Moreover, the increasing demand for services with different Quality of Service (QoS) requirements, together with the progressive increase in traffic volumes, imposes a re-definition of Internet capabilities. This aim can only be achieved through open international co-operation of both engineering, lead by the IETF, and academic efforts. The COST Action 263 aims at the coordination, from a European perspective, of concerted actions among participating organisations and research groups active in the field of the Quality of future Internet Services (QofIS), with the QofIS workshop being its main scientific event. COST sponsorship is also used for other existing events to give them the appropriate focus.

The COST 263 Action participates in QofIS relevant clustering of IST projects, and establishes contacts with European and other International bodies. Among others, COST 263 is supporting initiatives to create a QofIS Network of Excellence within the sixth Framework Programme, maintains active contacts with Eurescom, IETF, TMF, Internet2, Qbone, TF-NGN, etc. monitors and helps disseminating further ongoing practical work in the IST QoS cluster comprised of Aquila, Tequila, Cadenus, M3I, Long, and other relevant projects.

COST 263 created the framework for an annual international workshop on QofIS, now a relevant international conference on QoS for the Internet. The first QofIS workshop (QofIS'00) was held in Berlin (Germany) on September 25, 2000. The second workshop (QofIS'02) took place in Coimbra (Portugal) in September 24–26, 2001; while the third workshop will be held in Zurich (Switzerland) on October 16–18, 2002. The following QofIS'03 is already scheduled to be held in Kista (Sweden). The workshop proceedings are published by Springer in Lecture Notes in Computer Science series and are distributed at the event. Based on the workshop outcome and on the need to deepen certain topics from a more focussed perspective, COST 263 has accepted the kind invitation of Computer Communications Journal to prepare a special issue.

This Special Issue is devoted to the best papers presented at the Second International Workshop on Quality of future Internet Services, QofIS'01, held in Coimbra. All QofIS'01 authors were asked to produce extended and updated versions of their papers and to submit them to a selection

process for publication in this Special Issue. After this selection process, from the 22 papers presented at QofIS'01, eight of them were finally accepted (35% acceptance ratio).

These eight papers plus two invited papers are included in this Special Issue. These papers cover QoS routing, capacity admission control (CAC) methods, differentiated services (DiffServ) networks, traffic engineering strategies, application design issues, and charging and billing in the Internet.

In the paper *An Analytical Design of Optimal Payout Schedulers for Packet Video Receivers*, the authors address the trade-off that must be considered when designing packet video receivers. An analytical model that captures stream continuity and stream latency behaviours in best effort networks is used to analyse the performance gains of the optimal payout scheduler.

The paper *On Call Admission Control for IP Telephony in Best Effort Networks*, proposes a CAC solution to cope with the trade-off between efficient utilisation of bandwidth and implementation complexity to support voice communication with acceptable quality over best effort IP networks, without e.g. DiffServ mechanisms.

One approach for supporting service differentiation, which is followed by the DiffServ architecture, is to add mechanisms inside the network routers. Drawbacks of this approach are the increased complexity, compared with the Internet today. An alternative approach can be based on installing a simple congestion mechanism in the network, such as Explicit Congestion Notification (ECN) marking, that informs users of the congestion cost their traffic is incurring. The paper *Service Differentiation in ECN Networks using Weighted-Based Congestion Control for various Packet Marking Algorithms*, investigates the service differentiation in terms of average throughput and achieved performance using a weighted window-based congestion control.

In the paper *A Framework for Providing Differentiated QoS Guarantees in IP-based Networks*, the authors describe the admission control and resource management mechanisms together with network services implemented in the pilot network of the IST AQUILA project. Special emphasis is given to the implementation of traffic classes. The described mechanisms operate at time scales that range from the long and medium term down to packet-level scheduling.

The paper *The Two Markers System for TCP and UDP Flows in a Differentiated Services Network* proposes a marking scheme that considers both the TCP dynamics and the interaction of TCP and UDP traffic in DiffServ networks. The use of two markers, one at TCP sources to control the dynamics of TCP flows, and another at the edge of DiffServ domains to fairly mark aggregate flows, is discussed and analysed.

In the paper *The TCP Control Block Interdependence in Fixed Networks—New Performance Results*, the authors explore the use of information collected from existing TCP connections in order to initialise control variables of new TCP connections. The paper investigates and compares two TCP control block interdependence algorithms along with their performance and fairness gains.

