NETWORKING 2000

Broadband Communications, High Performance Networking, and Performance of Communication Networks

IFIP-TC6/European Commission International Conference
Paris, France, May 14-19, 2000
Proceedings

Springer
Preface


In view of the three sponsoring Working Groups, there were three separate tracks, one per Working Group. Each track was handled by a different co-chairman. Specifically, the track of Working Group 6.2 was handled by Ulf Körner, the track of Working Group 6.3 was handled by Ioanis Stavrakakis, and the track of Working Group 6.4 was handled by Serge Fdida. The overall program committee chairman was Harry Perros, and the general conference chairman was Guy Pujolle.

A total of 209 papers were submitted to the conference of which 82 were accepted. Each paper was submitted to one of the three tracks. Papers within each track were reviewed separately, and the decision as to which papers to accept was taken separately within each track. For presentation purposes, most of the sessions in the final program were made up by mixing papers from the three tracks.

The program covers a variety of research topics which are of current interest, such as wireless networks, optical networks, switching architectures, residential access networks, signaling, voice and video modelling, congestion control, call admission control, QoS, TCP/IP over ATM, interworking of IP and ATM, internet protocols, differentiated services, routing, multicasting, real-time traffic management, resource management and allocation, and performance modelling.
VI  Preface

We would like to thank the program committee members and the referees. Without their dedication and hard work this conference would not have materialized. We are also indebted to our two web masters Costas Tsibanis and Dimitris Koutoulas (with special thanks to Costas) at the Network Operation Center of the University of Athens, for setting-up and managing the conference’s web site.

March 2000

Guy Pujolle
Harry Perros
Serge Fdida
Ulf Körner
Ioannis Stavrakakis
Executive Committee

General Chair
Guy Pujolle - France

Steering Committee
André Danthine - Belgium

General Manager
Eric Horlait - France

Technical Program Chair
Harry Perros - USA

Special Program Chair: Broadband Communications
Ulf Körner

Special Program Chair: Performance of Communication Systems
Ioannis Stavrakakis - Greece

Special Program Chair: High Performance Networking
Serge Fdida - France

Publicity Program Chair
Raouf Boutaba - Canada

Tutorial Chair
Eric Horlait - France

Local Arrangement and Registration Chair
Catherine Plottier - France

Organizing Chair
Jean-Alain Hernandez - France
René Joly - France
Program Committee Members

