Curriculum Vitae
Zhenghao Zhang
July 2, 2012

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1 General Information

University Address :	Computer Science Department
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1.1 Professional Prepartion

Ph.D.	2006	Electrical Engineering *State University of New York at Stony Brook*, Stony Brook, NY Dissertation: *Packet Scheduling and Performance Modeling of Optical and Wireless Networks* Dissertation supervisor: Yuanyuan Yang
M.S.	1999	Electrical Engineering *Zhejiang University*, Hangzhou, China
B.Eng.	1996	Electrical Engineering *Zhejiang University*, Hangzhou, China

1.2 Academic Positions

08/2007 - Present	Assistant Professor, Department of Computer Science, College of Arts and Sciences, Florida State University.
10/2006 - 07/2007	Postdoctoral Research Fellow, Computer Science Department, Carnegie Mellon University.

1.3 Other Professional Positions

04/1999 - 07/2001	Embedded System Engineer, *SOYEA Tech.*, Hangzhou, China.

1.4 Awards

NSF CAREER Award, June 2012.

Google Research Award, November 2011.

Best Paper Award, IEEE International Conference on Communications (ICC), June 2009.

1.5 Professional Society Memberships

IEEE member and ACM member.

1.6 Summary of Teaching, Research, and Service at Florida State University

- *Teaching*: Taught undergraduate course CDA3100 *Computer Organization I*; taught graduate courses CNT5505 *Data and Computer Communications* and CIS5930 *Wireless Networking*. Currently advising 3 PhD students; one PhD student is expected to graduate in summer 2012. Graduated one M.S. student with Thesis and 2 M.S. students with Project. Currently serving on 2 PhD student committees. Have served on one PhD and 12 M.S. committees.

- *Research*: Published in leading/reputable journals including *IEEE Transactions on Information Forensics & Security* and *IEEE Journal of Lightwave Technology*. Also published in leading international conferences including *ACM Mobisys* and *IEEE Infocom* which are highly selective with acceptance ratio under 20%. Many papers are completed by only my students and me. Received *NSF CAREER Award* of $450,883 in 2012. Received a *Best Paper Award* for a paper with my student in *IEEE ICC 2009*. Received a *Google Research Award* of $31,216 in 2011. Received a grant of $150,000 from NSF as the Principle Investigator at FSU in 2009 and subsequently its REU grant of $16,000. Received multiple internal FSU grants totaling $54,000.

- *Service*: Served on departmental committees including *Faculty Evaluation Committee*, *Faculty Recruitment Committee*, *PhD Portfolio Committee*, and *Graduate Admission Committee*. Serving as the Faculty Representative of the Association for Computing Machinery (ACM) FSU Chapter since Fall 2011. Served as the co-chair of the Next Generation Networking Symposium of *IEEE Globecom 2011*. Served as program committee members for 10 international conferences including leading conference such as *IEEE Infocom*. Served as panelist for NSF in 2012 and reviewer for the Austrian Science Fund (FWF) in 2011. Served as reviewer for many journals and conferences.

2 Research and Creative Activity

2.1 Publications (*Student names are shown in italic font; directly supervised students are further marked with superscript* *.)

Book Chapter

1. **Z. Zhang** and Y. Yang, "Optimal parallel scheduling algorithms in WDM packet interconnects," in *Parallel Computing: Models, Algorithms, and Applications*, S. Rajasekaran (Eds), Chapman and Hall/CRC Press.

Refereed Journal Article under Review after Revision

1. **Z. Zhang**, *S. Bronson**, *J. Xie** and *W. Hu**, "Employing the one-sender-multiple-receiver technique in wireless LANs," *IEEE Transactions on Networking*, under review after major revision.

Refereed Journal Articles

1. *L. Liu*, **Z. Zhang** and Y. Yang, "Pipelining packet scheduling in a low latency optical packet switch," *IEEE Journal of Lightwave Technology*, to appear.

2. **Z. Zhang**, "A new bound on the performance of the bandwidth puzzle," *IEEE Transactions on Information Forensics & Security*, vol. 7, no. 2, pp. 731-742, April 2012.

3. **Z. Zhang** and Y. Yang, "Enhancing downlink performance in wireless networks by simultaneous multiple packet transmission," *IEEE Transactions on Computers*, vol. 58, no. 5, pp. 706-718, May 2009.

4. *C. Ma*, **Z. Zhang** and Y. Yang, "Battery-aware scheduling in wireless mesh networks," *ACM/Springer Mobile Networks and Applications (MONET)*, vol. 13, pp. 228-241, 2008.

5. **Z. Zhang**, *M. Ma* and Y. Yang, "Energy efficient multi-hop polling in clusters of two-layered heterogeneous sensor networks," *IEEE Transactions on Computers*, vol. 57, no. 2, pp. 231-245, February 2008.

6. **Z. Zhang**, *L. Liu* and Y. Yang, "Slotted optical burst switching (SOBS) networks," *Journal of Computer Communications*, vol. 30, no. 18, pp. 3471-3479, December 2007.

7. **Z. Zhang** and Y. Yang, "A novel analytical model for switches with shared buffer," *IEEE/ACM Transactions on Networking*, vol. 15, no. 5, pp. 1191-1203, October 2007.

8. **Z. Zhang** and Y. Yang, "On-line optimal wavelength assignment in WDM networks with shared wavelength converter pool," *IEEE/ACM Transactions on Networking*, vol. 15, no. 1, pp. 234- 246, February 2007.

