

# IEEE 802.11b Ad Hoc Networks: Performance Measurements

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**Abstract.** In this paper we investigate the performance of IEEE 802.11b ad hoc networks by means of an experimental study. An extensive literature, based on simulation studies, there exists on the performance of IEEE 802.11 ad hoc networks. Our analysis reveals several aspects that are usually neglected in previous simulation studies. Firstly, since different transmission rates are used for control and data frames, different transmission ranges and carrier-sensing ranges may exist at the same time in the network. In addition, the transmission ranges are in practice much shorter than usually assumed in simulation analysis, not constant but highly variable (even in the same session) and depends on several factors. Finally, the results presented in this paper indicate that for correctly understanding the behavior of an 802.11b network operating in ad hoc mode, several different ranges must be considered. In addition to the transmission range, the physical carrier sensing range is very important. The transmission range is highly dependent on the data rate and is up to 100 m, while the physical carrier sensing range is almost independent from the data rate and is approximately 200 m. Furthermore, even though stations are outside from their respective physical carrier sensing range, they may still interfere if their distance is lower than 350 m.

## 1 Introduction

The IEEE 802.11 technology [IEE02] is a good platform to implement single-hop ad hoc networks because of its extreme simplicity. Single-hop means that stations must be within the same transmission radius (say 100-200 meters) to be able to communicate. This limitation can be overcome by multi-hop ad hoc networking. This requires the addition of routing mechanisms at stations so that they can forward packets towards the intended destination, thus extending the range of the ad hoc network beyond the transmission radius of the source station. Routing solutions designed for wired networks (e.g., the Internet) are not suitable for the ad hoc environment, primarily due to the dynamic topology of ad hoc networks. Even though large-scale multi-hop ad hoc networks will not be available in the near future, on smaller scales, mobile ad hoc networks are starting to appear thus extending the range of the IEEE 802.11 technology over multiple radio hops.

# Ieee 802 11 Ad Hoc Networks Performance Measurements

**Mostafa Hashem Sherif, Abdelhamid Mellouk, Jun Li, Paolo Bellavista**



## **Ieee 802 11 Ad Hoc Networks Performance Measurements:**

*Quality of Service Architectures for Wireless Networks: Performance Metrics and Management* Adibi, Sasan, Jain, Raj, Parekh, Shyam, Tofighbakhsh, Mostafa, 2010-01-31 This book further explores various issues and proposed solutions for the provision of Quality of Service QoS on the wireless networks Provided by publisher **Ad Hoc Networks** Jun Zheng, Cheng Li, Peter Han Joo Chong, Weixiao Meng, Feng Yan, 2020-01-02 This book constitutes the refereed proceedings of the 11th International Conference on Ad Hoc Networks ADHOCNETS 2019 held in Queenstown New Zealand in November 2019 The 28 full papers were selected from 64 submissions and cover a variety of network paradigms including mobile ad hoc networks sensor networks vehicular networks underwater networks airborne networks underground networks personal area networks device to device D2D communications in 5G cellular networks and home networks The papers present a wide range of applications in civilian commercial and military areas *Parallel and Distributed Processing and Applications* Yi Pan, 2005-10-21 This book constitutes the refereed proceedings of the Third International Symposium on Parallel and Distributed Processing and Applications ISPA 2005 held in Nanjing China in November 2005 The 90 revised full papers and 19 revised short papers presented together with 3 keynote speeches and 2 tutorials were carefully reviewed and selected from 645 submissions The papers are organized in topical sections on cluster systems and applications performance evaluation and measurements distributed algorithms and systems fault tolerance and reliability high performance computing and architecture parallel algorithms and systems network routing and communication algorithms security algorithms and systems grid applications and systems database applications and data mining distributed processing and architecture sensor networks and protocols peer to peer algorithms and systems internet computing and Web technologies network protocols and switching and ad hoc and wireless networks **Handbook of Algorithms for Wireless Networking and Mobile Computing** Azzedine Boukerche, 2005-11-28 The Handbook of Algorithms for Wireless Networking and Mobile Computing focuses on several aspects of mobile computing particularly algorithmic methods and distributed computing with mobile communications capability It provides the topics that are crucial for building the foundation for the design and construction of future generations of mobile and wireless networks including cellular wireless ad hoc sensor and ubiquitous networks Following an analysis of fundamental algorithms and protocols the book offers a basic overview of wireless technologies and networks Other topics include issues related to mobility aspects of QoS provisioning in wireless networks future applications and much more **Passive and Active Network Measurement** Steve Uhlig, Konstantina Papagiannaki, Olivier Bonaventure, 2007-06-30 This book constitutes the refereed proceedings of the 8th International Conference on Passive and Active Measurement PAM 2007 held in Louvain la Neuve Belgium April 2007 Coverage focuses on research and practical applications of network measurement and analysis techniques detailing interdomain routing P2P wireless 802 11 wireless 3G CDMA Bluetooth infrastructure and services traffic and measurement principles **Vehicular Ad-hoc Networks for**