Augusto Albuquerque - Brazil
Harmen van As - Austria
Augusto Casaca - Portugal
Paolo Castelli - Italy
Imrich Chlamtac - USA
Jean-Pierre Coudreuse - France
Nelson L. S. Fonseca - Brazil
Luigi Fratta - Italy
Giorgio Gallazzi - Italy
Andre Girard - Canada
Villy B. Iversen - Denmark
Bijan Jabbari - USA
Konosuke Kawashima - Japan
Peter Key - UK
Daniel Kofman - France
Paul Kuehn - Germany
Helmut Leopold - Austria
John Luetchford - Canada
Lorne Mason - Canada
Serafim Nunes - Portugal
Guido Petit - Belgium
Sathya Rao - Switzerland
Joao Rodrigues - Portugal
Catherine Rosenberg - UK
Tadao Saito - Japan
Amardeo Sarnea - Germany
Marion Schreinemachers - Netherl.
Jan Slavik - Czech Republic
Samir Tohme - France
Danny Tsang - Hong Kong
Finn Arve Aagesen - Norway
Andres Albanese - USA
Chase Bailey - USA
Ermanno Berruto - Italy
Andrew Campbell - USA
Jon Crowcroft - UK
Andre Danthine - Belgium
Walid Dabbous - France
Michel Diaz - France
Sarolta Dibuz - Hungary
Christophe Diet - USA
Otto Duarte - Brazil
Wolfgang Effelsberg - Germany
Nicolas D. Georganas - Canada
Enrico Gregori - Italy
Roch Guerin - USA
Christian Haitema - USA
Marjory Johnson - USA
Farouk Kamoun - Tunisia
Koos Koen - RSA
Jacques Labetouille - France
Jean-Yves Le Boudec - Switzerl.
Guy Leduc - Belgium
Olli Martikainen - Finland
Steve Pink - Sweden
Nina Taft Plotkin - USA
Radu Popescu-Zeletin - Germany
Luigi Rizzo - Italy
Aruna Seneviratne - Australia
Otto Spaniol - Germany
Ralf Steinmetz - Germany
David Hutchison - UK
Chris Blondia - Belgium
Miklos Boda - Hungary
Herwig Bruneel - Belgium
Olga Casals - Spain
Prosper Chemouil - France
Giovanni Colombo - Italy
Tony Ephremides - USA
Andras Farago - USA
Erol Gelenbe - USA
Mario Gerla - USA
Fabrice Guillemin - France
Gerard Hebuterne - France
Demetres Kouwatso - UK
Karl Lindberger - Sweden
Jon Mark - Canada
Marco Marsan - Italy
Lazaros Merakos - Greece
Jouni Mikkonen - Finland
Debasis Mitra - USA
Naotama Morita - Japan
<table>
<thead>
<tr>
<th>Name</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arne Nilsson</td>
<td>USA</td>
</tr>
<tr>
<td>Raif Onvural</td>
<td>USA</td>
</tr>
<tr>
<td>Ramon Puigjaner</td>
<td>Spain</td>
</tr>
<tr>
<td>James Roberts</td>
<td>France</td>
</tr>
<tr>
<td>Yutaka Takahashi</td>
<td>Japan</td>
</tr>
<tr>
<td>Ahmed Tantawy</td>
<td>USA</td>
</tr>
<tr>
<td>Phouk Tran-Gia</td>
<td>Germany</td>
</tr>
<tr>
<td>Jorma Virtamo</td>
<td>Finland</td>
</tr>
<tr>
<td>Adam Wolisz</td>
<td>Germany</td>
</tr>
<tr>
<td>Lyman Chapin</td>
<td>USA</td>
</tr>
</tbody>
</table>
List of Reviewers

