

Yuan Yuan

yuanyuan@cs.umd.edu
www.cs.umd.edu/~yuanyuan
☎ 240-205-5677

A.V. Williams Building, Computer Science Department
University of Maryland, College Park, MD, 20770, USA

Education

Ph.D in Computer Science University of Maryland, College Park <i>Advisor: Dr. William Arbaugh</i> <i>Co-Advisor: Dr. Ashok Agrawala</i>	2003-current
M.S. in Computer Science University of Maryland, College Park <i>Advisor: Dr. William Arbaugh</i>	2001-2003 GPA: 3.85/4
Bachelor of Computer Science & Engineering Special Class for Gifted Young Southeast University, China <i>Advisor: Dr. Guangxin Wu</i>	1995-1999 GPA: 3.80/4

Research Interests:

Wireless networking, distributed systems, mobile computing, cognitive radio systems, network security, sensor networks

Awards

1. NSF Grace Hopper Scholarship, 2006
2. Department Scholarship for Grace Hopper Conference, 2006
3. Department Travel Award for Globecom Conference, 2002
4. Science and Technology Progress Awards by Education Ministry, 1999
5. First-Class Academic Scholarship, first rank (< 5%), 1995~1999
6. International Mathematical Contest on Modeling, Honorable Mention, 1997

Relevant Graduate Courses

Computer and Network Security, Cryptography, Advanced Topics in Network Security, Advanced Topics in Computer Systems, Parallel Algorithms, Advanced Topics in Programming Languages, Numerical Analysis, Scientific Computing, Bioinformatics and High-Performance Computing, Introduction to Human-Computer Interaction

Research Highlights

My research focuses on dynamic spectrum allocation for improving the efficiency of the next-generation wireless networks. The electromagnetic spectrum is a three-dimensional resource, consisting of time, frequency, and space. How to allocate the spectrum resource among contending nodes determines the network performance. Especially the next-generation wireless networks have largely increased the physical-layer capacity and the radio agility: the transmission rate is driven to orders of magnitude higher; and a wide range of radio parameters including frequency, bandwidth and power, can be reconfigured in real-time.

I have mainly worked on three facets of this problem. First, I proposed a two-tier design at the MAC layer to allocate the spectrum resource in the time domain. The design scales to various population sizes and a wide range of high physical-layer rates. Second, I proposed the concept of the time-spectrum block that decides the time for which a link uses a segment of spectrum. Using this concept, the spectrum can be dynamically allocated based on the instantaneous traffic demands at the fine timescale. Third, I worked the admission control and QoS management scheme that allows wireless nodes to allocate and reserve the spectrum resource in multi-hop wireless networks.

Most of my research outcomes have been patented, and incorporated in the proposal for IEEE standards including 802.11n, 802.15.3a and 802.11s. The concept of time-spectrum block serves as the basis of the cognitive radio system built by Microsoft. The prototyping of cognitive radios leads to the demonstrations to the FCC and the TechFest in MS. My research has challenged fundamentals of the existing allocating scheme that are based on one-layer control and fixed channelization.

Research Experience

Microsoft Research, Redmond, WA

(Jul. 2006 – current)

Networking Research Group, Communication and Collaboration Group,
Wireless Incubation Group

Research Intern

- Managed the research project on building cognitive radio and networking technologies
- Proposed the framework that tightly couples the spectrum allocation and the medium access control to efficiently use the unoccupied frequencies in the TV bands
 - **Patent technology:** b-SMART: Spectrum Allocation and Medium Access Control for Cognitive Radio Networks
 - The proposed notion of dynamic spectrum allocation is radically different from the existing schemes based on the fixed channelization. This notion challenges the fundamentals of the fixed channels, which has been widely adopted in the current wireless networks
- Integrated the physical-layer design of cognitive radios with upper layers, and contributed to the first-phrase prototype of the cognitive radio system

Maryland Information and System Security Laboratory

(Oct. 2004 – Jul. 2006)

Dept. of Computer Science, University of Maryland, College Park

Graduate Research Assistant

- Proposed the scalable and resilient solutions to wireless networks
 - The proposed MAC design takes the two-tier approach to support various user populations and improve MAC-layer efficiency.
 - Proposed ROMER, resilient opportunistic mesh routing protocol. The design builds a runtime, forwarding mesh on a per-packet basis to improve the resilience against channel outages, errors, and attacks.
- Identified the cross-layer coordination issues and studied their impacts on throughput and queue stability in mesh networks
 - Built the wireless mesh network testbed with about 20 wireless nodes.

