Matthew J. Miller

Curriculum Vitae

Contact

Apex, NC

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Employment

1/2007–present
Software Engineer
Cisco Systems
Research Triangle Park, NC

1/2003–9/2005
Research Assistant
Coordinated Science Laboratory, University of Illinois at Urbana-Champaign
Urbana, IL

Education

Ph.D., Computer Science, December 2006
University of Illinois at Urbana-Champaign
Urbana, IL

Thesis: *Energy Efficiency and Security for Multihop Wireless Networks*
Adviser: Prof. Nitin H. Vaidya
Committee: Prof. Klara Nahrstedt, Prof. Jennifer Hou, and Prof. Indranil Gupta
GPA: 3.94/4.0

M.S., Computer Science, December 2003
University of Illinois at Urbana-Champaign
Urbana, IL

Thesis: *Minimizing Energy Consumption in Sensor Networks Using a Wakeup Radio*
Adviser: Prof. Nitin H. Vaidya

B.S., Computer Engineering, May 2001
Clemson University
Clemson, SC

GPA: 4.0/4.0
Minors: *Computer Science* and *Mathematics*

Industry Experience

Cisco Systems

- IOS developer for 7600 router and SIP-400 linecard platforms.
- Helped implement core dump feature which was a finalist for a Reliability, Availability, and Serviceability (RAS) Award within business unit.
- Sustaining for 7600 IP routing platform code. Consistently resolved the most bugs in the group.
- Involved in troubleshooting several high profile customer cases.
- Reviewer for external proposals for Cisco Research.
- Served multiple times as a Cisco judge for Duke University's graduate networking project class.

Honors

US National Science Foundation Fellowship
Awarded in 2001
Acceptance Percentage: 16.2% (903/5560)

ASEE National Defense Science and Engineering Graduate Fellowship
Awarded in 2001
Acceptance Percentage: 21.3% (285/1339)

Publications

Journal Papers

Cigdem Sengul, **Matthew J. Miller**, and Indranil Gupta. Adaptive Probability-Based Broadcast Forwarding in Energy-Saving Sensor Networks. *ACM Transactions on Sensor Networks*, 2008.
Accepted for publication.

Matthew J. Miller and Nitin H. Vaidya. Ad hoc Routing for Multilevel Power Save Protocols. *Elsevier Ad Hoc Networks*, 6(2):210–225, April 2008.

Matthew J. Miller and Nitin H. Vaidya. A MAC Protocol to Reduce Sensor Network Energy Consumption Using a Wakeup Radio. *IEEE Transactions on Mobile Computing*, 4(3):228–242, May/June 2005.
Acceptance rate $\approx$ 25%.

Conference Papers

Matthew J. Miller and Indranil Gupta. Practical Exploitation of the Energy-Latency Tradeoff for Sensor Network Broadcast. In *IEEE Workshop on Sensor Networks and Systems for Pervasive Computing (PerSeNS) 2007*, March 2007.
Acceptance rate = 28.9% (13/45).

Matthew J. Miller and Nitin H. Vaidya. Leveraging Channel Diversity for Key Establishment in Wireless Sensor Networks. In *IEEE Conference on Computer Communications (Infocom) 2006*, April 2006.
Acceptance rate = 18% (252/1400).

Matthew J. Miller and Nitin H. Vaidya. Improving Power Save Protocols Using Carrier Sensing for Dynamic Advertisement Windows. In *IEEE Mobile Ad hoc and Sensor Systems (MASS) 2005*, November 2005.
Acceptance rate = 35.7% (59/165).

Matthew J. Miller, Cigdem Sengul, and Indranil Gupta. Exploring the Energy-Latency Trade-off for Broadcasts in Energy-Saving Sensor Networks. In *IEEE International Conference on Distributed Computing Systems (ICDCS) 2005*, pages 17–26, June 2005.
Acceptance rate = 13.8% (75/542) overall and 10.1% (9/89) for papers on sensors.

Matthew J. Miller and Nitin H. Vaidya. Power Save Mechanisms for Multi-Hop Wireless Networks. In *IEEE International Conference on Broadband Networks (BROADNETS) 2004*, pages 518–526, October 2004. Invited paper.

Matthew J. Miller and Nitin H. Vaidya. Minimizing Energy Consumption in Sensor Networks Using a Wakeup Radio. In *IEEE Wireless Communications and Networking Conference (WCNC) 2004*, March 2004.
Acceptance rate = 43.2% (470/1087).

Submitted Papers

Matthew J. Miller and Nitin H. Vaidya. Using Carrier Sensing to Improve the Energy Consumption of Sensor Network Wake-Up Protocols. In submission to *Elsevier Ad Hoc Networks*, 2005.