Kostas Tsibantis  Koos Koen  Gerard Hebuterne
Harman van As  Jacques Labetoulle  Raif Onvural
Augusto Albuquerque  Jean-Yves Le Boudec  Ahmed Tantawy
Lazaros Merakos  Guy Leduc  Karl Lindberger
Augusto Casaca  Olli Martikainen  Marco Marsan
Imrich Chlamtac  Steve Pink  David Hutchinson
Nelson L.S. Fonseca  Nina Taft Plotkin  Ralf Steinmetz
Luigi Fratta  Ralu Popescu-Geletin  Giovanni Colombo
Giorgio Gallassi  Luigi Rizzo  Serge Fdida
Andre Girard  Aruna Seneviratne  Debasis Mitra
Villy B. Iversen  Otto Spaniol  Ulf Koerner
Bijan Jabbari  Chris Blondia  James Roberts
Konasuke Kawashima  Miklos Boda  Lyman Chapin
Peter Key  Herwig Bruneel  Philippe Owezarski
Daniel Kofman  Olga Casals  Bart Steyaert
Paul Kuehn  Tony Ephremides  Stefano Giordano
Helmut Leopold  Andreas Farago  Samuli Aalto
Lorne Mason  Erol Gelenbe  Norbert Vicari
Serafim Nunes  Mario Gerla  Patricia Wilcox
Tadao Saito  Demetres Kovatsos  Michael Mens
Danny Tsang  Jon Mark  Stefan Koehler
Finn Arve Aagesen  Ioannis Stavarakakis  Henning Sanneck
Andres Albanese  Joumi Mikkonen  Nedo Celandroni
Chase Bailey  Arne Nilsson  Francesco Potorti
Ermanno Berruto  Ramon Paugianer  Vittorio Ghini
Andrew Campbell  Yutaka Takahashi  Raffaele Perotto
Jon Crowcroft  Phouk Tran-Gia  Kurt Tutschka
Andre Danthine  Jorna Virtamo  Shojo Kasahara
Walid Dabbous  Adam Wolisz  Oliver Rose
Michel Diaz  Jean-Pierre  Mathias Duemmler
Sarolta Dibuz  Coureuse  Kenji Leibnitz
Christophe Diet  John Luetchford  Lars Wolf
Otto Duarte  Guido Petit  Luigi Verri
Wolfgang Effelsberg  Sathiya Rao  Marco Di Concetto
Nicolas D. Georganas  Joao Rodrigues  Nikolaos Mitrou
Enrico Gregori  Catherine Rosenberg  Fabrizio Zizza
Roch Guerin  Jan Slavik  Roberto Paglino
Christian Huitema  Samir Tohme  Giorgio Gallassi
Marjory Johnson  Prosper Chemouil  Andrea Bianco
Farouk Kamoun  Fabrice Guillemin  Emilio Leonardi
Meo Michela  
Claudio Casetti  
Renato Lo Cigno  
Marco Mellia  
Fabio Neri  
Gian Paolo Rossi  
Iakovos Venieris  
Luigi Masumeci  
Franco Davoli  
Andrea Baiocchi  
Sergio Palazzo  
Sebastien Ardon  
Christos Douligeris  
Leandros Tassulas  
Dimitrios Serpanos  
Michael Paterakis  
Jeff Capone  
Elias Manolakos  
Sophia Tsakiridou  
Bjorn Landfeldt  
Jonathan Chan  
Enzo Mingozzi  
Dirk Staehle  
Celia Ramos  
J. Monteiro  
Boris Tsybakov  
Dimitrios Makrakis  
Michael Devetsikiotis  
Klara Nahristedt  
Denis Collange  
Philippe Olivier  
Marinho Barcellos  
Edmundo Madeira  
Rene Boel  
Udo Krieger  
Ilka Norros  
Villy Baek Iversen  
Emilio Leonardi  
Jose R. Gallardo  
Ioannis Nikolaidis  
Naoki Yamanaka  
Guido H. Petit  
Masaki Aida  
Ioannis Lambadaris  
Kaoru Sasaki  
Naoto Miyoshi  
Arata Koyke  
Hiroyuki Kawano  
Shigeo fus Suzuki  
Noriaki Kamiyama  
Naoki Naoki  
Miki Yamamoto  
Marcelo Rubinstein  
Paulo Goncalves  
Paulo Vidal  
Artur Ziviani  
Bo Friis Nielsen  
Lee Johnston  
John Cashnie  
Steven Simpson  
Laurent Mathy  
Mark Banfield  
Ryutaro Kawamura  
Piet Demeester  
Bo Friis Nielsen  
Sebastia Galmes  
Harry G. Perros  
Henrik Christiansen  
Salvador Balle  
Guillem Femenias  
Nikolas Mitrou  
David McDonald  
Hajer Tounsi  
Ilhem Lengliz  
Antonio Loureiro  
Abdelfattah Belghith  
Thomas Fuhrmann  
Farouk Kamoun  
Jogesh Muppala  
Manivasakan  
Rathinam  
Jean-Jacques Pansiot  
Thomas Ziegler  
Guy Pujolle  
Kave Salamatian  
Khalidoun Al Agha  
Ayavadi Ganesh  
Sambit Sahu  
Sapratik  
Bhattacharyya  
Koenraad Laevens  
Lars Staalhagen  
Allan T. Andersen  
Dorte Moeller  
Jana Tuckova  
Qiang Ren  
Arunabha Sen  
Jose M. Barcelo  
Dominique Delisle  
Gyorgy Miklos  
Loren Cerd  
Leos Bohac  
Victor Yau  
Jianping Pan  
Yu Zeng  
Brahim Bensaou  
Dongmei Zhao  
Jianping Pan  
Olivier Bonaventure  
Jean-Marc Uze  
Geoffroy Jennes  
Ravi Mazumdar  
Ness Shroff  
Laurent Massoulie  
Edwin Chong  
Andre Girard  
Hossam Abdelbaki  
William Lau  
Anton Kuchar  
Koenraad Laevens  
Norvald Stol  
Olav Osterbo  
Pavel Hofman  
Laurent Dairaine  
Saul Pomares  
Frantisek Krizovsky  
Antonio Grilo  
Ragnar Andreassen  
Khaled Elsayed  
Aarstad Egil  
Rui Lopes  
Teresa Vazao  
Bjarne E. Helvik  
Kimon Kontovasilis  
Peder Emstad  
Evangelos Zerva
Table of Contents