Intel Research, Hillsboro, OR

(May. 2004 – Oct.2004)

Research Intern

- Worked on the MAC-layer proposal for IEEE 802.11s, wireless mesh networks
 - **Patent technology:** Region-based opportunistic admission control for wireless mesh networks

- **Patent technology:** QoS management to support multimedia applications in wireless mesh networks
- Studied the WiMAX technology

Mitsubishi Electric Research Laboratories, Boston, MA (May. 2003 – May. 2004)

Research Intern

- Worked on the complete MAC-layer proposal for the 802.11n wireless LAN
 - Surveyed a wide range of the MAC technologies including 802.11b/e, HiperLAN/2, GSM, 802.15, Zigbee, 802.16
 - Implemented and evaluated the IEEE 802.11e MAC design in OPNET simulator
 - **Patent technology:** adaptive distributed channel access for wireless LANs
 - **Patent technology:** sequential controlled channel access for wireless LANs
- Worked the MAC-layer proposal to IEEE 802.15.3a WPAN
 - Proposed the mechanism called “proportional channel time partition” to handle the rate diversity in the Piconet
- Proposed resource management and scheduling algorithms for multi-rate wireless LANs
 - **Patent technology:** MWFS: Multirate Wireless Fair Scheduling for wireless LANs

Maryland Information and System Security Laboratory (May. 2002 – May. 2003)

Research Assistant

- Worked on the project to provide the secure routing in wireless ad-hoc networks
- Proposed a dynamic discovery protocol to securely search for services in wireless ad-hoc networks
- Designed and constructed the IP telephony testbed for MISSL, set up IP Gateway to PSTN, Gatekeeper, Billing/Accounting System
- Studied on the security issues in the VoIP applications by integrating Firewall with IP-telephony

Network and Information Research Lab, (Feb. 2000 – May. 2002)

Southeast University, China

Research Assistant, Software Engineer

- Designed and constructed the VPN system for the Nanjing Network Center, China
- Implemented the IP security module according to the network security protocols in the Linux platform
- Implemented and improved the key generation and management methods for the VPN clients
- Network Administrator of the Nanjing Network Center, China

Selected Publications

1. Yuan Yuan, Starsky H. Y. Wong, Songwu Lu, William Arbaugh, **ROMER: Resilient Opportunistic Mesh Routing for Wireless Mesh Networks**, IEEE WiMesh 2005
2. Hao Yang, Fan Ye, Yuan Yuan, Songwu Lu and William Arbaugh, **Toward Resilient Security in Wireless Sensor Networks**, ACM MOBIHOC 2005
3. Yuan Yuan, L. Lily Yang, William Arbaugh, **Opportunistic Region-based Admission Control for Wireless Mesh Networks**, ACM MOBIHOC Poster 2005
4. Yuan Yuan, Daqing Gu, William Arbaugh, Jinyun Zhang, **Achieving Fair Scheduling Over Error-Prone Channels in Multirate WLANs**, IEEE WirelessCom 2005

5. Xiaoqiao Meng, Starsky Wong, Yuan Yuan, Songwu Lu, **Characterizing Flows in Large Wireless Data Networks**, ACM MOBICOM 2004
6. Yuan Yuan, Daqing Gu, William Arbaugh, Jinyun Zhang, **High-Performance MAC for High-Capacity Wireless LANs**, IEEE ICCCN 2004
7. Yuan Yuan, Daqing Gu, William Arbaugh, Jinyun Zhang, **Adapting Wireless Fair Packet Scheduling to Multirate WLANs**, IEEE VTC 2004
8. Yuan. Yuan and William Arbaugh, **A Secure Service Discovery Protocol for MANET**, In Proc. of the 14th IEEE International Symposium on Personal, Indoor and Mobile Radio Communications (PIMRC 2003), vol. 1, Beijing, China, Sept. 7-11, 2003, pp. 502-506.
9. Zhai Mingyu, Yuan Yuan, **Fair Bandwidth Allocations through Queue Management in Core-Stateless Networks**, Globecom 2001, San Antonio, TX, Aug, 2001
10. Yuan Yuan Ji Yi Gu Guanqun, **Modeling the Extranet's Security Architecture with VPN**, CCICS'99, p56-62, Dec. 1999

Under Submission

1. Yuan Yuan, William Arbaugh, Songwu Lu, **Toward Scalable MAC Design in High-speed Wireless LANs**, Under submission
2. Yuan Yuan, William Arbaugh, Songwu Lu, Agrawala Ashok, **On Cross-layer Adaptations in Wireless Mesh Networks**, Under submission
3. Yuan Yuan, Paramvir Bahl, Ranveer Chandra, Philip A. Chou, Srihari Narlanka, Yunnan Wu, **A Cognitive Radio System for Efficient Spectrum Utilization Using Adaptive Bandwidth Tuning**, Under submission to IEEE Dyspan 2007

Patent Applications

1. **MWFS: Multirate Wireless Fair Scheduling for wireless LANs**, Yuan Yuan, Daqing Gu, Jinyun Zhang, MERL US patent, Nov. 2003
2. **Adaptive Distributed Channel Access for wireless LANs**, Yuan Yuan, Daqing Gu, Jinyun Zhang, MERL US patent, May. 2004
3. **Sequential Controlled Channel Access for Wireless LANs**, Yuan Yuan, Daqing Gu, Jinyun Zhang, MERL US patent, July. 2004
4. **Region-based Opportunistic Admission Control for Wireless Mesh Networks**, Yuan Yuan, Lily Yang, Intel Pending US patent, Aug. 2004
5. **QoS Management to Support Multimedia Applications in Wireless Mesh Networks**, Yuan Yuan, Lily Yang, Intel Pending US patent, Sept. 2004

