Preface

One of the important factors contributing to the success of mobile communications, from the very beginning, has been a good understanding of users' requirements. In its first generation, mobile networks offered users the freedom to communicate irrespective of their locations and the joy of instant access to telephony services. This provided a competitive edge over the fixed wire line communication networks. Continual assessment of users' requirements and the important role that mobile communications play in our daily lives brought about the 2nd and 3rd generations of standards. However, because of the widespread availability of the Internet and high-speed data on mobile networks, the users are becoming more accustomed to the use of such services in carrying out both private and professional aspects of their lives. The users' expectations from mobile networks are becoming more demanding and this trend is expected to intensify in the future. To continue with the successful approach adopted in mobile/wireless communications, a better understanding of the users' needs and requirements is essential to identify appropriate future technologies. However, as it is very difficult to accurately predict how such needs would evolve, the envisaged future systems must possess sufficient flexibility to be able to handle efficiently unforeseen needs, new services, and applications.

This is the very approach taken in the writing of this book, starting with the identification of users' future requirements based on today's observation on the usage of mobile communications and extrapolations of that to the next 10 to 15 years. The book structure also reflects that of the WWRF Working Groups and presents the contents of some of the White Papers produced in the last 18 months. The White Papers are the outcome of a large number of presentations, discussions, and contributions made by international researchers representing both industry and academia who are active in advanced research on future mobile/wireless communications. This is a follow-on book to Volume-1 published in 2004, but with more emphasis on the user requirements and an in-depth analysis of the important technologies.

The book starts with an introduction to worldwide and regional activities on Beyond 3G and 4G and gives a comprehensive overview of the WWRF organizational structure and mode of operation. Chapter 2 presents the WWRF-developed vision and requirements in the future wireless world based on observations made today and their extrapolation to years 2010 and 2017. In Chapter 3, a number of usage scenarios are identified and discussions are presented on how these scenarios should be used in the future development of wireless technologies and in particular, the problems and research issues associated with the advanced user interface in future mobile devices. Chapters 4, 5, 6, 7, 8 and 9 are more technology-oriented chapters addressing various subsystems of a mobile network. In particular, Chapters 4 and 5 cover important areas of future service platforms, generic service elements and enabling technologies, user security and trust requirements, and identify important research issues associated with them as well as challenges in user

identity management in future heterogeneous networks. Chapter 6 provides a comprehensive overview of new air-interface technologies and new deployment concepts for wide area networks together with related technologies in achieving high spectral and power efficiencies using advanced technologies such as MIMO, cross-layer optimization schemes, and research issues for resource management. Chapter 7 addresses technologies and research issues for short-range wireless communications and provides a thorough overview of ultra wide band technology and its future perspectives. This chapter also provides a comprehensive overview of requirements and technical challenges encountered in optical wireless communications as well as wireless sensor networking, and identifies a number of interesting research topics. Chapter 8 presents an in-depth discussion on reconfigurability covering aspects such as application scenarios for reconfigurability, essential element management, and Software-defined Radio together with reconfigurable network architecture and support services, and the use of Cognitive Radio for spectrum management. Chapter 9 outlines issues concerning self-organization in communication networks, in particular for Ad hoc and Sensor Networks, and provides an interesting discussion on the potential limitation of self-organization.