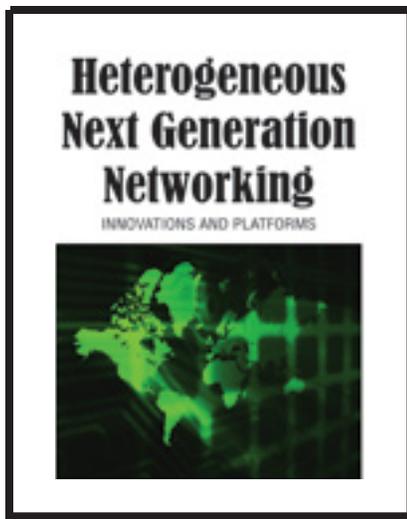


New Release

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**Handbook of Research on Heterogeneous Next  
Generation Networking: Innovations and Platform****Edited by: Stavros Kotsopoulos and Konstantinos  
Ioannou, University of Patras, Greece**

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““This handbook focuses on the NGN functions including the shared core network that contains the involved issues of the control and transport layer, the multiple access networks, the service layer, the terminal equipment, the multiple applications and the wireless channel characterization.”

-Stavros A. Kotsopoulos, University of  
Patras, Greece

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**Market:**

This essential publication is for all academic and research libraries as well as for all teachers, researchers, scholars, and professionals of telecommunication networking. The handbook will also serve as a reference for all managers, information technology engineers, and consultants seeking the most current information about the concepts, issues, trends and technologies in next generation networking.

In recent years, scientists have become more focused on the research, development, and integration of Heterogeneous Wireless Networks (HWN) platforms in order to both converge the existing telecom technology and to deliver multimedia services of high intrinsic and perceived Quality of Service (QoS) to users.

The **Handbook of Research on Heterogeneous Next Generation Networking: Innovations and Platforms** identifies key issues facing next generation networks and highlights promising technologies. With over 20 research contributions from 47 international experts, this comprehensive collection explores the technical characteristics of the shared core network and multiple access networks, and the associated modeling, security, and performance issues essential to quality service delivery of integrated data, video, and voice. Enhanced with far-reaching considerations of the societal and commercial implications in such domains as e-government and e-commerce, this essential addition to library reference collections will also benefit academics, technology specialists, managers, and policy makers in a broad range of settings.



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# Handbook of Research on Heterogeneous Next Generation Networking: Innovations and Platform

Edited by: Stavros Kotsopoulos and Konstantinos Ioannou,  
University of Patras, Greece

## Table of Contents

### Section I: Core and Multiple Access Networks

#### Chapter I: Formal Methods in Cross layer Modelling and Optimization of Wireless Networks: State of the Art and Future Directions

Dzmitry Kliazovich, DIT - University of Trento, Italy  
Michael Devetsikiotis, North Carolina State University, USA  
Fabrizio Granelli, DIT - University of Trento, Italy

*This chapter highlights the past accomplishments and promising research trends of the important topic of cross-layering in the creation of future wireless communication networks. A detailed survey of the state-of-the-art of the cross-layering is given and formal methods in the design are presented in order to provide high performance, mobility support, high resource utilization, and QoS in wireless networks*

#### Chapter II: Cross-layer resource allocation and scheduling for wireless systems

Dimitris Toumpakaris, Wireless Telecommunications Laboratory, Greece

Jungwon Lee, Marvell Semiconductor Inc., USA

*This chapter introduces the cross-layer scheduling and resource allocation for single-hop wireless systems. The necessity of these entities is analyzed by giving an approach to the characteristic of variability of the networks (i.e. the case of varying channel in a system where the transmitter and the receiver are fixed). The case of power and delay-efficient scheduling over fading Gaussian channels are examined. Moreover the cross-layer scheduling and resource allocation among many users in cellular networks, for fading multiple access and broadcast channels, for CDMA and ODMA wireless systems and multiple antenna systems are presented*

#### Chapter III: An AAA Framework for IP Multicast Communication in Next Generation Networks

Dr Prashant Pillai, University of Bradford, UK

Prof Yim Fun Hu, University of Bradford, UK

*This chapter describes the MSEC-AAA framework that allows Network Providers to authenticate and authorise users requesting multicast data, to restrict multicast content access to only authenticated users, to monitor the different multicast sessions accessed by end users and to enable flat-rate or usage based charging mechanisms to be implemented. The authors review the existing Multicast Security Mechanisms (i.e. IGAP, Gothic Multicast Architecture, L2/L3 Authentication before Join and the IETF Multicast Security Architecture). In addition they concentrate on the AAA for Multicast (i.e. the IGMPx Service Access Control Mechanism and the extension to the MSEC Architecture to support AAA). Finally, by an implemented OPNET simulation model corresponding results are taken for Test Case 1: All users input the correct credentials, Test Case 2: One user inputs the wrong credentials and the verification of the accounting mechanisms for Multicast Communications.*

