

Joseph Camp

CONTACT INFORMATION

Southern Methodist University
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RESEARCH INTERESTS

Wireless networks and computer architecture. Specific areas include deployment, measurement, and analysis of large-scale wireless networks and development of embedded protocols for network hardware from high- or low-level programming languages to hardware descriptive languages.

EDUCATION

Rice University, Houston, Texas USA

Ph.D., Electrical and Computer Engineering, May 2009

- Dissertation: “Experimental and Analytical Evaluation of Embedded Link Performance with Small-Scale Channel Fluctuations”
- Advisor: Professor Edward W. Knightly

M.S., Electrical and Computer Engineering, December 2005

- Thesis: “Measurement Driven Deployment of a Two-Tier Urban Mesh Access Network”
- Advisor: Professor Edward W. Knightly

University of Texas, Austin, Texas USA

B.S. with Honors, Electrical and Computer Engineering, May, 2003

POSITIONS

Southern Methodist University, 7/09-present. *Assistant Professor.*

Southern Methodist University, 10/09-present. *J. Lindsay Embrey Trustee Professor.*

HONORS AND AWARDS

NSF Travel Grant for ACM MobiCom (2008)

Rice Presidential Fellowship (August 2003 to present)

First Place in Advanced Micro Devices/Rice VLSI Design Contest (2004)

Outstanding Intel Intern (2000 and 2002)

University of Texas Scholarships (1998): Terry Foundation, Jesse H. Jones (Houston Endowment), Texas Engineering Foundation, University of 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)

PUBLICATIONS

J. Camp, E. Aryafar, and E. Knightly. “Coupled 802.11 Flows in Urban Channels: Model and Experimental Evaluation,” to appear in Proceedings of INFOCOM 2010, San Diego, California, March, 2010.

J. Camp, “Experimental and Analytical Evaluation of Embedded Link Performance with Small-Scale Channel Fluctuations,” PhD Thesis, Rice University, May 2009.

J. Camp and E. Knightly, “Modulation Rate Adaptation in Urban and Vehicular Environments: Cross-layer Implementation and Experimental Evaluation,” 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," *IEEE Communications Magazine*, 46(8):120-126, 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," *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.

J. Camp, "Measurement Driven Deployment of a Two-Tier Urban Mesh Access Network," MS Thesis, Rice University, December 2005.

DEMONSTRATIONS

J. Camp, A. Khattab, C. Hunter, P. Murphy, A. Sabharwal, and E. Knightly, "Cross-Layer Rate Adaptation Using WARP," ACM MobiCom, San Francisco, California, September 2008.

J. Camp, A. Khattab, C. Hunter, P. Murphy, A. Sabharwal, and E. Knightly, "Cross-Layer Rate Adaptation Using WARP," IEEE INFOCOM, 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," ACM MobiCom, Montreal, Canada, September 2007.

J. Camp, A. Khattab, C. Hunter, P. Murphy, A. Sabharwal, and E. Knightly, "Clean-slate Mesh Protocol Design using WARP," ACM MobiSys, San Juan, Puerto Rico, June 2007.

P. Murphy, C. Hunter, J. Camp, A. Khattab, E. Knightly, and A. Sabharwal, "Clean-slate Multi-hop Wireless Networks using WARP," IEEE INFOCOM, Anchorage, Alaska, May 2007.

PROFESSIONAL EXPERIENCE

Rice University, Houston, Texas USA

Research Assistant

Fall 2003 - present

Performed research: (i) architecting, deploying, and evaluating an urban mesh network, the Technology For All (TFA) Wireless Network, which serves 4,000 users and covering 3 km², surpassing the density of any existing wireless research testbed, and (ii) designing, implementing, and evaluating clean-slate protocols for media access and modulation rate adaptation on the Wireless Open-Access

Research Platform (WARP).

At-scale Urban Experimentation

Spring 2004 - present

Developed a measurement-driven deployment strategy for the TFA Network which decreased the deployment cost by an order of magnitude. Showed the overhead on a wireless network has an amplified effect, causing the throughput of the network to decrease by up to 50 times the injected overhead rate and significantly altering the overhead-vs.-benefit tradeoff of control algorithms. Measured and first to analytically model the unfairness of information asymmetry and the physical layer capture effect in the TFA Network and generally for multirate CSMA networks.

Clean-slate and Cross-Layer Design

Spring 2004 - present

Developed a CSMA MAC protocol and co-designed a flexible MAC framework enabling cross-layer interaction of MAC and PHY on the WARP platform. Implemented and designed multiple and previously unimplemented modulation rate adaptation algorithms using WARP. In residential and downtown environments, experimentally showed that all prior rate adaptation protocols fail to track urban channel conditions. First to consider vehicular mobility in rate adaptation evaluation and found that SNR and coherence time must be considered jointly to accurately track urban channel conditions.