9. *C. Ma*, Y. Yang and **Z. Zhang**, "Constructing battery-aware virtual backbones in wireless sensor networks," *EURASIP Journal on Wireless Communications and Networking*, no. 1, January, 2007.

10. **Z. Zhang** and Y. Yang, "Performance modeling of bufferless WDM packet switching networks with wavelength conversion," *IEEE Transactions on Communications*, vol. 54, no. 8, pp. 1473- 1480, August 2006.

11. **Z. Zhang** and Y. Yang, "Low-loss switching fabric design for recirculating buffer in WDM optical packet switching networks using arrayed waveguide grating routers," *IEEE Transactions on Communications*, vol. 54, no. 8, pp. 1469- 1472, August 2006.

12. **Z. Zhang** and Y. Yang, "WDM optical interconnects with recirculating buffering and limited range wavelength conversion," *IEEE Transactions on Parallel and Distributed Systems*, vol. 17, no. 5, pp. 466-480, May 2006.

13. **Z. Zhang** and Y. Yang, "Optimal scheduling in buffered WDM interconnects with limited range wavelength conversion capability," *IEEE Transactions on Computers,* vol. 55, no. 1, pp. 71-82, January 2006.

14. **Z. Zhang** and Y. Yang, "Performance analysis of k-fold multicast networks," *IEEE Transactions on Communications*, vol. 53, no. 2, pp. 308-314, February 2005.

15. **Z. Zhang** and Y. Yang, "Optimal scheduling algorithms in WDM optical interconnects with limited range wavelength conversion capability," *IEEE Transactions on Parallel and Distributed Systems*, vol. 15, no. 11, pp. 1012-1026, November 2004.

Refereed Conference Articles at International Meetings and National Meetings

1. *H. Lu**, *S. Zhou** and **Z. Zhang**, "Retransmission rate selection for block-based partial packet recovery," to appear in *IEEE Globecom*, 2012. 6 pages. Acceptance rate: 37.7% (966 / 2560).

2. **Z. Zhang**, *W. Hu** and *J. Xie**, "Employing coded relay in multi-hop wireless networks," to appear in *IEEE Globecom*, 2012. 6 pages. Acceptance rate: 37.7% (966 / 2560).

3. **Z. Zhang**, "Analog Bloom Filter: Efficient simultaneous query for wireless networks," to appear in *IEEE Globecom*, 2012. 7 pages. Acceptance rate: 37.7% (966 / 2560).

4. *S. Zhou** and **Z. Zhang**, "cMAC: A centralized MAC protocol for high speed wireless LANs," in *Proc. of IEEE Globecom*, Houston, USA, December 2011. 6 pages. Acceptance rate: 36.6% (1070 / 2923).

5. *W. Hu**, *J. Xie** and **Z. Zhang**, "pMORE: Exploiting partial packets in opportunistic routing," in *Proc. of IEEE Globecom*, Houston, USA, December 2011. 6 pages. Acceptance rate: 36.6% (1070 / 2923).

6. **Z. Zhang**, "Distribute and match – The DM switch for high speed packet switching networks," in *Proc. of IEEE Globecom*, Houston, USA, December 2011. 6 pages. Acceptance rate: 36.6% (1070 / 2923).

7. **Z. Zhang**, "A new bound on the performance of the bandwidth puzzle," in *Proc. of IEEE Globecom*, Houston, USA, December 2011. 6 pages. Acceptance rate: 36.6% (1070 / 2923).

8. *J. Xie**, *W. Hu** and **Z. Zhang**, "Revisiting partial packet recovery for 802.11 wireless LANs," in *Proc. of ACM Mobisys*, Washington DC, USA, June 2011. 12 pages. Acceptance rate: 17.7% (25 / 141).

9. *L. Liu*, **Z. Zhang** and Y. Yang, "Packet scheduling in a low-latency optical switch with wavelength division multiplexing and electronic buffer," in *Proc. of IEEE Infocom*, Shanghai, China, April 2011. 9 pages. Acceptance rate: 15.96% (291 / 1823).

10. *L. Liu*, **Z. Zhang** and Y. Yang, "Pipelining packet scheduling in a low latency optical packet switch," in *Proc. of IEEE Infocom*, Shanghai, China, April 2011. 9 pages. Acceptance rate: 15.96% (291 / 1823).

11. *C. Hekimian*, *B. Grant*, X. Liu, **Z. Zhang** and P. Kumar, "Accurate localization of RFID tags using phase difference," in *Proc. of IEEE RFID*, Orlando, USA, April 2010. 8 pages. Acceptance rate: 30 % (39 / 130).

12. **Z. Zhang**, *S. Bronson**, *J. Xie** and *W. Hu**, "Employing the one-sender-multiple-receiver technique in wireless LANs," in *Proc. of IEEE Infocom*, San Diego, USA, March 2010. 9 pages. Acceptance rate: 18 % (276 / 1575).

13. M.K. Reiter, *V. Sekar*, *C. Spensky* and **Z. Zhang**, "Making contribution-aware P2P systems robust to collusion attacks using bandwidth puzzles," in *Proc. of ICISS*. Kolkata, India, December 2009. 16 pages. Acceptance rate: 19.8 % (18 / 91). *Name in alphabetical order*.

14. **Z. Zhang** and *S. Bronson**, "A packet scheduling algorithm for optimizing downlink throughput in wireless LANs with the one-sender-multiple-receiver technique," in *Proc. of IEEE Globecom*, Hawaii, USA, December 2009. 5 pages. Acceptance rate: 34.8 % (1104 / 3200).

