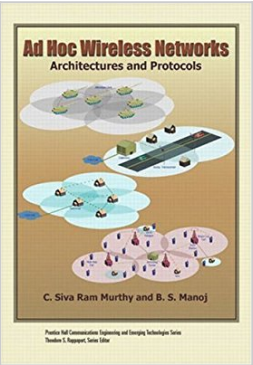

Ad Hoc Wireless Networks: Architectures and Protocols

By C. Siva Ram Murthy, B.S. Manoj

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Practical design and performance solutions for every ad hoc wireless network

Ad Hoc Wireless Networks comprise mobile devices that use wireless transmission for communication. They can be set up anywhere and any time because they eliminate the complexities of infrastructure setup and central administration-and they have enormous commercial and military potential. Now, there's a book that addresses every major issue related to their design and performance. Ad Hoc Wireless Networks: Architectures and Protocols presents state-of-the-art techniques and solutions, and supports them with easy-to-understand examples. The book starts off with the fundamentals of wireless networking (wireless PANs, LANs, MANs, WANs, and wireless Internet) and goes on to address such current topics as Wi-Fi networks, optical wireless networks, and hybrid wireless architectures. Coverage includes:

- Medium access control, routing, multicasting, and transport protocols
- QoS provisioning, energy management, security, multihop pricing, and much more
- In-depth discussion of wireless sensor networks and ultra wideband technology
- More than 200 examples and end-of-chapter problems

Ad Hoc Wireless Networks is an invaluable resource for every network engineer, technical manager, and researcher designing or building ad hoc wireless networks.

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Ad Hoc Wireless Networks: Architectures and Protocols By C. Siva Ram Murthy, B.S. Manoj Bibliography

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Editorial Review

From the Back Cover

I have reviewed many books on the topic of Ad Hoc Networks, and this is the finest I have seen on the topic.—Dr. Theodore S. Rappaport, William and Bettye Nowlin Chair in Engineering, Director, Wireless Networking and Communications Group, University of Texas.

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About the Author

C. SIVA RAM MURTHY is a Professor in the Department of Computer Science and Engineering, Indian Institute of Technology, Madras, India. His research interests include parallel and distributed computing, real-time systems, and optical and wireless networks. He holds a Ph.D. from the Indian Institute of Science, Bangalore, and is a fellow of the Indian National Academy of Engineering and an IEEE senior member. He has co-authored four books, including WDM Optical Networks (Prentice Hall PTR).

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Preface

In the last few years, there has been a big interest in ad hocwireless networks as they have tremendous

military and commercialpotential. An ad hoc wireless network is a wireless network, comprisedof mobile computing devices that use wireless transmission forcommunication, having no fixed infrastructure (a central administrationsuch as a base station in a cellular wireless network or an access pointin a wireless local area network). The mobile devices also serve asrouters due to the limited range of wireless transmission of thesedevices, that is, several devices may need to route or relay a packetbefore it reaches its final destination. Ad hoc wireless networks can bedeployed quickly anywhere and anytime as they eliminate the complexityof infrastructure setup. These networks find applications in severalareas. Some of these include: military communications (establishingcommunication among a group of soldiers for tactical operations whensetting up a fixed wireless communication infrastructure in enemyterritories or in inhospitable terrains may not be possible), emergencysystems (for example, establishing communication among rescue personnelin disaster-affected areas) that need quick deployment of a network,collaborative and distributed computing, wireless mesh networks,wireless sensor networks, and hybrid (integrated cellular and ad hoc)wireless networks.

The purpose of this book is to provide students, researchers,network engineers, and network managers with an expert guide to thefundamental concepts, design issues, and solutions to the issues-- architectures and protocols -- and the state-of-the-art researchdevelopments in ad hoc wireless networking. A unique feature of the bookis that it deals with the entire spectrum of issues that influence thedesign and performance of ad hoc wireless networks, and solutions to theissues, with easy-to-understand illustrative examples highlighting theintuition behind each of the solutions.

This book, organized into fourteen chapters, each covering a uniquetopic in detail, first presents (in Chapters 1-4) the fundamental topicsinvolved with wireless networking such as wireless communicationstechnology, wireless LANs and PANs, wireless WANs and MANs, and wirelessInternet. It then covers all important design issues (in Chapters5-11) -- medium access control, routing, multicasting, transport layer,security, quality of service provisioning, energy management --in ad hocwireless networking in considerable depth. Finally, some recent relatedimportant topics covered in this book (in Chapters 12-14) includewireless sensor networks, hybrid wireless architectures, pricing inmulti-hop wireless networks, ultra wideband technology, Wi-Fi systems,optical wireless networks, and Multimode 802.11.

The book is intended as a textbook for senior undergraduate andgraduate-level courses on ad hoc wireless networks. It can also be usedas a supplementary textbook for undergraduate courses on wirelessnetworks, wireless/mobile communications, mobile computing, and computernetworks. The exercise problems provided at the end of each chapter addstrength to the book. A solutions manual for instructors is availablefrom Prentice Hall. The book is a useful resource for the students andresearchers to learn all about ad hoc wireless networking and furthertheir research work. In addition, the book will be valuable toprofessionals in the field of computer/wireless networking.

We owe our deepest gratitude to Karthigeyan, Jayashree, and Archanafor reading line by line all the chapters and suggesting ways to correcttechnical and presentation problems. We wish to express our thanks tothe following HPCN lab students who have contributed mightily to thisbook writing project: Archana, Bhaya Gaurav Ravindra, Bheemarjun,Jagadeesan, Jayashree, Karthigeyan, Rajendra Singh Sisodia, Srinivas,Subir Kumar Das, Vidhyashankar, and Vyas Sekar. Raj Kumar drew all theillustrations and we thank him for his excellent work. We appreciate theefforts of Steven M. Hirschman, Irving E. Hodnett, and ShivkumarKalyanaraman in reviewing our draft manuscript and suggestingimprovements. We would like to gratefully acknowledge the help renderedby the Indian Institute of Technology (IIT), Madras, especially forcreating an excellent working environment, the Department of Science andTechnology, New Delhi, and the Curriculum Development Cell of the Centrefor Continuing Education, IIT Madras for providing the financial aid forwriting this book. Infosys Technologies Ltd., Bangalore, providedfinancial support to the second author for wireless networking researchover the last four years, and he is indebted to Infosys for the same. Weare thankful to Bernard Goodwin and his colleagues at Prentice Hall fortheir excellent work in

producing this book. Last though not least, weacknowledge the love and affection from our families. This project wouldnever have been successfully completed but for their understanding andpatience.

We have taken reasonable care in eliminating typographical or othererrors that might have crept into the book. We encourage you to sendyour comments and suggestions to us via email. We appreciate yourfeedback and hope you enjoy reading the book.

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Users Review

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