

# BROADBAND MOBILE MULTIMEDIA

Techniques and Applications

Edited by

Yan Zhang ♦ Shiwen Mao ♦ Laurence T. Yang ♦ Thomas M. Chen



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# **BROADBAND MOBILE MULTIMEDIA**

# WIRELESS NETWORKS AND MOBILE COMMUNICATIONS

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# Preface

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“Follow the money” was W. Mark Felt’s (a.k.a. *Deep Throat*) advice to Bob Woodward and Carl Bernstein for unraveling the Watergate scandal. After years of research and development, there have been significant advances in signal processing, networking and delivery technologies, network infrastructure and deployment, as well as successful business models. Multimedia is now ready to hit the market. Users are not satisfied with simple forms of communications anymore. A wide range of multimedia applications are emerging, such as Voice-over-IP, online chatting, video on demand, Internet Protocol Television (IPTV) or cellvision/mobile TV, and interactive gaming, among others. Service providers are making great efforts to move toward “triple play” or “quad play.” This trend is highlighted by the recent multi-billion-dollar eBay/Skype deal and the Google/YouTube deal.

An equally important advice for engineers, researchers, and for all of us is to “find the bottleneck.” Thus, where is the performance bottleneck in the big picture as multimedia is becoming widely available in the Internet? The answer, we believe, is wireless access networks, such as third-generation (3G) and beyond wireless networks, Wi-Fi, WiMAX, and Bluetooth wireless local area networks (WLAN), *ad hoc*/mesh networks, and wireless sensor networks. Despite considerable advances, current wireless networks are not able to offer comparable data rates as do their wired counterparts. Although it frees users from a socket and cable, mobility brings about a new level of challenge, including time-varying wireless channels and dynamic topology and connectivity. The situation is even more serious in the case of multihop wireless networks, where end-to-end throughput quickly decreases as hop count increases, largely due to carrier sensing and spatial reuse issues. As the increasing demand for multimedia communications continues to drive the expansion of consumer and enterprise markets as well as the evolution of wireless technologies, multimedia service provisioning is believed to be



one of the prerequisites to guarantee the success of the next-generation wireless networks.

This book aims to meet this compelling need by providing a collection of the latest advances in this important problem area. Given the considerable research effort being made and the vast literature that exists, it is not possible to provide a complete coverage of all the related issues. However, we aim to provide a big picture of state-of-the-art research, a representative sampling of important research outcomes, and in-depth treatments of selected topics in the area of broadband wireless multimedia communications. Overall, this book is a useful technical guide covering introductory concepts, fundamental techniques, latest advances, and open issues in broadband wireless multimedia. A large number of illustrative figures, cross-references, as well as comprehensive references for readers interested in more details are provided.

This book consists of 15 chapters, which are organized into four parts as follows:

- Multimedia systems
- Multimedia over *ad hoc* and sensor networks
- Multimedia over wireless local area networks
- QoS and enabling technologies

Part I introduces various broadband wireless multimedia systems and surveys related work. Part II focuses on the routing and cross-layer design issue of multimedia communication over multihop wireless *ad hoc*/sensor networks, where video is used as a reference application. Part III explores various issues related to multimedia communications over WLANs, which constitute a dominant part of today's broadband wireless access networks. Part IV presents latest advances in QoS provisioning mechanisms and other enabling technologies, including end-to-end QoS provisioning, middleware, mobility management, scheduling, and power control.

The salient features of the book are as follows:

- Identifies the basic concepts, key technologies, and cutting-edge research outcomes, as well as open problems and future research directions in the important problem area of broadband mobile multimedia
- Provides comprehensive references on state-of-the-art technologies for broadband wireless multimedia
- Contains a sufficient number of illustrative figures for easy reading and understanding of the materials
- Allows complete cross-referencing through a broad coverage on layers of the protocol architecture
- In-depth treatment of selected problems/technologies for enabling wireless multimedia service

The book represents a useful reference for techniques and applications of broadband wireless multimedia. Target readers include students, educators, telecommunication service providers, research strategists, scientists, researchers, and engineers working in the areas of wireless communications, wireless networking, and multimedia communications. It can also be used as a textbook for an advanced selected topic course on broadband wireless multimedia for graduate students.

This book would not have been possible without the efforts and the time invested by all the contributors. They were extremely professional and cooperative, and did a great job in the production of this book. Our reviewers provided valuable comments/feedbacks, which, we believe, greatly helped improve the quality of this book. Special thanks go to Rich O'Hanley, Jessica Vakili, and Karen Schober of Taylor & Francis Group for their continuous support, patience, and professionalism from the beginning to the final stage. Last but not least, we thank our families and friends for their constant encouragement, patience, and understanding throughout this project, which was a pleasant and rewarding experience.

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