15. *B. Sun** and **Z. Zhang**, "Probabilistic diagnosis of link loss using end-to-end path measurements and maximum likelihood estimation," in *Proc. of IEEE ICC*, Dresden, Germany, June 2009. 5 pages. Acceptance rate: 35 % (1050 / 3000). **Winner of a Best Paper Award**.

16. **Z. Zhang** and Y. Yang, "Performance analysis of optical packet switches enhanced with electronic buffering," in *Proc. of IEEE IPDPS*, Rome, Italy, May 2009. 9 pages. Acceptance rate: 22.7 % (100 / 440).

17. **Z. Zhang** and Y. Yang, "Optical packet switches enhanced with electronic buffering and fixed wavelength conversion," in *Proc. of 20th International Teletraffic Congress (ITC)*, Ottawa, Canada, June 2007. 12 pages. Acceptance rate: ?

18. *M. Zhao*, **Z. Zhang** and Y. Yang, "Medium access diversity with uplink-downlink duality and transmit beamforming in multiple-antenna wireless networks," in *Proc. of IEEE Globecom*, San Francisco, CA, Nov. 2006. 5 pages. Acceptance rate: 40.2 % (1027 / 2548).

19. **Z. Zhang**, *L. Lin* and Y. Yang, "Slotted optical burst switching (SOBS) networks," in *Proc. of IEEE International Symposium on Network Computing and Applications (NCA)*, Cambridge, MA, July 2006. 7 pages. Acceptance rate: 35.2 % (25 / 71).

20. **Z. Zhang** and Y. Yang, "Enhancing downlink performance in wireless networks by simultaneous multiple packet transmission," in *Proc. of IEEE IPDPS*, Rhodes Island, Greece, April 2006. 10 pages. Acceptance rate: 23.1% (125 / 531).

21. *C. Ma*, **Z. Zhang** and Y. Yang, "Battery-aware router scheduling in wireless mesh networks," in *Proc. of IEEE IPDPS*, Rhodes Island, Greece, April 2006. 10 pages. Acceptance rate: 23.1% (125 / 531).

22. *M. Ma*, **Z. Zhang** and Y. Yang, "Multi-channel polling in multi-hop clusters of hybrid sensor networks," in *Proc. of IEEE Globecom*, St. Louis, November 2005. 5 pages. Acceptance rate: 47.7% (770 / 1638).

23. *C. Ma*, Y. Yang and **Z. Zhang**, "Constructing battery-aware virtual backbones in sensor networks," in *Proc. of International Conference on Parallel Processing (ICPP)*, Oslo, Norway, pp. 203-210, June 2005. Acceptance rate: 28.6% (69 / 241).

24. **Z. Zhang**, *M. Ma* and Y. Yang, "Energy efficient multi-hop polling in clusters of two-layered heterogeneous sensor networks," in *Proc. of IEEE IPDPS*, Denver, Colorado, April, 2005. 8 pages. Acceptance rate: 33.5% (115 / 343).

25. **Z. Zhang** and Y. Yang, "On-line optimal wavelength assignment in WDM networks with shared wavelength converter pool," in *Proc. of IEEE Infocom*, Miami, FL, pp. 694-705, March 2005. Acceptance rate: 18% (252 / 1400).

26. **Z. Zhang** and Y. Yang, "A novel analytical model for electronic and optical switches with shared buffer," in *Proc. IEEE Infocom*, Miami, FL, pp. 420-431, March 2005. Acceptance rate: 18% (252 / 1400).

27. **Z. Zhang** and Y. Yang, "Prioritized scheduling in WDM packet switching networks with limited range wavelength conversion," in *Proc. of IEEE Globecom*, Dallas, TX, November 2004. 5 pages. Acceptance rate: 37.7% (792 / 2086).

28. **Z. Zhang** and Y. Yang, "Packet scheduling in WDM optical interconnects with limited range wavelength conversion," in *Proc. of the 9th Asia-Pacific Computer Systems Architecture Conference (ACSAC)*, LNCS 3189, Beijing, China, pp. 335-348, September 2004. Springer-Verlag Berlin Heidelberg. Acceptance rate: ?

29. **Z. Zhang** and Y. Yang, "Optimal parallel scheduling algorithm for WDM optical interconnects with recirculating buffering," in *Proc. of International Conference on Parallel Processing (ICPP),* Montreal, Canada, pp. 458-465, August 2004. Acceptance rate: 34.2% (65 / 190).

30. **Z. Zhang** and Y. Yang, "Distributed QoS-aware scheduling in WDM optical interconnects with arbitrary wavelength conversion capability," in *Proc. of International Conference on Parallel Processing (ICPP),* Montreal, Canada, pp. 301-308, August 2004. Acceptance rate: 34.2% (65 / 190).

31. **Z. Zhang** and Y. Yang, "A new design for WDM packet switching networks with wavelength conversion and recirculating buffering," in *Proc. of IEEE ICC*, Paris, France, pp. 1816-1820, June 2004. Acceptance rate: 29.0% (864 / 2946).

32. **Z. Zhang** and Y. Yang, "Scheduling in buffered WDM packet switching networks with arbitrary wavelength conversion capability," in *Proc. of IEEE Infocom*, Hong Kong, pp. 1372-1382, March 2004. Acceptance rate: 18% (261 / 1420).

33. **Z. Zhang** and Y. Yang, "Performance modeling of bufferless WDM packet switching networks with wavelength conversion," in *Proc. of IEEE Globecom*, San Francisco, CA, pp. 2498-2502, December 2003. Acceptance rate: 36.3% (816 / 2250).

