

## Joseph Camp

---

### CONTACT INFORMATION

Rice University  
ECE Department  
6100 South Main MS-366  
Houston, TX 77005 USA

*Voice:* (713) 348-2253  
*Cell:* (832) 725-2285  
*E-mail:* camp@rice.edu  
*Web:* www.ece.rice.edu/~camp

### RESEARCH INTERESTS

My research interests are in wireless mesh networks, with a focus on two main areas: deployment, measurement, and analysis of large-scale mesh networks and development of protocols for programmable mesh network hardware spanning the media access control and physical layers.

### EDUCATION

#### Rice University, Houston, Texas USA

- Ph.D. Candidate, Computer Engineering, January 2006 (expected graduation date: May 2009)
- Dissertation Topic: “Cross-Layer Implementation and Urban Experimental Evaluation of Heterogeneous Multirate Systems”
  - Advisor: Professor Edward W. Knightly
- M.S., Computer Engineering, December 2005
- Thesis: “Measurement Driven Deployment of a Two-Tier Urban Mesh Access Network”
  - Advisor: Professor Edward W. Knightly
  - GPA: 3.84

#### University of Texas, Austin, Texas USA

- B.S. with Honors, Electrical and Computer Engineering, May, 2003
- GPA: 3.73

### PUBLICATIONS

J. Camp and E. Knightly, **Modulation Rate Adaptation in Urban and Vehicular Environments: Cross-layer Implementation and Experimental Evaluation**, to appear in *Proceedings of ACM MobiCom 2008*, San Francisco, California, September 2008.

J. Camp and E. Knightly, **The IEEE 802.11s Extended Service Set Mesh Networking Standard**, to appear in *IEEE Communications Magazine*, August 2008.

J. Camp, V. Mancuso, O. Gurewitz, and E. Knightly, **A Measurement Study of Multiplicative Overhead Effects in Wireless Networks**, in *Proceedings of IEEE INFOCOM 2008*, Phoenix, Arizona, April 2008.

J. Shi, O. Gurewitz, V. Mancuso, J. Camp and E. Knightly, **Measurement and Modeling of the Origins of Starvation in Congestion Controlled Mesh Networks**, in *Proceedings of IEEE INFOCOM 2008*, Phoenix, Arizona, April 2008.

A. Khattab, J. Camp, C. Hunter, P. Murphy, A. Sabharwal, and E. Knightly, **WARP: A Flexible Platform for Clean-Slate Wireless Medium Access Protocol Design**, in *ACM SIGMOBILE Mobile Computing and Communications Review*, 12(1):56-58, January 2008.

J. Camp, E. Knightly, and W. Reed, **Developing and Deploying Multihop Wireless Networks for Low-Income Communities**, in the *Journal of Urban Technology*, 13(3): 129-137, December 2006.

C. Hunter, J. Camp, P. Murphy, A. Sabharwal, and C. Dick, **A Flexible Framework for Wireless Medium Access Protocols**, Invited Paper in *Asilomar 2006*, Pacific Grove, CA, November 2006.

J. Camp, J. Robinson, C. Steger, and E. Knightly, **Measurement Driven Deployment of a Two-Tier Urban Mesh Access Network**, in *Proceedings of ACM MobiSys 2006*, Uppsala, Sweden, June 2006.

ACADEMIC  
EXPERIENCE

**Rice University**, Houston, Texas USA

*Research Assistant*

**August, 2003 - present**

My Ph.D. and Masters level research have been a combination of two hardware platforms for mesh networks. The first project is a mesh network deployment using off-the-shelf hardware to provide Internet to a low-income neighborhood in collaboration with a non-profit organization, Technology For All. The second project is a fully custom hardware platform for mesh networks called Wireless Open-Access Research Project.

**Technology For All-Wireless Project**

**May, 2004 - present**

At the inception of the project, I architected the network as well as chose the hardware platform to achieve neighborhood-wide coverage (4 km<sup>2</sup>). To date, I have decided where each node will be deployed and been responsible for the management of the network. Further, I have performed and continue to perform measurements on the network to study multihop wireless behavior to motivate and implement new mesh protocols.