**Smart Cities** Anis Laouiti, Amir Qayyum, Mohamad Naufal Mohamad Saad, 2014-09-08 Vehicular communication is a key technology in intelligent transportation systems For many years now the academic and industrial research communities have been investigating these communications in order to improve efficiency and safety of future transportation Vehicular networking offers a wide variety of applications including safety applications as well as infotainment applications This book highlights the recent developments in vehicular networking technologies and their interaction with future smart cities in order to promote further research activities and challenges SAADI BOUDJIT University of Paris 13 France HAKIMA CHAOUCHI Telecom SudParis France YACINE GHAMRI University La Rochelle France HALABI HASBULLAH Universiti Teknologi Petronas Malaysia ANIS LAOUITI Telecom SudParis France SAOUCENE MAHFOUDH Jeddah Saudi Arabia PAUL MUHLETHALER INRIA France AMIR QAYYUM Mohamad Ali Jinnah University Pakistan NAUFAL SAAD Universiti Teknologi Petronas Malaysia AHMED SOUA NIST USA HAJIME TAZAKI University of Tokyo Japan APINUN TUNPAN Aintec Thailand WEI WEI Xi an University China RACHID ZAGROUBA ENSI Tunisia

**Measurement, Modelling, and Evaluation of Computing Systems and Dependability in Fault Tolerance** Erwin Rathgeb, Klaus Echtele, Bruno Müller-Clostermann, 2010-03-05 This book constitutes the refereed proceedings of the 15th International GI ITG Conference on Measurement Modelling and Evaluation of Computing Systems and Dependability and Fault Tolerance held in Essen Germany in March 2010 The 19 revised full papers presented together with 5 tool papers and 2 invited lectures were carefully reviewed and selected from 42 initial submissions The papers cover all aspects of performance and dependability evaluation of systems including networks computer architectures distributed systems software fault tolerant and secure systems

Wireless Systems and Mobility in Next Generation Internet Gabriele Kotsis, 2005-03-23 This book constitutes the thoroughly refereed postproceedings of the first international workshop organized by the European Network of Excellence on Next Generation Internet EURO NGI 2004 held in Dagstuhl Castle Germany in June 2004 The 16 revised full research papers presented were carefully selected during two rounds of reviewing and improvement The papers are organized in topical sections on network and capacity planning medium access and admission control QoS in wireless networks and network inter connection and resource access The book provides a most relevant presentation of current issues of the next generation Internet in the area of wireless communication for mobile users

*Ubiquitous Intelligence and Computing* Hai Jin, Laurence T. Yang, Jeffrey J.-P. Tsai, 2006-08-29 This book is the refereed proceedings of the Third International Conference on Ubiquitous Intelligence and Computing UIC 2006 held in Wuhan China The book presents 117 revised full papers together with a keynote paper were carefully reviewed and selected from 382 submissions The papers are organized in topical sections on smart objects and embedded systems smart spaces environments and platforms ad hoc and intelligent networks sensor networks and more

*Ad Hoc Networks* Mostafa Hashem Sherif, Abdelhamid Mellouk, Jun Li, Paolo Bellavista, 2014-01-03 This book constitutes the thoroughly refereed proceedings of the 5th International Conference on Ad

Hoc Networks ADHOCNETS 2013 held in Barcelona Spain in October 2013 The 14 revised full papers presented were carefully selected and reviewed from numerous submissions and cover a wide range of applications commercial and military such as mobile ad hoc networks sensor networks vehicular networks underwater networks underground networks personal area networks home networks and large scale metropolitan networks for smart cities They are organized in topical sections on wireless sensor networks routing applications and security

**LTE-Advanced and Next Generation Wireless Networks** Guillaume de la Roche,Andrés Alayón-Glazunov,Ben Allen,2012-11-05 LTE A and Next Generation Wireless Networks Channel Modeling and Performance describes recent advances in propagation and channel modeling necessary for simulating next generation wireless systems Due to the radio spectrum scarcity two fundamental changes are anticipated compared to the current status Firstly the strict reservation of a specific band for a unique standard could evolve toward a priority policy allowing the co existence of secondary users in a band allocated to a primary system Secondly a huge increase of the number of cells is expected by combining outdoor base stations with smaller cells such as pico femto cells and relays This evolution is accompanied with the emergence of cognitive radio that becomes a reality in terminals together with the development of self organization capabilities and distributed cooperative behaviors The book is divided into three parts Part I addresses the fundamentals e g technologies channel modeling principles etc Part II addresses propagation and modeling discussing topics such as indoor propagation outdoor propagation etc Part III explores system performance and applications e g MIMO Over the air testing electromagnetic safety etc