**Session 1: Multicasting in Heterogeneous Networks**

Multi-criteria Arguments for Improving the Fairness of Layered Multicast Applications  
Marcelo Dias de Amorim, Otto Carlos M.B. Duarte, and Guy Pujolle ............................ 1

Network-Driven Layered Multicast with IPv6  
Ho-pong Sze and Soung C. Liew ............................................................................... 11

Analysis of the Requirements for ATM Multicasting  
Based on Per-PDU ID Assignment  
Josep Mangues-Bafalluy and Jordi Domingo-Pascual ............................................. 23

**Session 2: Performance of ATM Networks**

Sensitivity of ABR Congestion Control Algorithms to Hurst Parameter Estimates  
Sven A.M. Östring, Harsha Sirisena, and Irene Hudson ........................................... 36

Providing GFR Guarantees for TCP/IP Traffic over APON Access Systems  
Sašo Stojanovski, Maurice Gagnaire, and Rudy Hoebeke ........................................ 49

Buffer Size Requirements for Delay Sensitive Traffic Considering Discrete Effects and Service-Latency in ATM Switches  
Steven Wright and Yannis Viniotis ......................................................................... 61

**Session 3: Packet Switching Node Architectures**

Distributed Input and Deflection Routing Based Packet Switch Using Shuffle Pattern Network  
Thai Thach Bao, Hiroaki Morino, Hitoshi Aida, and Tadao Saito ............................. 74

A Distributed Dynamic Scheduling Algorithm for a Terabit Multicast Packet Switch  
Feihong Chen, Necdet Uzun, and Ali N. Akansu .................................................... 85

An Interworking Call Control Solution for a Multidiscipline Switch  
Pertti Raatikainen and Sami Raatikainen ............................................................... 98

**Session 4: Multicasting I**

Generic Multicast Transport Services: Router Support for Multicast Applications  
Brad Cain and Don Towsley................................................................................... 108
Table of Contents

RP-Based Multicast Receiver Access Control in PIM-SM
Thomas Hardjono ................................................................. 120

An Algorithm for Multicast with Multiple QoS Constraints
and Dynamic Membership
Aiguo Fei and Mario Gerla....................................................... 132

Session 5: QoS and Traffic Issues

Optimal Traffic Partitioning in MPLS Networks
Esmael Dinan, Daniel O. Awduche, and Bijan Jabbari .................. 144

Impact of the Ethernet Capture Effect on Bandwidth Measurements
Mats Björkman and Bob Melander ........................................... 156

Session 6: Optical Networks

Statistical Study of the Correlation Between Topology and Wavelength Usage
in Optical Networks with and without Conversion
Christian Fenger, Emmanuel Limal, Ulrik Gliese, and Cathal J. Mahon .......... 168

Computing Blocking Probabilities in Multi-class Wavelength Routing Networks
Sridhar Ramesh, George N. Rouskas, and Harry G. Perros ...................... 176

A Comparative Study of Mesh and Multi-ring Designs
for Survivable WDM Networks
Thanyporn Iamvasant, Charoenchai Baworntummarat,
and Lunchakorn Wuttisittikulkij ............................................ 189