34. **Z. Zhang** and Y. Yang, "Multicast scheduling in WDM switching networks," in *Proc. of IEEE ICC*, Anchorage, Alaska, pp. 1458-1462, May 2003. Acceptance rate: 37.5% (704 / 1879).

35. **Z. Zhang** and Y. Yang, "Distributed scheduling algorithms for wavelength convertible WDM optical interconnects," in *Proc. of IEEE IPDPS*, Nice, France, April 2003. 8 pages. Acceptance rate: 31.8% (142 / 447).

36. **Z. Zhang** and Y. Yang, "Performance analysis of k-fold multicast networks," in *Proc. of IEEE Globecom*, Taipei, Taiwan, pp. 2385-2389, November 2002. Acceptance rate: 30.6% (606 / 1980).

2.2 Speeches and Addresses

Conference Presentations

1. "Distribute and match – The DM switch for high speed packet switching networks," *IEEE Globecom*, Houston, USA, December 2011.

2. "A new bound on the performance of the bandwidth puzzle," *IEEE Globecom*, Houston, USA, December 2011.

3. "Packet scheduling in a low-latency optical switch with wavelength division multiplexing and electronic buffer," *IEEE Infocom*, Shanghai, China, April 2011.

4. "Pipelining packet scheduling in a low latency optical packet switch," *IEEE Infocom*, Shanghai, China, April 2011.

5. "Employing the one-sender-multiple-receiver technique in wireless LANs," *IEEE Infocom*, San Diego, USA, March 2010.

6. "Probabilistic diagnosis of link loss using end-to-end path measurements and maximum likelihood estimation," *IEEE ICC*, Dresden, Germany, June 2009.

7. "Performance analysis of optical packet switches enhanced with electronic buffering," *IEEE IPDPS*, Rome, Italy, May 2009.

8. "On-line optimal wavelength assignment in WDM networks with shared wavelength converter pool," *IEEE Infocom*, Miami, FL, March 2005.

9. "A novel analytical model for electronic and optical switches with shared buffer," *IEEE Infocom*, Miami, FL, March 2005.

10. "Prioritized scheduling in WDM packet switching networks with limited range wavelength conversion," *IEEE Globecom*, Dallas, TX, November 2004.

11. "Performance modeling of bufferless WDM packet switching networks with wavelength conversion," *IEEE Globecom*, San Francisco, CA, November 2003.

12. "Multicast scheduling in WDM switching networks," *IEEE ICC*, Anchorage, AL, May 2003.

2.3 Funded Research Grants

- NSF, "CAREER: Addressing fundamental challenges for wireless coverage service in the TV white space," 09/01/2012 - 08/31/2017, $450,883, **PI**.

- Google Faculty Research Award, "Energy-efficient Wi-Fi partial packet recovery for Android systems," 01/01/2012 - 12/31/2012, $31,216. **PI**.

- NSF REU, "SHF: Small: Collaborative Research: Ultra-low latency optical packet switched interconnects with novel switching paradigm," 09/01/2009 - 08/31/2012, $16,000. **PI**.
- NSF CCF, "SHF: Small: Collaborative Research: Ultra-low latency optical packet switched interconnects with novel switching paradigm," 09/01/2009 - 08/31/2012, $150,000. **PI**.
- Florida State University Planning Grant, "Accurate localization with RFID tags," 12/01/2010 - 11/30/2011, $12,000. **PI**.
- Florida State University COFRS Grant, "The investigation of practical physical layer multi-node transmissions in wireless LANs," 5/08/2009 - 8/06/2009, $14,000. **PI**.
- Florida State University Planning Grant, "Providing trusted incentive mechanisms to P2P networks," 12/01/2007 - 11/30/2008, $12,000. **PI**.
- Florida State University First Year Assistant Professor Award, "Novel cross-layer design in wireless networks," 05/08/2008 - 08/06/2008, $16,000. **PI**.

2.4 Pending Research Grants

- National Science Foundation, "Collaborative Research: Development of real-time wireless sensor network to improve environmental monitoring in rural and underserved areas," 2012 - 2015, $300,000, PI at FSU (with Jae Ryu at Univ. of Idaho, Gang-Ryung Uh at Boise State Univ., and David Whalley and Gary Tyson at FSU), submitted on Feb. 23, 2012.
- National Science Foundation, "TWC: Phase: Small: Exploiting the physical layer for stronger practical security in Wi-Fi networks," 2012 - 2015, $382,863, PI, submitted on Jan. 12, 2012.

2.5 Declined Research Grants

- National Science Foundation, "CPS:Medium: Components:Accurate localization with RF tags," 2011 - 2014, $1,309,006, PI (with Xiuwen Liu and Mike Burmester), submitted on Mar. 21, 2011.
- National Science Foundation, "DRRC/Collaborative Research: Developing real-time wireless sensor network to measure vulnerability and resilience of agricultural drought," 2011 - 2014, $125,000, Co-PI (with Jae Ryu, Gang-Ryung Uh, David Whalley, Gary Tyson), submitted on Mar. 3, 2011.
- National Science Foundation, "SHF:Small: Design cost-effective load balanced networking infrastructure for large scale data centers and high performance computing system," 2011 - 2014, $440,343, Co-PI (with Xin Yuan), submitted on Dec. 17, 2010.
- National Science Foundation, "CSR:Medium: Accurate localization with RF tags," 2011 - 2014, $890,632, PI (with Xiuwen Liu and Mike Burmester), submitted on Sept. 15, 2010.
- National Science Foundation, "II-NEW: Cloud computing for mobile devices," 2011 - 2014, $740,292, Co-PI (with Gary Tyson, Piyush Kumar, An-I Wang, Xin Yuan and Feifei Li), submitted on Aug. 4, 2010.
- Department of Energy, "High-capacity hybrid optical networks for next generation data centers," 2010 - 2013, $300,000, PI (with Yuanyuan Yang and Dantong Yu), submitted on Mar. 26, 2010.
- Department of Energy, "High performance optical interconnects for exascale computing systems," 2010 - 2013, $1,860,000, PI (with Yuanyuan Yang and Dantong Yu), submitted on Apr. 23, 2010.
- National Science Foundation, "CPS: Small: Millimeter accuracy RFID tags and their applications," 2010-2013, $597,637.00, PI (with Xiuwen Liu and Mike Burmester), submitted on Mar., 11, 2010.