Teaching Assistant

Spring 2005 and Spring 2007

Wireless Networking for Under-Resourced Urban Communities - Advised students on developing and executing semester-long research plans to measure and evaluate the performance of the Technology For All Wireless Network on the East End of Houston. Projects spanned topics such as the feasibility of VoIP traffic, mobility and fast handoff, routing link metrics, traffic analysis, characterizing the system capacity, optimizing placement of wireless nodes, and studying the effects of traffic and channel characteristics on system-wide performance.

Lecturer

Spring 2004 and 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, homework assignments, and exams.

Technology For All, Houston, Texas USA

Chief Network Architect and TFA Staff

May, 2004 - present

Deployed and managed a wireless mesh network in the low-income neighborhood of Pecan Park (East End of Houston). 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).

University of Texas at Austin, Austin, Texas USA

Volunteer Undergraduate Researcher

December, 2002 - May, 2003

Worked on a team of three, under the supervision of Dr. Yale Patt, to envision, architect, design, and verify a fully-functioning LC-3 (16 instruction set designed by Yale Patt) computer implemented in VHDL with monitor and keyboard device drivers written in LC-3 assembly.

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.

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).

MEDIA COVERAGE

Self-tracking software helping people stay in shape, Pegasus News, Oct. 27, 2009.

(<http://www.pegasusnews.com/news/2009/oct/27/self-tracking-software-helping-people-stay-shape/>)

In-Home Health Care Via Wireless Networks, NSF Awards \$1.5M For Study, Medical News Today, April 28, 2008.

(<http://www.medicalnewstoday.com/articles/105396.php>)

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)

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.myfoxboston.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)

Wireless Project Breaks New Ground: Pecan Park users may test new medical devices, Houston Chronicle, Feb. 15, 2007.

(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>)

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^AT_EX, Microsoft Office, iWork, iLife, iPerf.
- Algorithms: Combinatorial Optimization.
- Operating Systems: Mac OS X, Unix/Linux, Windows.

ACTIVITIES

Deacon Chairman, City of Refuge (COR) Evangelical Presbyterian Church (2007-2009)

Founder/Leader, COR Small Group for Inner-City College Students (2007-2009)

Leader, COR Youth Group (2004-2007)

Finisher, Aramco Houston Half-Marathon (2009)

Finisher, Big D Texas Half-Marathon (2006)

Technical Program Committee Member

7th IEEE Communications Society Conference on Sensor, Mesh and Ad Hoc Communications and Networks, IEEE SECON 2010

11th IEEE International Symposium on a "World of Wireless, Mobile and Multimedia Networks," IEEE WoWMoM 2010

29th Conference of the IEEE Communications Society, Work In Progress Session, IEEE INFOCOM 2010 WiP

Technical Program Co-Chair

ACM MobiHoc S³ Workshop 2009: a first-of-its-kind technical venue that is entirely by the students, featuring student-driven panel and invited talk sessions and organized by a student-run technical program committee (TPC). This "of the Students, by the Students, and for the Students" workshop aims to foster early-career development among students and encourage student leadership in research.

Technical Reviewer

Journals: IEEE Journal of Selected Areas of Communications, IEEE Transactions on Wireless Communications, IEEE Transactions on Mobile Computing, IEEE Transactions on Wireless and Mobile Computing, IEEE/ACM Transactions on Networking, IEEE Transactions on Vehicular Technology; **Magazines:** IEEE Network Magazine, IEEE Communications Magazine, IEEE Communication Letters; **Conferences:** IEEE INFOCOM ('09, '08, '07, '06, '05), ACM MobiCom ('08, '07, '06), ACM MobiHoc ('08), IEEE VTC ('08), ACM SIGMETRICS ('07), ACM WICON ('06); **Workshops:** ACM E-Wind, ACM/SIGMOBILE REALMAN, IEEE WinMee, IEEE CCNC

RELEVANT COURSEWORK

Introduction to Embedded Systems, Real-time Embedded Systems, Microcomputer Organization and Application, Digital Systems Design using VHDL, Computer Architecture, VLSI Design, Modeling and Design of High Speed Integrated Circuits, Computer-aided Design for VLSI, Introduction to Computer Networks, Design and Control of Computer Networks, Deployment and Measurement of

Wireless Networks, Advanced Topics in Wireless Networking, Wireless Communications, Algorithms and Data Structures, Integer and Combinatorial Optimization

REFERENCES

Available upon request.