Session 7: Multicasting II

Membership-Insensitive Totally Ordered Multicast: Properties and Performance
Jerzy Konorski ................................................................................. 201

On Finding Feasible Solutions to the Group Multicast Routing Problem
Ning Wang and Chor Ping Low .................................................... 213

Session 8: TCP/IP over ATM

Analysis of Cell Spacing on a TCP Flow Mapped onto an ATM Connection
Fabrice Guillemin, Jacqueline Boyer, Olivier Dugeon, and Christophe Mangin... 228

Mapping of Loss and Delay Between IP and ATM Using Network Calculus
Tjani Chahed, Gérard Hébuterne, and Caroline Fayet.......................... 240
Session 9: Traffic with Long Range Dependencies

A Self-Similar Point Process Through Fractal Construction
Manjunath A. Krishnam, Anand Venkatachalam, and Jeffrey M. Capone .......... 252

Tail Transitions in Queues with Long Range Dependent Input
Tim Daniëls and Chris Blondia................................................................. 264

Session 10: Congestion Control in Broadband Multicast Networks

An Exact Algorithm for Calculating Blocking Probabilities in Multicast Networks
Eeva Nyberg, Jorma Virtamo, and Samuli Aalto........................................ 275

Approximations for Call-Blocking Probabilities
in Multirouting Multicastin Multirate Loss Networks
Tibor Cinkler and Lázsló Ast................................................................. 287

Consolidation Algorithm Interoperability in Point-to-Multipoint ABR Services
in ATM Networks
Naris Rangsinoppamas, Tanun Jaruvitayakovit, Wisitsak Sa-niamsak,
Praphan Pavarangkoon, and Prasit Prapinmongkolkarn ......................... 299

Session 11: QoS and Signalling

Evaluation of the INSIGNIA Signaling System
Seoung-Bum Lee, Gahng-Seop Ahn, Xiaowei Zhang, and Andrew T. Campbell.. 311

Design and Implementation of RSVP Based on Object-Relationships
Martin Karsten ......................................................................................... 325

Indirect RSVP for Virtual Cluster Cellular Mobile IP Networks
Yu Zeng, Jon W. Mark, and Xuemin Shen .............................................. 338

Session 12: Voice/Video Traffic Modelling

Aggregation of Markovian Sources: Approximations with Error Control
Marco Conti, Silvia Ghezzi, and Enrico Gregori....................................... 350

Multi-scaling Models of Sub-frame VBR Video Traffic
Iraj Saniee, Arnold Neidhardt, Onuttom Narayan, and Ashok Erramilli ........ 362

An Accurate Closed-Form Formula to Calculate the Dejittering Delay
in Packetised Voice Transport
D. De Vleeschauwer, G.H. Petit, B. Steyaert, S. Wittevrongel, and H. Bruneel .... 374
Session 13: IP and ATM Interworking

Interworking of B-ISDN Signaling and Internet Protocol
Muneyoshi Suzuki ................................................................. 386

Mapping an Internet Assured Service on the GFR ATM Service
Fernando Cerdán and Olga Casals .............................................. 398

Real-Time Cell Arrival Sequence Estimation and Simulator for IP/ATM Networks
Hiroshi Saito, Toshiaki Tsuchiya, Gyula Marosi, Gyorgy Horvath, Peter Tatai, and Shoichiro Asano .............................................................. 410

Session 14: Single-Server Queues

Computing Stochastical Bounds for the Tail Distribution of an M/GI/1 Queue
Pierre L. Douillet, André-Luc Beylot, and Monique Becker ................... 423

Analysis of Packet Delay in a GI-G-1 Queue with Non-preemptive Priority Scheduling
Joris Walraevens, Bart Steyaert, and Herwig Bruneel ................................. 433

New Results on the Numerical Stability of the Stochastic Fluid Flow Model Analysis
Markus Fiedler and Holger Voos .................................................. 446