- National Science Foundation, "NeTS: Small: Routing in wireless networks with advanced physical layers," 2010-2013, $360,000.00, PI, submitted on Dec., 17, 2009.
- Equipment and Infrastructure Enhancement Program, Florida State University, "Acquiring equipments for wireless technology research," 2010, $33,888, PI (with Xiuwen Liu), submitted on Oct. 26, 2009.
- Department of Energy, "High performance optical networks for future data centers," 2010-2015, $767,000, PI, submitted on Aug. 30, 2009.
- National Science Foundation, "CAREER: Novel protocols and algorithms for future wireless LANs," 2010-2015, $499,990, PI, submitted on Jul. 21, 2009.
- National Science Foundation, "CPS: Medium: Designing a battery aware paradigm for mobile cyber physical systems," 2009-2012, $1,496,209.00, Co-PI (with Ted Baker, Feifei Li, Gary Tyson, Andy Wang, David Whalley, and Jim Zheng), submitted on Feb. 27, 2009.
- National Science Foundation, "NeTS: Small: Collaborative Research: Building faster wireless LANs through many-to-one and one-to-many transmissions," 2009-2012, $389,686.00, PI (with Jianqiu Zhang), submitted on Dec. 17, 2008, declied.
- National Science Foundation, "NEDG: Practical physical layer and MAC layer techniques with multi-node transmission in wireless access networks," 2008-2011, $431,182.00, PI (with Xin Yuan), submitted Mar. 25, 2008.
- National Science Foundation, "Collaborative Research: CPA-CSA: Ultra low latency optical packet switched interconnects with novel switching paradigm," 2008-2011, $200,000.00, PI (with Yuanyuan Yang), submitted on Dec. 5, 2007.

3 Teaching and Training

3.1 Courses Taught in Last Five Years

- **Data/Computer Communications (CNT5505), Spring 2012, 33 students.**
  Graduate level course. URL: http://www.cs.fsu.edu/~ zzhang/CNT5505_Spring_2012.htm.
- **Computer Organizations (CDA3100), Fall 2011, 48 students.**
  Undergraduate level course. URL: http://www.cs.fsu.edu/~ zzhang/CDA3100_Fall_2011.htm.
- **Computer Organizations (CDA3100), Spring 2011, 53 students.**
  Undergraduate level course. URL: http://www.cs.fsu.edu/~ zzhang/CDA3100_Spring_2011.htm.
- **Data/Computer Communications (CNT5505), Fall 2010, 22 students.**
  Graduate level course. URL: http://www.cs.fsu.edu/~ zzhang/CNT5505_Fall_2010.htm.
- **Data/Computer Communications (CNT5505), Spring 2010, 24 students.**
  Graduate level course. URL: http://www.cs.fsu.edu/~ zzhang/CNT5505_Spring_2010.htm.
- **Computer Organizations (CDA3100), Spring 2010, 38 students.**
  Undergraduate level course. URL: http://www.cs.fsu.edu/~ zzhang/CDA3100_Spring_2010.htm.
- **Computer Organizations (CDA3100), Fall 2009, 48 students.**
  Undergraduate level course. URL: http://www.cs.fsu.edu/~ zzhang/CDA3100_Fall_2009.htm.
- **Wireless Networking (CIS5930), Spring 2009, 15 students.**
  Graduate level course. URL: http://www.cs.fsu.edu/~ zzhang/CIS5930_Spring_2009.htm.

- **Computer Organizations (CDA3100), Spring 2009, 40 students.**
  Undergraduate level course. URL: http://www.cs.fsu.edu/~ zzhang/CDA3100_Spring_2009.htm.
- **Data/Computer Communications (CNT5505), Fall 2008, 23 students.**
  Graduate level course. URL: http://www.cs.fsu.edu/~ zzhang/CNT5505_Fall_2008.htm.
- **Computer Organizations (CDA3100), Spring 2008, 23 students.**
  Undergraduate level course. URL: http://www.cs.fsu.edu/~ zzhang/CDA3100_Spring_2008.htm.
- **Data/Computer Communications (CEN5515), Fall 2007, 15 students.**
  Graduate level course. URL: http://www.cs.fsu.edu/~ zzhang/CEN5515.htm.

3.2 Graduate Student Advisory and Committee Membership

- PhD students advising:
  - Jin Xie, graduation in Summer 2012.
  - Hu Wei, expected to graduate before Summer 2013.
  - Shuaiyuan Zhou, expected to graduate before Summer 2013.
- Master students advised:
  - Chakradhar Chillumuntala. Graduated Fall 2011. Project title: "Network path packet loss measurement tool"."
  - Bo Sun. Graduated June 2009. Thesis title: "Probabilistic diagnosis of link loss using end-to-end path measurements and maximum likelihood estimation." A part of the thesis appeared in ICC 2009 and won a Best Paper Award.
  - Jonathan Jenkins. Graduated August 2008. Project title: "JMSIM: An ad hoc network reputation system simulator."
- PhD student committees: Peng Chen, Santosh Mahapatr, Onyekachi Acholem.
- Master student committees: Frank Sposaro, Akil Merchant, Ya Li, Brandon Grant, Gokhan Kaya, Omar Ghaznavi, Polina Volkova, Marcus Wolff, Diming Lu, Ajay Boindala, Peng Chen, Shashank Sahai, Louis Brooks.