*Information Networking. Towards Ubiquitous Networking and Services* Teresa Vazão,Mário M. Freire,Ilyoung Chong,2008-11-20 This volume contains the set of revised selected papers presented at the 21st International Conference on Information Networking ICOIN 2007 which was held in Estoril Portugal January 23 25 2007 The conference series started under the name of Joint Workshop on Computer Communications in 1986 At that time it constituted a technical meeting for researchers and engineers on ternet technologies in East Asian countries where several technical networking issues were discussed In 1993 the meeting was reorganized as an international conference known as ICOIN Recent conferences were held in Sendai Japan 2006 Jeju Korea 2005 Pusan Korea 2004 Jeju Korea 2003 Jeju Korea 2002 Beppu City Japan 2001 Hsin chu Taiwan 2000 and Tokyo Japan 1999 In 2007 for the rst time since its creation ICOIN took place outside Asia and we were very pleased to host it in Portugal ICOIN 2007 was or nized by INESC ID and IST Technical University of Lisbon Portugal with the technical co sponsorship of IEEE Communications Society and IEEE Portugal Section Computer Society Chapter in cooperation with the Order of Engineers College of Informatics Engineering Portugal IPSJ Information Processing ciety of Japan KISS Korea Information Science Society and Lecture Notes in Computer Science LNCS Springer Germany The papers presented in this volume were selected in two stages 1 reviling and selection for the ICOIN program and 2 on site presentation review by session chairs or by program committee chairs

**Adaptation and Cross Layer Design in Wireless Networks** Mohamed Ibnkahla,2018-10-08 Adaptive

techniques play a key role in modern wireless communication systems The concept of adaptation is emphasized in the Adaptation in Wireless Communications Series through a unified framework across all layers of the wireless protocol stack ranging from the physical layer to the application layer and from cellular systems to next generation wireless networks Adaptation and Cross Layer Design in Wireless Networks is devoted to adaptation in the data link layer network layer and application layer The book presents state of the art adaptation techniques and methodologies including cross layer adaptation joint signal processing coding and networking selfishness in mobile ad hoc networks cooperative and opportunistic protocols adaptation techniques for multimedia support self organizing routing and tunable security services It presents several new theoretical paradigms and analytical findings which are supported with various simulation and experimental results Adaptation in wireless communications is needed in order to achieve high capacity and ubiquitous communications The current trend in wireless communication systems is to make adaptation dependent upon the state of the relevant parameters in all layers of the system Focusing on simplified cross layer design approaches this volume describes advanced techniques such as adaptive resource management adaptive modulation and coding 4G communications QoS diversity combining and energy and mobility aware MAC protocols The first volume in the series Adaptive Signal Processing in Wireless Communications cat no 46012 covers adaptive signal processing at the physical layer *Networks 2004* Hermann Kaindl, 2004 *Mobile Ad-hoc and Sensor Networks* Hongke Zhang, Stephan Olariu, Jiannong Cao, David B. Johnson, 2007-11-28 This book constitutes the refereed proceedings of the Third International Conference on Mobile Ad hoc and Sensor Networks MSN 2007 held in Beijing China in December 2007 The papers address all current issues in mobile ad hoc and sensor networks and are organized in topical sections on routing network protocols energy efficiency data processing self organization and synchronization deployment and application as well as security **Mobile Ad Hoc Robots and Wireless Robotic Systems: Design and Implementation** Santos, Raul Aquino, 2012-12-31 The emergence of wireless robotic systems has provided new perspectives on technology With the combination of disciplines such as robotic systems ad hoc networking telecommunications and more mobile ad hoc robots have proven essential in aiding future possibilities of technology Mobile Ad Hoc Robots and Wireless Robotic Systems Design and Implementation aims to introduce robotic theories wireless technologies and routing applications involved in the development of mobile ad hoc robots This reference source brings together topics on the communication and control of network ad hoc robots describing how they work together to carry out coordinated functions **Wireless Systems and Mobility in Next Generation Internet** Jorge García-Vidal, Llorenç Cerdà-Alabern, 2007-05-05 This book is the thoroughly refereed post proceedings of the Third International Workshop on Wireless and Mobility organized by the European Network of Excellence on Next Generation Internet held in Spain June 2006 It covers WLAN characterization vehicular networks WLAN and sensor networks protocols QoS and routing in ad hoc networks heterogeneous networks resource management in cellular networks TCP in wireless and