The motivation for the problem addressed in the paper *Profile-Based Routing and Traffic Engineering*, arises from the needs of service providers who must dynamically reserve bandwidth guaranteed routes in carrier's and ISPs' networks. This paper presents a new algorithm and framework for dynamic routing of bandwidth-guaranteed flows.

The paper *On the Complexity of QoS Routing* presents an exact QoS routing algorithm and analyses its complexity for various cases. The focal point of the paper is not the proposed algorithm itself but the complexity of QoS routing. In the general case of additive link weights, QoS routing is an NP-complete problem, that is, a problem that is unsolvable in practical terms. The paper, however, presents arguments that point to the fact that in the majority of realistic networks the QoS routing problem is not NP-complete and, thus, is feasible.

The two invited papers included in this Special Issue, respectively, deal with two of the hottest topics in next generation Internet, namely Route and Resource Management, and Charging and Pricing.

The first invited paper is entitled *A New Traffic Engineering Manager for DiffServ/MPLS Networks: Design and Implementation on an IP QoS Testbed*, and proposes the TEAM tool (a Traffic Engineering Automated Manager), which is designed to provide a novel and unique architecture capable of managing large scale MPLS/DiffServ networks.

The second invited paper, entitled *A Market-Managed Multi-service Internet*, describes an approach to managing QoS using pricing, which also allows open innovation for providers through their tariffs and for customers in their use

of the network for new applications. This paper presents a broad picture of the achievements of the Market Managed Multi-service Internet (M3I) IST project.

This Special Issue ends with a short note on the keynote speech presented at the QofIS'2001 workshop by Roberto Sabatino. In this note the author presents the SEQUIN project, which involves eight partners in seven countries and is co-funded by the European Commission under the Information Society Technologies (IST) Programme. The objective of SEQUIN is to define and implement an end-to-end approach to Quality of Service (QoS) across the pan-European network for research, GEANT, and the National Research and Education Networks (NRENs) that connect to GEANT.

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F. Boavida^{a,*}

J. Solé-Pareta^b

^a*Departamento de Engenharia Informática, Universidade de Coimbra, Pólo II Pinhal de Coimbra, 3030-290 Coimbra, Portugal*

E-mail address: boavida@dei.uc.pt

^b*Departament d'Arquitectura de Computadors, Universitat Politècnica de Catalunya, Jordi Girona, 1-3, Mòdul D6 (Campus Nord), 08034*

Barcelona, Catalunya, Spain

E-mail address: pareta@ac.upc.es

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* Corresponding author.



Fernando Boavida received his PhD in Informatics Engineering in 1990, and he currently is an Associate Professor at the Department of Informatics Engineering (DEI) of the Faculty of Sciences and Technology of the University of Coimbra. He is the leader of the Laboratory of Communications and Telematics of DEI and the President of the Computing Centre of the University of Coimbra. His main research interests are Multimedia Distributed Systems and Quality of Service in Communications Systems. He was

the chairman of the Program Committee of QofIS'2001—Second International Workshop on Quality of future Internet Services. His publications include one book, three book chapters, and over 20 papers in national conferences and 55 papers in international refereed journals and conferences. He participated in European initiatives such as RARE (Réseaux IP Européenes), EWOS (European Workshop for Open Systems) and COST 263. He is a member of ACM and of IEEE, and he is a licensed Professional Engineer. He is a member of the Editorial Advisory Board for Computer Communications. His homepage is at <http://www.dei.uc.pt/~boavida>.



Josep Solé-Pareta was awarded his Master's degree in Telecommunication Engineering in 1984, and his PhD in Computer Science in 1991, both from the Universitat Politècnica de Catalunya (UPC). In 1984 he joined the Computer Architecture Department of UPC. Since 1992 he has been an Associate Professor with this department. He spent the summers of 1993 and 1994 at the Georgia Institute of Technology. He has participated in the Spanish R&D Programme for the development of the Broad-

band Communications in Spain (PLANBA). He is co-founder and member of the Advanced Broadband Communications Centre of UPC (<http://www.ccaba.upc.es>). His current research interests are in Broadband Internet, High-Speed and Optical Networks, with emphasis on traffic engineering, traffic characterisation, traffic management and QoS provisioning. He has participated in INFOWIN, MICC and IMMP ACTS projects, and currently is participating in LION, DAVID and LONG IST projects. He was a member of the Infocom'98 Program Committee, and currently is member of the program committee of the QofIS workshop, which is annually organized by the COST 263 Action. He is a member of the IEEE.