4 Services

4.1 Departmental Committee

- Graduate Admission Committee: Spring 2012.
- Faculty Recruitment Committee: Spring 2012.
- Faculty Representative of the Association for Computing Machinery (ACM) FSU Chapter: Since Fall 2011.
- Faculty Evaluation Committee: 2010.
- PhD Portfolio Committee: Fall 2011, Fall 2010, Fall 2009, Fall 2008.
- Department Representative for Graduation Ceremony: Fall 2011, Spring 2009, Spring 2008.

4.2 Conference Organization

- Co-chair of the Next Generation Networking Symposium of IEEE Globecom 2011.

4.3 Reviewer for Funding Agencies

- National Science Foundation (NSF), United States.
- Austrian Science Fund (FWF), Austria.

4.4 Technical Committee

- Technical Program Committee member of the 32th IEEE Annual Conference on Computer Communications (INFOCOM'13).
- Technical Program Committee member of the 31th IEEE Annual Conference on Computer Communications (INFOCOM'12).
- Technical Program Committee member of the 30th IEEE Annual Conference on Computer Communications (INFOCOM'11).
- Technical Program Committee member of the 5th Annual IEEE International Conference on RFID (RFID'11).
- Technical Program Committee member of the 29th IEEE Annual Conference on Computer Communications (INFOCOM'10).
- Technical Program Committee member of the 2010 IEEE International Communications Conference (ICC'10).
- Technical Program Committee member of the 2010 IEEE Global Communications Conference (GLOBECOM'10).
- Technical Program Committee member of the 16th International Conference on High Performance Computing (HiPC'09).
- Technical Program Committee member of the 37th International Conference on Parallel Processing (ICPP'08).
- Technical Program Committee member of the 16th International Conference on Computer Communications and Networks (ICCCN'07).

4.5 Referee

IEEE Transactions on Parallel and Distributed Systems, IEEE Transactions on Signal Processing, IEEE Transactions on Systems Man & Cybernetics, Journal of Parallel and Distributed Computing, IEEE/ACM Transactions on Networking, IEEE Journal of Lightwave Technology, Journal of Optical Networking, IEEE Communications Letters, IEEE Transactions on Wireless Communications, IEEE Transactions on Vehicular Technology, Computer Communications, IEEE Transactions on Mobile Computing, IEEE Transactions on Computers, IEEE Journal of Selected Areas on Communications, ICNP'09, ICC'08, IPDPS'06, ICC'06, GLOBECOM'05, HPSR'05, INFOCOM'05, IPDPS'05, ICC'05, INFOCOM'04, GLOBECOM'04, ICC'04.

Research Statement

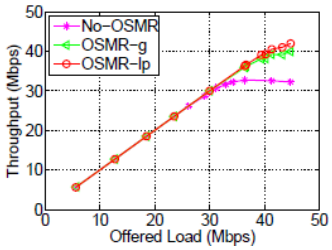
My research is in the networking area, including wireless networks, optical networks, and incentive mechanisms in peer-to-peer networks. My research usually involves theoretical analysis as well as system implementations in various types of physical networks of practical interests. My research sponsors include NSF and Google. Since I joined FSU in August 2007, I have published in top venues such as *ACM Mobisys*, *IEEE Infocom*, and *IEEE Transactions on Information Forensics and Security*. I received *NSF CAREER Award* in 2012, *Google Research Award* in 2011, and a *Best Paper Award* in *IEEE ICC 2009*. I have graduated three Master students. I have been working with three PhD students since Summer 2008; one PhD student has passed the dissertation defense. I have supported all my PhD students to attend conferences where they have papers accepted.

In this document, I will summarize my research projects since joining FSU, as well as my research philosophy and future plans. Unless specified as "collaborative project," a project involves only my students and me. Research papers are referenced according to the publication list in my CV; the published journal articles, journal articles under review, and published conference articles are referred to as J, SJ, and C followed by the paper index, respectively.

More detailed descriptions of my research projects *and* ***links to my papers*** *can be found at* *http://www.cs.fsu.edu/~zzhang/research.htm*.

I. Summary of Research Projects since Joining FSU

I.1 Multi-User Multiple-Input-Multiple-Output (MU-MIMO) for Wi-Fi



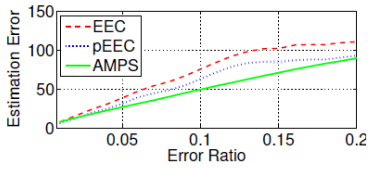
Wi-Fi is a widely deployed technology; laptop computers, tablets, and smartphones and are all equipped with a Wi-Fi interface. A technological advancement for Wi-Fi can potentially make a significant impact on business as well as people's everyday life. Much of my research since joining FSU has been focused on Wi-Fi networks. Our project on applying the Multiple-Input-Multiple-Output (MU-MIMO) technology to Wi-Fi networks was started in 2008. **MU-MIMO allows the Access Point (AP) to send unique data packets to multiple users *simultaneously* and will significantly improve the network throughput compared to the one-to-one transmission model adopted by the current Wi-Fi protocol.** Our contributions include:

