

RAHUL C. SHAH

1322 Shattuck Ave., #205
Berkeley, CA 94709
Ph: (510) 604-1120

rcshah@eecs.berkeley.edu
<http://www.eecs.berkeley.edu/~rcshah>

EDUCATION

June 2005 (expected)

PhD in Electrical Engineering and Computer Sciences

University of California, Berkeley

Thesis title: "Opportunistic routing and network lifetime maximization for wireless sensor networks"

Thesis advisor: Jan M. Rabaey

Minors: 1. Management of Technology

2. Embedded System Design

June 1999

B. Tech (Hons.) in Electronics and Electrical Communication Engineering

Indian Institute of Technology, Kharagpur

Thesis title: "A protocol for multimedia conferencing over wireless networks"

WORK EXPERIENCE

Graduate Student Researcher, Dept. of EECS, University of California, Berkeley

(June 2000 – present)

- Group leader (2002-03) for the PicoRadio project which consists of about 15 graduate and 5 undergraduate students. The PicoRadio project is a system-level research project to design ultra-low power sensor nodes and networking architectures to enable sensor networks that scale to 100s and 1000s of devices.
- Designed networking protocols to maximize the lifetime of sensor networks
 - Developed and implemented opportunistic routing that uses spatial diversity in the network to combat fading channels and node failures
 - Designed a MAC layer protocol to enable anycast in ad hoc networks
 - Designed and implemented a distributed duty cycling algorithm that maximizes network lifetime without requiring any control overhead or communication among nodes
- Created an asset management system prototype using RFID tags for a high-end retail chain. The system was capable of real-time inventory checking, providing product information to customers and integrated with existing billing systems.
- Studied entrepreneurship and the venture capital industry in China and Japan as part of the Mayfield fellowship program

Product Manager, Silver Spring Networks, San Mateo

(June 2004-August 2004)

- Defined product requirements for the communication cards to be used in Silver Spring's next generation utility network that supports advanced features including automatic meter reading, outage management and demand response
- Helped design the routing and MAC layer communication protocols for the next generation system
- Created a simulation of the entire communication network to demonstrate the operation and scalability of the system
- Developed marketing collateral such as product datasheets and brochures for upcoming product launch

Research Staff Member, Intel Research Lab, Seattle

(June 2002 – September 2002)

- Designed the system architecture of Data MULEs, a sparse sensor network that utilized mobility in the environment for data transfer
- Developed usage scenarios and device requirements for the MULE system
- Analyzed system performance and scalability of a wide area deployment of such an architecture

Graduate Student Instructor, Dept. of EECS, University of California, Berkeley

(August 1999 – May 2000)

- Designed and conducted laboratory sessions for EE40: Introduction to Microelectronic Circuits and EE100: Electronic Techniques for Engineering, introductory courses in Electrical Engineering for undergraduates

AWARDS

- **Mayfield Fellow**, 2004, University of California, Berkeley (sponsored by the Mayfield Venture Fund, Menlo Park). This award is given to recognize and encourage entrepreneurship among students interested in the business aspects of technology.
- **Hitachi Fellow**, 2003, University of California, Berkeley (sponsored by Hitachi Ltd., Japan). This award was instituted by Hitachi to research and develop potential market opportunities for their Mu-chip (RFID tag).

PUBLICATIONS

Journals and Book Chapters

- Sushant Jain, Rahul C. Shah, Waylon Brunette, Gaetano Borriello and Sumit Roy, "**Exploiting mobility for energy efficient data collection in wireless sensor networks**", to appear in the *ACM/Kluwer Mobile Networks and Applications Journal*, 2005.
- J. Ammer et. al., "**Ultra-low power integrated wireless nodes for sensor and actuator networks**", book chapter in *Ambient Intelligence* (ed. W. Weber, J. Rabaey and E. Aarts), Springer-Verlag, 2005.
- Rahul C. Shah, Dragan Petrovic and Jan Rabaey, "**Energy aware routing and data funneling in sensor networks**", book chapter in *Handbook of Sensor Networks: Compact Wired and Wireless Sensing Systems* (ed. M. Ilyas and I. Mahgoub), CRC Press, 2004.
- Rahul C. Shah, Sumit Roy, Sushant Jain and Waylon Brunette, "**Data MULEs: Modeling and analysis of a three-tier architecture for sparse sensor networks**", *Elsevier Ad Hoc Networks Journal*, vol. 1, issues 2-3, Sept. 2003, pp. 215-233.