Session 15: Real-Time Traffic Management

QoS Support for Real-Time Applications Using the Integration of RSVP/Intserv and Diffserv: A Testbed Experiment
Seong-Ho Jeong, Myung Choi, Randal Abler, Henry Owen, John Copeland, and Joachim Sokol ................................................................. 458

Efficient End-to-End Transport of Soft Real-Time Applications
Zoe Antoniou and Ioannis Stavrakakis ............................................. 470

Real-Time Traffic Transmission over the Internet
Marco Furini and Don Towsley ..................................................... 483

Session 16: High Speed Wireless Access

High Speed Wireless Internet Access: Combination of MPLS and BRAN HIPERLAN/2 Technologies
Kallikratidas Nitsos, Tasos Dagiuiklas, and Hamed Al-Raweshidy .................. 495

Effect of Turn-Around Times on the Performance of High Speed Ad-hoc MAC Protocols
Ajay Chandra V. Gunmallla and John O. Limb ...................................... 507
Experimental Investigation of the Effects of Delay and Error Rate on Throughput and Performance of ATM Satellite Links Serving LAN Islands
Sufian Yousef and Caroline Stange ................................................................. 518

Session 17: Differentiated Services

Dynamic Algorithms with Worst-Case Performance for Packet Classification
Pankaj Gupta and Nick McKeown ....................................................................... 528

Intelligent Traffic Conditioners for Assured Forwarding Based Differentiated Services Networks
Biswajit Nandy, Nabil Seddigh, Peter Pieda, and Jeremy Ethridge .................... 540

DiffServ in the Web: Different Approaches for Enabling Better Services in the World Wide Web
Hartmut Ritter, Thorsten Pastoors, and Klaus Wehrle ........................................... 555

Session 18: Internet Performance and Control

Performance of Short TCP Transfers
Chadi Barakat and Eitan Altman ............................................................................ 567

Performance Study of Satellite-Linked Web Caches and Filtering Policies
Xiao-Yu Hu, Pablo Rodriguez, and Ernst W. Biersack ........................................... 580

Distributed Control System for Low Priority Controllable Traffic in Packet Switched Backbone Networks
Kimmo Pulakka and Jarmo Harju ....................................................................... 596

Session 19: Residential Access Networks

Application-Independent End-to-End Security in Shared-Link Access Networks
José C. Brustoloni and Juan A. Garay ................................................................. 608

Fair Efficient Call Admission Control Policies for Heterogeneous Traffic Streams in a Packet Routing Server Using the DTM Technology
Chih-Jen Chang and Arne A. Nilsson ................................................................. 620

Session 20: QoS Negotiation

An Agent-Based Framework for Large Scale Internet Applications
Mamadou Tadiou Kone and Tatsuo Nakajima ..................................................... 632

Benchmarking of Signaling Based Resource Reservation in the Internet
István Cselényi, Gábor Fehér, and Krisztián Németh ............................................ 643
Session 21: Resource Management

Kalman and Neural Network Approaches
for the Control of a VP Bandwidth in an ATM Network
Raphaël Feraud, Fabrice Clérot, Jean-Louis Simon, Daniel Pallou,
Cyril Labbé, and Serge Martin ............................................................................. 655

Fairness and Aggregation: A Primal Decomposition Study
André Girard, Catherine Rosenberg, and Mohammed Khemiri ....................... 667

Session 22: QoS in Wireless Networks

On Learning and the Quality of Service in a Wireless Network
Tiina Heikkinen .................................................................................................. 679

Distributed Fair Bandwidth Allocation of a Wireless Base Station
György Miklós and Sándor Molnár ..................................................................... 689

Fast Approximate Algorithms for Maximum Lifetime Routing in Wireless Ad-hoc Networks
Jae-Hwan Chang and Leandros Tassiulas ........................................................... 702

Session 23: Delay Bounds

Performance Evaluation of Resource Division Policies for PPGS Scheduling in ATM Networks
Amr S. Ayad, Khaled M.F. Elsayed, and Mahmoud T. El-Hadidi ....................... 714