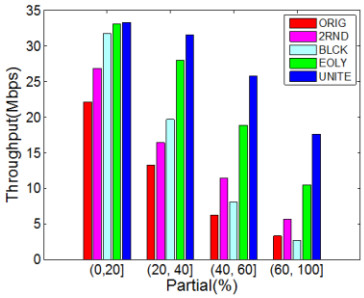
- **We were among the first to demonstrate the feasibility of MU-MIMO in indoor Wi-Fi environments with prototype implementation and experiments.** We implement a MU-MIMO transmitter and receiver with the GNU Software Defined Radio (SDR), with which we demonstrate successful MU-MIMO transmissions in the indoor environments. Prior to our implementation, MU-MIMO was mainly studied with theoretical analysis and simulations.
- **We study the unique packet scheduling problem with MU-MIMO under dynamic data traffic and propose a practical algorithm that achieves the potential gain of**

MU-MIMO. Prior to our algorithm, MU-MIMO has been mainly studied under saturated traffic, which is a convenient assumption for packet scheduling because there is always data to be transmitted and the algorithm need only optimize for the wireless channel. However, this is an over-simplification for Wi-Fi where the users generate random and highly dynamic traffic; in some cases, the MU-MIMO transmission preferred by the wireless channel cannot be scheduled because there is no data to one of the users. We prove the optimal packet scheduling problem is NP-hard, and then propose a practical scheduling algorithm. We conduct simulations driven by real network traffic traces and wireless channel traces collected with SDR, and the results confirm the gain of MU-MIMO and the effectiveness of our algorithm.

This project was first presented at *IEEE Infocom 2010* [C12]; an extended version is currently under review after major revision by *IEEE Transactions on Networking* [SJ1].

I.2 Software Partial Packet Recovery in Wi-Fi Networks





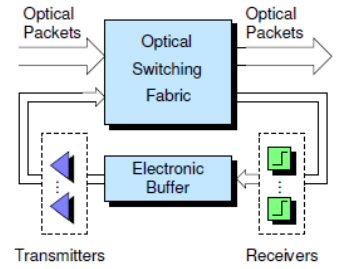
Data packets in the Wi-Fi network are usually around 1500 bytes. *Partial packets* are packets with only a few errors which occur very often in Wi-Fi networks. In the current Wi-Fi protocol, such packets are retransmitted; however, much higher efficiency can be achieved by *repairing* such packets because only a small amount of data is needed to recover the corrupted packet. In this project, we design and implement a software-only partial packet recovery solution as a driver extension to the MadWifi driver. **Our software runs on commodity wireless cards without any modification to the hardware such that the throughput gain can be enjoyed by a simple update of the drivers in the Access Point (AP) and the user devices.** Our main contributions include:

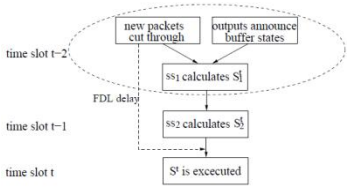
- We propose an error estimator called *AMPS*, which estimates the number of errors in a packet and provides key information for error recovery. AMPS is based on the *Maximum A Posteriori (MAP)* criteria and achieves good accuracy with only 8 bytes of overhead. **We compare AMPS against *EEC* which was published in Sigcomm 2010, and show that AMPS achieves much higher accuracy with much less overhead than EEC.**
- We design and implement our partial packet recovery scheme called *UNITE*, which employs multiple repair methods and uses the AMPS estimate for selecting the optimal repair method in real time to achieve high throughput without over-consuming the CPU time. The repair methods include retransmitting the corrupted blocks and using error correction codes. The CPU time constraint is important in real systems because the error correction algorithm may have high complexity. **UNITE is an optimized and practical recovery scheme compared to**

existing schemes that use only one repair method and do not consider the CPU time constraint.

UNITE was first presented at *ACM Mobisys 2011* [C8]. Currently, we are working on an extended version with support from Google, considering the power consumption constraints of the user device.

I.3 *OpCut* – High Performance Optical Packet Switch (Collaborative Project)



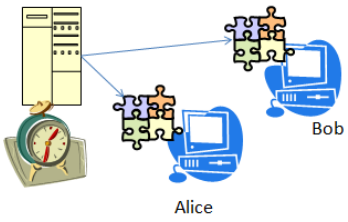


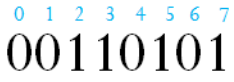
OpCut is an NSF-supported project on the design of an ultra-low latency optical packet switch for high performance computing; I am the PI at FSU. OpCut combines optical switching with electronic buffering which is the only feasible solution today for optical packet switching. **The main feature of OpCut is that it allows optical packets to *cut-through* the switch without being converted to electronic forms whenever possible, which helps achieve low packet latency critical to high performance computing applications. OpCut is a novel switching architecture that outperforms existing optical packet switches such as the IBM OSMOSIS switch**. My contributions in this project include:

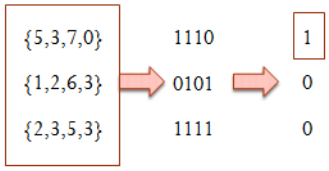
- **Conceiving the initial idea of OpCut, obtaining preliminary results, and participating in writing the NSF grant proposal.** In the OpCut switch, packets that can be transferred to the output side are directly transferred; other packets are sent to the electronic buffer by the switching fabric which will compete with the new packets in subsequent time slots.
- **Solving the key packet ordering problem and giving the theoretical performance analysis of the switch.** Packets in the OpCut switch may be stored at any buffer nodes. To make sure that packets belong to the same flow are sent in order, I propose a solution based on a timestamp-indexed buffer. I also analyze the performance of the OpCut switch with a Markov chain model.
- **Participating in the scheduling algorithm design for a pipelined scheduler and a scheduler for a multi-wavelength switch.** Packet scheduling is the key to achieving the potential of the OpCut switch. I co-advised a student on the design of a pipelined scheduler to reduce the length of a time slot, as well as the design of a scheduler for a multi-wavelength switch which must maintain the order of packets arriving on different wavelengths.