Conferences (refereed)

- Rahul C. Shah, Adam Wolisz and Jan Rabaey, "**On the performance of geographical routing in the presence of localization errors**", *IEEE International Conference on Communications*, 2005.
- Rahul C. Shah, Sven Wietholter, Adam Wolisz and Jan Rabaey, "**Modeling and analysis of opportunistic routing in low traffic scenarios**", *IEEE/ACM International Symposium on Modeling and Optimization in Mobile, Ad hoc and Wireless Networks*, 2005.
- Rahul C. Shah, Sven Wietholter, Adam Wolisz and Jan Rabaey, "**When does opportunistic routing make sense?**", *IEEE International Workshop on Sensor Networks and Systems for Pervasive Computing*, 2005.
- Rahul C. Shah, Alvise Bonivento, Dragan Petrovic, En-yi Lin, Jana van Greunen and Jan Rabaey, "**Joint optimization of a protocol stack for sensor networks**", *IEEE Military Communications Conference*, 2004.
- Sushant Jain, Rahul C. Shah, Waylon Brunette, Gaetano Borriello and Sumit Roy, "**Exploiting mobility for energy-efficient data collection in sensor networks**", *IEEE/ACM International Symposium on Modeling and Optimization in Mobile, Ad hoc and Wireless Networks*, 2004.
- Rahul C. Shah, Sumit Roy, Sushant Jain and Waylon Brunette, "**Data MULEs: Modeling a three-tier architecture for sparse sensor networks**", *IEEE Workshop on Sensor Network Protocols and Applications*, May 2003.
- Dragan Petrovic, Rahul C. Shah, Kannan Ramchandran and Jan Rabaey, "**Data Funneling: Routing with aggregation and compression for wireless sensor networks**", *IEEE Workshop on Sensor Network Protocols and Applications*, May 2003.
- Andreas Willig, Rahul Shah, Jan Rabaey and Adam Wolisz, "**Altruists in the PicoRadio Sensor Network**", *IEEE International Workshop on Factory Communication Systems*, 2002.
- Rahul C. Shah and Jan Rabaey, "**Energy Aware Routing for Low Energy Ad Hoc Sensor Networks**", *IEEE Wireless Communications and Networking Conference*, March 2002.
- Lizhi Charlie Zhong, Jan Rabaey, Chunlong Guo and Rahul Shah, "**Data Link Layer Design for Wireless Sensor Networks**", *IEEE Military Communications Conference*, 2001.

- Lizhi Charlie Zhong, Rahul Shah, Chunlong Guo and Jan Rabaey, "**An ultra low power and distributed access protocol for broadband wireless networks**", *IEEE Network Interop Broadband Wireless Summit*, May 2001.
- Julio L. Da Silva Jr. et. al., "**Design Methodologies for Pico Radio Networks**", *Design Automation and Test in Europe*, Munich, Germany, March 2001.
- Gaurav Agarwal, Rahul C. Shah and Jean Walrand, "**Content Distribution Architecture using Network Layer Anycast**", *IEEE Workshop on Internet Applications*, 2001.
- Rahul Shah, Venkatachalam Muthaiah and Pradip K. Biswas, "**A Load Balanced Parallel Algorithm for Depth Perception by Stereo Correspondence using Hough Transform**", *National Conference on Communications*, India, Jan. 1999.

ACTIVITIES

- Reviewer for leading journals and conferences: IEEE Transactions on Parallel and Distributed Systems, IEEE/ACM Conference on Information Processing in Sensor Networks, IEEE European Workshop on Wireless Sensor Networks, IEEE International Conference on Communications, IEEE Globecom, IEEE Wireless Communications and Networking Conference
- Student member of the IEEE

REFERENCES

Prof. Jan Rabaey

Donald O. Pedersen Distinguished Professor
 Dept. of Electrical Engineering and Computer
 Sciences
 University of California, Berkeley
 2108 Allston Way, Suite 200
 Berkeley, CA 94704
 Ph: (510) 666-3102
 Email: jan@eecs.berkeley.edu

Prof. Adam Wolisz

Dept. of Electrical Engineering
 Technical University of Berlin
 Sekr. FT-5, Einsteinufer 25,
 10587 Berlin, Germany
 Ph: (+49 30) 314-22911
 Email: awo@ieee.org

James Pace

Director, Product Management
 Silver Spring Networks
 2755 Campus Drive, Suite 205
 San Mateo, CA 94403
 Ph: (650) 357-8770 extn. 113
 Email: pace@silverspringnet.com

Prof. Sumit Roy

Professor, Dept. of Electrical Engineering
 M330 EE/CSE, Box 352500
 University of Washington
 Seattle, WA 98195
 Ph: (206) 221-5261
 Email: roy@ee.washington.edu