Worst-Case Deterministic Delay Bounds for Arbitrary Weighted Generalized Processor Sharing Schedulers
Robert Szabó, Peter Barta, Felician Németh, and Jozsef Bíró ........................... 727

Deterministic End-to-End Delay Bounds in an Accumulation Network
Guillaume Urvoy, Gérard Hébuterne, and Yves Dallery .................................... 740

Session 24: Internet Protocols

Performance Analysis of IP Switching and Tag Switching
Gargi Banerjee, Rob Rosenberry, and Deepinder Sidhu ................................. 752

A Distributed Mechanism for Identification and Discrimination of Non-TCP-friendly Flows in the Internet
Thomas Ziegler and Serge Fdida ....................................................................... 763
### Session 25: Wireless LAN

New Handoff Strategies in Microcell/Macrosecell Overlaying Systems  
Selma Boumerdassi and André-Luc Beylot ......................................................... 776

Dynamic IEEE 802.11: Design, Modeling and Performance Evaluation  
Federico Calì, Marco Conti, and Enrico Gregori ............................................... 786

TCP/IP over the Bluetooth Wireless Ad-hoc Network  
Niklas Johansson, Maria Kihl, and Ulf Körner .................................................. 799

### Session 26: Traffic Control for Quality of Service

A Scheme for Time-Dependent Resource Reservation in QoS-Enabled IP Networks  
Roberto Canonico, Simon Pietro Romano, Mauro Sellitto, and Giorgio Ventre .... 811

Impact of "Trunk Reservation" on Elastic Flow Routing  
Sara Oueslati-Boulahia and James W. Roberts .................................................. 823

### Session 27: Routing

New Distributed Multicast Routing and Its Performance Evaluation  
Takuya Asaka, Takumi Miyoshi, and Yoshiaki Tanaka ......................................... 835

Distance-Vector QoS-Based Routing with Three Metrics  
Luís Henrique M.K. Costa, Serge Fdida, and Otto Carlos M.B. Duarte ................. 847

On Shortest Path Problems with "Non-Markovian" Link Contribution to Path Lengths  
Arunabha Sen, K. Selçuk Candan, Afonso Ferreira, Bruno Beauquier,  
and Stephane Perennes ....................................................................................... 859

### Session 28: Quality of Service for Video and Multimedia

Adaptive QoS Platform in Multimedia Networks  
Mahmoud Sherif, Ibrahim Habib, Mahmoud Naghshineh, and Parviz Kermani .... 871

Quality-of-Service (QoS) in Heterogeneous Networks: CLIP, LANE and MPOA Performance Test  
Kai-Oliver Detken ............................................................................................... 883

Experiments with Dynamic Multiplexing and UPC Renegotiation for Video over ATM  
Maria Teresa Andrade and Artur Pimenta Alves .................................................. 895
Session 29: Call Admission Control in Cellular Systems

The Study of Burst Admission Control in an Integrated Cellular System
Jie Zhou, Yoshikuni Onozato, and Ushio Yamamoto.........................................................908

Model and Optimal Call Admission Policy in Cellular Mobile Networks
Amine Berqia and Noufissa Mikou ..................................................................................920

Measurement-Based Pre-assignment Scheme with Connection-Level QoS Support for Multiservice Mobile Networks
Xiaoyuan Luo, Ian Thng, Bo Li, and Shengming Jiang....................................................932

Session 30: Resource Allocation

QoS Rewards and Risks: A Multi-market Approach to Resource Allocation
Errin W. Fulp and Douglas S. Reeves .................................................................945

Spare Capacity Planning for Survivable Mesh Networks
Adel Al-Rumaih, David Tipper, Yu Liu, and Bryan A. Norman.................................957

A Cooperative Game Theory Approach to Resource Allocation in Wireless ATM Networks
Xinjie Chang and Krishnappa R. Subramanian ..............................................................969

Author Index.........................................................................................................................979