Technical Reports

Matthew J. Miller. An Errata for *Delay Efficient Sleep Scheduling in Wireless Sensor Networks*. Technical report, University of Illinois at Urbana-Champaign, September 2005.

Matthew J. Miller and Nitin H. Vaidya. On-Demand TDMA Scheduling for Energy Conservation in Sensor Networks. Technical report, University of Illinois at Urbana-Champaign, June 2004.

Matthew J. Miller, William D. List, and Nitin H. Vaidya. A Hybrid Network Implementation to Extend Infrastructure Reach. Technical report, University of Illinois at Urbana-Champaign, 2003.

Research Experience

Graduate Work

My work focuses on *security* and *energy efficiency* in wireless multihop networks, particularly sensor networks. In the security domain, I proposed a key distribution protocol to provide symmetric, pairwise keys that, with high probability, are unknown to eavesdroppers. This was the first work to use the underlying wireless channel diversity to address this problem. In the energy efficiency domain, most power save protocols use static sleeping and listening intervals regardless of the network environment. My work looks at adaptively adjusting these intervals in response to network traffic. Additionally, I have proposed methods of using carrier sensing to further improve the energy efficiency of power save protocols and a lightweight protocol to address the energy-latency tradeoff for broadcast dissemination in sensor networks.

Graduate Class Projects

- *Exploring the Energy-Latency Trade-off of Broadcasts in IEEE 802.11 Power Save Networks*
  Joint work with Cigdem Sengul in Fall 2003. Designed, analyzed, simulated, and evaluated (using *ns-2*) a protocol for power save networks and the impact of its parameters on energy and latency. Selected by the professor as one of the three best two-person projects in the class. Published in IEEE ICDCS 2005.
- *Improving Fault Tolerance in AODV*
  Joint work with Jungmin So in Fall 2002. Designed, simulated, and evaluated (using *ns-2*) techniques to maintain multiple routes in an ad-hoc routing protocol.
- *Improving Connectivity in a Scatternet Formation Algorithm*
  Joint work with Cristina L. Abad in Spring 2002. Designed, simulated, and evaluated (using a custom built simulator written in C) a protocol to provide greater connectivity in Bluetooth scatternet formation.
- *Log Correlation for Intrusion Detection*
  Group project in Spring 2003. Investigated how information from various system logs can be used to identify specific attacks. Subsequent work by some group members led to a publication based on the project:

  C. Abad, J. Taylor, C. Sengul, W. Yurcik, Y. Zhou, and K. Rowe, "Log Correlation for Intrusion Detection: A Proof of Concept," in *Annual Computer Security Applications Conference (ACSAC 2003)*, December 2003.
- *Tools for Middle School Students to Create Vignettes*
  Joint work with Jeffrey Naisbitt and Naomi Caldwell in Spring 2003. Designed, implemented, and did user-testing on a tool (using Java Swing) to allow students to create life stories using an instant messenger-like interface.

Awards

- NSF Student Travel Grant (US $500) for IEEE BROADNETS 2004
- NSF Student Travel Grant (US $750) for ACM SenSys 2004
- DARPA/NSF Student Travel Grant (US $400–750) for IEEE MASS 2005

Undergraduate Work

- Participated in the NSF-funded Summer Undergraduate Research Experience (SURE) at Clemson University in 1999.
- Worked in Parallel Architecture Research Lab (PARL) at Clemson University for two years.
- Projects included designing user interfaces (using Java Swing) for scientific computing problem solving environments to allow message passing between modules and array partitioning.

External Reviewer

- *IEEE Transactions on Mobile Computing*, *IEEE Transactions on Dependable and Secure Computing*, *IEEE Transactions on Wireless Communications*, *IEEE Transactions on Information Forensics and Security*, and *IEEE Communications Magazine*.
- MobiQuitous 2004, IEEE WCNC 2004, IEEE ICC 2005, IEEE MASS 2006, and IEEE VTC 2006.
- Cisco Research funding proposals.
- Judge for Duke University Computer Science graduate class projects (2007).

Memberships

1997–present Member, Institute of Electrical and Electronics Engineers (IEEE)

Technical Skills

Proficient
C, Python, C++, Java, Perl, LaTeX, Matlab, *ns-2* Network Simulator (C++ based), TinyOS/TOSSIM

Familiar
Tcl/Tk, ML, Prolog, Lisp, PHP

Extracurricular

2004–2005 Large Group Coordinator
UIUC Graduate InterVarsity Christian Fellowship

- Responsible for contacting and scheduling about 20 speakers
- Responsible for arranging facility and equipment reservations
- Helped restructure the chapter budget

Miscellaneous

Citizenship: United States of America

Marital Status: Married

Erdös Number: ≤ 4

December 10, 2016