#### Chapter IV: Wavelength Division Multiplexing Technologies and their Applications

Nikos Merlemis, Technological Education Institute of Athens, Athens, Greece

Dimitrios G. Zevgolis, Hellenic Open University, Patras, Greece

*This chapter presents in detail the Wavelength-division multiplexing (WDM) technologies (such as Dense WDM and coarse WDM) and their recent applications in optical networks. The authors investigate the parameters affecting the increment of the bit rate in a TDM system and the methods for increasing the number of optical carriers. Moreover, they present the WDM technologies, the fundamentals of DWDM and describe the mechanism of the fiber optic transmission by explaining the entities of light sources and detectors, optical amplifiers, Multiplexers – Demultiplexers, Optical Add/Drop multiplexers and DWDM Interfaces*

#### Chapter V: Radio over Fiber for Broadband Communications: a promising technology for Next Generation Networks

Sotiris Karabetos, Technological Educational Institution of Athens, Greece

Spiros Mikroulis, Technological Educational Institution of Athens, Greece

Athanase Nassiopoulou, Technological Educational Institution of Athens, Greece

*This chapter addresses the main issues relating to the hybrid fiber radio technology and points out the key factors for its exploitation in current and next generation broadband networks. The performed analysis by the authors is focused on the RoF technology by examining the involved RoF architectures and deployments (RoF Techniques for Generation and Distribution of Electrical Signals, Intensity Modulation Direct Detection (IM-DD), Remote Heterodyne Detection (RHD), RoF Optical Components). Moreover the RoF Architectures and Link Deployments are examined. Their work end by giving RoF applications for NGNs and in addition they present a short demonstration on basic RoF operations.*

#### Chapter VI: High Altitude Stratospheric Platforms (HASPs)

Konstantinos Birkos, University of Patras, Greece

*This chapter presents the basic characteristics of the HASP-related technology. The multi-beam adaptive antenna array is a basic component of the system's RF payload. Via this array, many cellular patterns on the ground can be implemented and dynamically adjusted according to the specific telecommunication needs. Serving high-speed mobile routers requires reliable DOA estimation techniques. The author investigates the parameters affecting the coverage planning, the capacity and interference issues, the call admission control, the performed handover operational procedures and the involved network layer issues. Finally, the TCP performance issue is analyzed. It is concluded that in the transport layer, multi-cast protocols that take into account the on-board proxy functionalities of the HASPs can offer enhanced packet error rate performance.*

## About the Editors:

**Stavros A. Kotsopoulos** was born in Argos-Argolidos (Greece) (1952). He received his BSc in physics in the year 1975 from the Aristotle University of Thessaloniki (Greece), and in the year 1984 got his diploma in electrical and computer engineering from the University of Patras (Greece). He did his postgraduate studies in the University of Bradford (United Kingdom), and he is an MPhil and PhD holder since 1978 and 1985 correspondingly. He is a member of the academic staff of the department of electrical and computer engineering of the University of Patras and holds the position of professor. Since 2004, is the director of the Wireless Telecommunications Laboratory (WTL) and develops his professional life teaching and doing research in the scientific area of telecommunications, with interest in cellular mobile communications, wireless network technologies, interference, satellite communications, telematics applications, communication services and antennas design. Moreover he is the (co)author of the book titled "mobile telephony". He has offered consultant services to various telecom organizations and bodies in Greece and he is member of various technical committees. The research activity is documented by more than 200 publications in scientific journals and proceedings of international conferences. Professor Kotsopoulos has been the leader of several European and many national research projects. Finally, he is member of the Greek Physicists Society and member of the Technical Chamber of Greece.

**Konstantinos Ioannou** was born in Patras (Greece) (1975). He received the diploma and the PhD in electrical and computer engineering (1998 and 2004 respectively), from the Polytechnic School of the University of Patras. His dissertation, elaborated at the Wireless Telecommunications Laboratory of the department of electrical and computer engineers, dealt with channel assignment techniques, handover procedures, traffic modeling and call admission policies in 2G, 3G mobile systems and security mobile systems. During his postgraduate studies, he participated in many European and national research projects. Since the September (2006), he is working as network engineer in ministry of interior of Greece and as a post doctor in wireless telecommunication laboratory in department of electrical and computer engineering in University of Patras. During the last 2 years, he belongs also to the Technical Consultants Team of the Ministry of Public Order, regarding the C41 Olympic Security System, involved, among others, with TETRA and AVL subsystems. His scientific interests include mobile and satellite communications, wired and wireless networks, handover and channel assignment techniques and communication services. A lot of publications in scientific journals and conference proceedings - 27 and 41, respectively - and 3 chapters in books, document his research activity. Konstantinos Ioannou is a member of the Technical Chamber of Greece (TEE).

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