**Wireless Open-Access Research Project (WARP)**

**January, 2004 - present**

Early in the project, I developed an IEEE 802.11 MAC that was operational on the PowerPC of the WARP hardware and interacted with ns-2 to form the physical and network layers. After the development of the physical layer by the communications research team, I added MAC functionality to a simple aloha-type MAC such as carrier sense and RTS/CTS as well as the development of next generation MAC protocols that opportunistically send data according to channel conditions.

*Teaching Assistant*

**January, 2007 - May, 2007**

ELEC 438 (Spring 2007) - Deployment and Measurement of Wireless Networks. Worked with students to design measurement studies and make deployment decisions for the Technology For All-Wireless Network on the East End of Houston. Projects spanned topics such as VoIP, mobility, routing, and traffic analysis over the TFA mesh.

*Lecturer*

**January, 2006 - May, 2006**

ELEC 220 (Spring 2006) - Fundamentals of Computer Engineering. Lecturer for weekly lab connected to the course where students learned computer engineering, including bits, logic, state machines, instruction-sets, assembly language, linkage conventions, storage hierarchies, interrupts, I/O, and systems issues. Shared responsibility for grading labs and exams.

*Grader*

**August, 2005 - December, 2005**

ELEC 537 (Fall 2005) - Communication Networks. Duties included grading of homework assignments and exams, preparation of exam questions, and fielding of student inquiries. Course included in topics of wireless networks, media access, routing, traffic modeling, congestion control, and scheduling.

*Teaching Assistant*

**January, 2005 - May, 2005**

ELEC 438 (Spring 2005) - Deployment and Measurement of Wireless Networks. Worked with students to design measurement studies and make deployment decisions for the Technology For All-Wireless Network on the East End of Houston. Projects spanned topics such as characterizing the system capacity, optimizing placement of wireless nodes, and studying the effects of traffic and channel characteristics on system-wide performance.

*Grader*

**August, 2004 - December, 2004**

ELEC 422 (Fall 2004) - VLSI Design I. Duties included lecturing in the associated with the course design project, grading homework and exams, and fielding inquiries from students during the VLSI

design process. Course included a study of VLSI technology and design, MOS devices, characteristics and fabrication, logic design and implementation, VLSI design methodology, circuit simulation and verification.

*Lecturer*

**January, 2004 - May, 2004**

ELEC 220 (Spring 2004) - Fundamentals of Computer Engineering. Lecturer for weekly lab connected to the course where students learned computer engineering, including bits, logic, state machines, instruction-sets, assembly language, linkage conventions, storage hierarchies, interrupts, I/O, and systems issues. Shared responsibility for grading labs, homework assignments, and exams.

**MEDIA COVERAGE** **Rice team Brings Wireless Internet to Houston Community**, Rice at Large, Issue 6, Spring 2008.

([http://tfa.rice.edu/news\\_n\\_media/Rice-at-Large-Spring-08.pdf](http://tfa.rice.edu/news_n_media/Rice-at-Large-Spring-08.pdf))

**Bringing Wireless Internet to the Masses**, CBS11 News KHOU/TV, Feb. 5, 2008.

(<http://www.khou.com/video/news-index.html?nvid=215101>)

**One East Houston Section Wi-Fi Friendly**, FOX26 News KRIV/TV, Aug. 29, 2007.

(<http://www.myfoxhouston.com/myfox/pages/News/Detail?contentId=4212221&version=1&locale=EN-US&layoutCode=VSTY&pageId=3.2.1>)

**Can Houston fit into an Internet bubble?**, ABC13 News KTRK/TV, Apr. 4, 2007.

([http://abclocal.go.com/ktrk/story?section=sci\\_tech&id=5184404](http://abclocal.go.com/ktrk/story?section=sci_tech&id=5184404))

**Wireless Project Breaks New Ground**, Houston Chronicle, Feb. 15, 2007.

([http://www.chron.com/CDA/archives/archive.mpl?id=2007\\_4284632](http://www.chron.com/CDA/archives/archive.mpl?id=2007_4284632))

**Wireless Advances: Mesh Wi-Fi is one post-Katrina success story in New Orleans**, IEEE Spectrum Radio, Aug. 2006.

(<http://www.spectrum.ieee.org/radio?date=08.06&segDlink=2>)