mobility agents      *Personal Wireless Communications* Marco Conti, 2003-09-12 This book constitutes the refereed proceedings of the IFIP TC6 8th International Conference on Personal Wireless Communications PWC 2003 held in Venice Italy in September 2003 The 49 revised papers presented together with 6 special track papers 1 invited paper 11 project descriptions 7 work in progress reports and 8 novel ideas reports were carefully reviewed and selected from 115 submissions The papers are organized in topical sections on mobile computing wireless access sensor networks transport protocols performance models WCDMA ad hoc networks wireless and mobile systems cellular networks IPv6 Bluetooth and security and cooperations in ad hoc networks      ICT and Critical Infrastructure: Proceedings of the 48th Annual Convention of Computer Society of India- Vol I Suresh Chandra Satapathy, P. S. Avadhani, Siba K. Udgata, Sadasivuni Lakshminarayana, 2013-10-19 This volume contains 88 papers presented at CSI 2013 48th Annual Convention of Computer Society of India with the theme ICT and Critical Infrastructure The convention was held during 13th 15th December 2013 at Hotel Novotel Varun Beach Visakhapatnam and hosted by Computer Society of India Vishakhapatnam Chapter in association with Vishakhapatnam Steel Plant the flagship company of RINL India This volume contains papers mainly focused on Computational Intelligence and its applications Mobile Communications and social Networking Grid Computing Cloud Computing Virtual and Scalable Applications Project Management and Quality Systems and Emerging Technologies in hardware and Software      *Encyclopedia on Ad Hoc and Ubiquitous Computing* Dharma P. Agrawal, Dr. Bin Xie, 2010 Ad hoc and ubiquitous computing technologies have received extensive attention in both the academia and industry with the explosive growth of wireless communication devices These technologies are beneficial for many applications such as offering futuristic high bandwidth access for users and are expected to offer more exciting and efficient services anytime and anywhere In order to satisfy these diverse applications the design issues of various wireless networks such as ad hoc sensor and mesh networks are extremely complicated and there are a number of technique challenges that need to be explored involving every layer of the OSI protocol stack This book aims to provide a complete understanding of these networks by investigating the evolution of ad hoc sensor and mesh networking technologies from theoretic concept to implementation protocols from fundamentals to real applications It provides the necessary background material needed to go deeper into the subject and explore the research literature The explanation in the book is therefore sufficiently detailed to serve as a comprehensive reference for students instructors researchers engineers and other professionals building their understanding of these networks Sample Chapter s Chapter 1 Survey on Link Quality Models in Wireless Ad Hoc Networks 235 KB Contents Mobile Ad Hoc Networks Survey on Link Quality Models in Wireless Ad Hoc Networks M Lu Scalable Multicast Routing in Mobile Ad Hoc Networks R Menchaca Mendez TCP Congestion and Admission Control Protocols in Ad Hoc Networks A Mishra et al Wireless Ad Hoc Networks with Directional Antennas B Alawieh et al Peer to Peer and Content Sharing in Vehicular Ad Hoc Networks M Abuelela Properties of the Vehicle to Vehicle Channel for Dedicated Short Range

Communications L Cheng et al Radio Resource Management in Cellular Relay Networks K D Lee Game Theoretic Tools Applied to Wireless Networks H Liu et al Wireless Sensor Networks Wireless Sensor Networks OCo Routing Protocols A Jamalipour Handling QoS Traffic in Wireless Sensor Networks M Younis et al Mobility in Wireless Sensor Networks A Asok et al Delay Tolerant Mobile Sensor Networks Y Wang Integration of RFID and Wireless Sensor Networks H Liu et al Integrating Sensor Networks with the Semantic Web Y Pei Effective Multiuser Broadcast Authentication in Wireless Sensor Networks K Ren et al Security Attacks and Challenges in Wireless Sensor Networks A S K Pathan Information Security in Wireless Sensor Networks A Ouadjaout et al Wireless Mesh Networks Network Architecture and Flow Control in Multi Hop Wireless Mesh Networks D Nandiraju et al Multi Hop MAC IEEE 802 11s Wireless Mesh Networks R C Carrano et al Channel Assignment in Wireless Mesh Networks W Fu et al Multi Hop Multi Path and Load Balanced Routing in Wireless Mesh Networks S Mishra Mobility Management in Wireless Mesh Networks P Wu et al Selfishness and Security Schemes for Wireless Mesh Network L Santhanam et al Readership Advanced undergraduates and graduate students in computer engineering instructors researchers engineers and other professionals



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