6. **b-SMART: Spectrum Allocation and Medium Access Control for Cognitive Radio Networks**, Yuan Yuan, Paramvir Bahl, Ranveer Chandra, Philip A. Chou, Srihari Narlanka, Yunnan Wu,

Technique Report

1. Yuan Yuan, William Arbaugh, **Scalable and Efficient MAC for Next-Generation Wireless Data Networks**, Technical Report, Computer Science Department, University of Maryland, College Park, 2004
2. Yuan Yuan, Starky Wong, Hao Yang, Xiaoqiao, Meng, Songwu Lu, William Arbaugh, Lixia Zhang, **ROMER: Resilient Opportunistic Mesh Routing for Wireless Mesh Networks**, Technique Report, 2004
3. Yuan Yuan, Daqing Gu, Jinyun Zhang, **Implementation and Simulation documentation of IEEE 802.11e in OPNET**, Mitsubishi Electric Research Lab, Nov. 2003
4. Yuan Yuan, Ashok Agrawala, **A Secure Service Discovery Protocol for MANET**, Computer Science Technical Report CS-TR-4498, and UMIACS Technical Report UMIACS-TR-4498
5. Yuan Yuan, Paramvir Bahl, Ranveer Chandra, Philip A. Chou, Srihari Narlanka, Yunnan Wu, **A Cognitive Radio System for Efficient Spectrum Utilization Using Adaptive Bandwidth Tuning**, Microsoft Research, Internal technique report
6. Yuan Yuan, Paramvir Bahl, Ranveer Chandra, Thomas Moscibroda, Yunnan Wu, **Allocating Dynamic Time-Spectrum Blocks for Cognitive Radio Networks**, Microsoft Research, Internal technique report

Skills

- Experienced in IEEE 802.11b, 802.11e, 802.11n, 802.11s, 802.16e, 802.16, 802.22, routing protocols and scheduling algorithms in wireless networks, network measurement tools
- Experienced in wireless drivers including windows NSDI driver, MadWifi driver
- Experienced in C, C++, Java, scripting languages and network programming
- Experienced in QualNet, OPNET, ns-2 simulators

Professional Services

- Reviewer for many journals and conferences including **IEEE INFOCOM**, IEEE International Conference on Computer Communications and Networks (ICCCN), IEEE International Conference on Communications (ICC), IEEE International Conference on Communications (WCNC), International Wireless Communications & Mobile Computing Conference (IWCWC), IEEE International Conference on Mobile Ad hoc and Sensor Systems (MASS), Network and Distributed System Security Symposium (NDSS), **IEEE Transactions on Mobile Computing**, Wiley European Transactions on Telecommunications,

References

Dr. William Arbaugh

Dr. Victor Bahl

Associate Professor of
Computer Science Department
University of Maryland, College Park
waa@cs.umd.edu
Tel: (301) 405-2774

Dr. Songwu Lu
Associate Professor of
UCLA Computer Science Department
Los Angeles, CA 90095-1596
slu@cs.ucla.edu
Tel: (310) 794-9289

Dr. Philip A. Chou
Principal Researcher
Manager of Communication and
Collaboration Group
Microsoft Research
pachou@microsoft.com
Tel: (425) 706-3869

Dr. Daqing Gu
Docomo Beijing Communications Labs
Beijing , China
gu@docomolabs-beijing.com.cn
Tel: +86-(10)-82861501x126
Fax. +86-(10)-82861506

Dr. Ranveer Chandra
Researcher
Network Research Group
Microsoft Research
Ranveer@microsoft.com
Tel: (425) 706-7034

Dr. L. Lily Yang
Communications Technology Research Lab
Intel Corporation
lily.l.yang@intel.com
Tel: (503) 264-8813

Principal Researcher
Manager of Networking Research Group
Microsoft Research
bahl@microsoft.com
Tel: (425) 706-1021

Dr. Ashok Agrawala
Professor of
Computer Science Department
University of Maryland, College Park
agrawala@cs.umd.edu
Tel: (301) 405-2525

Dr. Jinyun Zhang
Group Manager
Digital Communications & Networking Lab
MERL Technology Lab
jzhang@merl.com
Tel: (617) 621-7595

Dr. Amer Hassan
Wireless Architect
Windows Networking Core System
Microsoft Corporation
amerh@microsoft.com
Tel: (425) 705-9590

Dr. Yunnan Wu
Researcher
Communication and Collaboration Group
Microsoft Research
yunnanwu@microsoft.com
Tel: (425) 706-5907

Citizenship and Status

China, F-1 Visa