**Wi-Fi Nodes to Talk Amongst Themselves**, IEEE Spectrum Magazine, July 2006.

(<http://www.spectrum.ieee.org/jul06/4114>)

**Doctoral Student Helps Provide Wireless Computer Access**, Rice News, Sept. 22, 2005.

(<http://www.media.rice.edu/media/NewsBot.asp?MODE=VIEW&ID=7724&SnID=2>)

**Evacuees Reconnecting with Loved Ones**, NPR, Sept. 6, 2005.

(<http://www.kuhf.org/site/News2?page=NewsArticle&id=13662>)

**Municipal Wireless Networks Open New Access and Old Debates**, IEEE Internet Computing Magazine, June 2005.

(<http://ieeexplore.ieee.org/iel5/4236/30969/01438298.pdf?arnumber=1438298>)

**Bringing Wireless Internet to Houston's East End**, Rice News, Feb. 24, 2005.

(<http://www.media.rice.edu/media/NewsBot.asp?MODE=VIEW&ID=7118&SnID=2>)

**PROFESSIONAL  
EXPERIENCE**

**Technology For All**, Houston, Texas USA

*Wireless Mesh Consultant and TFA Staff*

**May, 2004 - present**

Deployed a wireless mesh network spanning 4 square kilometers with over 1000 users in the low-income neighborhood of Pecan Park (East End of Houston). Have collaborated with individuals from Methodist Hospital, Houston Public Library, Houston Community College, Young Men's Christian Association (YMCA), and Houston Independent School District. Other responsibilities include

operations, inventory, and ordering as well as marketing the network to neighborhood residents.

**Intel Corporation, Austin, Texas USA**

*Hardware Design Engineer/Co-op*

**May, 2002 - August, 2003**

Used Perl and MySQL to build a regression management system database used to store test results of a next-generation network processor (Gigabit speed). Rated Outstanding Intern by Intel Supervisor, Xiao Sun (512-732-3966).

**Intel Corporation, Folsom, CA USA**

*Component Design Engineer/Co-op*

**January, 2000 - August, 2000**

Used Perl to aid P64H2 (Bridge from PCI/PCI-X to Hublink Buses) Design Team by porting and debugging Full Chip Tests (133) from P64H in the Bus Functional Language on the PCI Bus. Rated Outstanding Intern by Intel Supervisor, Ganesh Murthy (916-356-4406).

**NASA - Johnson Space Center, Houston, TX USA**

*Pre-Co-op*

**May, 1998 - August, 1999**

Programmed in 4th Dimension database environment, Multilinx, to build an operational database containing the internal systems of the X-38 Emergency Crew Return Vehicle. Produced a mathematical correlation of an infrared lamp experiment in a vacuum chamber using a UNIX application for the TransHab, an inflatable inhabitant module for the International Space Station.

*SHARP Apprentice*

**May, 1997 - August, 1997**

Created a FORTRAN simulation to emulate the reception of an antenna set to travel on the International Space Station from the TDRS (Tracking Data Relay Satellite).

COMPUTER SKILLS

- Hardware Design: VHDL, Verilog, Xilinx Tools, ChipScope, ModelSim, System Generator.
- High-Level Languages: C++, Perl, Pascal, Unix shell scripting, AWK, FORTRAN.
- Assembly Languages: Motorola 6800, LC-3, Intel.
- Applications: MATLAB, L<sup>A</sup>T<sub>E</sub>X, Microsoft Office, iWork, iLife, iPerf.
- Algorithms: Combinatorial Optimization.
- Operating Systems: Mac OS X, Unix/Linux, Windows.

HONORS AND AWARDS

First Place in Advanced Micro Devices/Rice VLSI Design Contest  
Outstanding Intel Intern (Austin, Texas and Folsom, California)  
University of Texas Scholarships: Terry Foundation, Jesse H. Jones (Houston Endowment), Texas Engineering Foundation, Texas Exes, Houston Northwest Chamber of Commerce, Cy-Fair Federal Credit Union, BankOne  
Salutatorian (2/460) and Senior Class President of Cy-Fair High School, 1998