The conference publications include one performance analysis paper in *IEEE IPDPS 2009* [C16] and two packet scheduling papers in *IEEE Infocom 2011* [C9, C10]. The extended version of one *IEEE Infocom 2011* paper has been accepted by *IEEE Journal of Lightwave Technology* [J1]; more papers are under revision for journal submissions.

I.4 Bandwidth Puzzle – Securing the Incentives in P2P Networks (Collaborative Project)





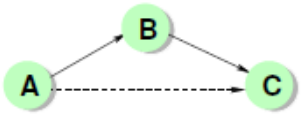


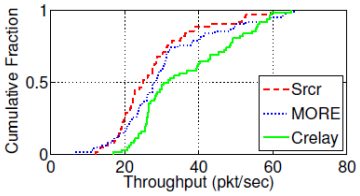
Peer-to-Peer (P2P) technology has been widely deployed; it has been reported that over 65% of the Internet traffic is P2P traffic. P2P networks depend on the willingness of peers to upload content to others and must employ incentive mechanisms to encourage the altruistic behavior. One key problem is the security of the incentive mechanisms, because peers may collude and ask for free credits from transmissions that did not take place. **We propose the *bandwidth puzzle* with which the peers can pass the puzzle challenge on the claimed content upload only if they have uploaded a comparable amount of bits. The bandwidth puzzle, by making colluding as expensive as doing the honest work, provides the much-needed security for the incentive mechanisms in P2P networks.** My contributions include:

- **The design of the puzzle.** Basically, the central controller informs a node how to generate a set of random strings from the content, as well as the hash of one of the strings; the node should reply with the index of the string which has the same hash as the one given by the central controller. The key features of the puzzle are: 1) a puzzle can be solved only if the node has the content, 2) solving puzzle takes time because of the hash function calls, and 3) puzzle generation and verification are much easier than solving the puzzle. **The features of the puzzle make it possible to apply the puzzle to practical systems with few servers handling many nodes**.
- **Proving a strong theoretical guarantee.** I prove a lower bound on the expected number of bits the adversaries must upload in order to solve the puzzles with a certain probability, regardless of the strategy that the adversaries may adopt. The proof is challenging because the optimal strategy is unknown yet the bound must hold even for the optimal strategy. I prove the bound with two steps: I first prove that the optimal strategy in the real world is not far away from the optimal strategy in a simplified environment, and then find the performance of the optimal strategy in the simplified environment. **The bound is a strong theoretical guarantee because it is asymptotically tight, i.e., can be achieved by a simple strategy. The bound guides the choices of optimal puzzle parameters and can improve the performance of real systems.**

This project was first presented at *ICISS 2009* [C13] with an implementation on a video streaming system. A shorter version of the performance guarantee was first presented at *IEEE Globecom 2011* [C7]; the complete version is published in *IEEE Transactions on Information Forensics and Security* [J2].

I.5 Coded Relay (Crelay) in Multi-hop Wireless Networks





Multi-hop wireless networks such as wireless mesh networks may extend the wireless coverage at low cost. In this project, we design and implement a novel packet forwarding protocol, exploiting both overhearing and partial packets. **The basic idea is to send only parity bytes to the downstream node if the downstream node has already overheard a corrupted version of the original packet because it can correct the errors with the parity bytes.** Our contributions include:

- We design a protocol with which nodes can learn the packet reception information at low cost. **The novelty of the protocol is to exploit packet queuing delays for extra coordination time**. That is, the downstream node announces a feedback about a packet that has been overheard and the upstream nodes can wait for the feedback before processing the packet *because it has to send other packets first*. The protocol will work seamlessly with the upper layers such as TCP because it processes individual packets while other opportunistic routing protocols may require packet batching and cannot work with TCP.
- **We implement the protocol in around 5,000 lines of C++ code in the Click modular router, and our experiments on an 11-node testbed show significant gains over existing protocols.**

This work will be presented in *IEEE Globecom 2012* [C2].

I.6 Other Selected Papers

- *Rate selection in partial packet recovery* [C1]. We propose a simple method for selecting the transmission date in a partial packet recovery system by exploiting the available information such as the number of corrupted data blocks. This work will be presented at *IEEE Globecom 2012*.
- *Network fault diagnosis* [C15]. We estimate the most likely faulty link with only the end-to-end path loss ratio observations. The novelty of this work is to exploit the prior knowledge of the link loss ratio which has been previously overlooked. This work won a *Best Paper Award* in *IEEE ICC 2009*.
- *A Medium Access Control (MAC) protocol combining polling and contention* [C4]. We propose to combine polling with contention to improve the network efficiency. We use the maximum likelihood estimation of the number of active nodes to determine the dynamic switching between the polling mode and contention mode. This work has been presented at *IEEE Globecom 2011*.
- *Enhancing random network coding with partial packets support* [C5]. We enhance MORE, a packet forwarding protocol based on wireless random network coding, with partial packets support. This work has been presented at *IEEE Globecom 2011*.
- *A hybrid packet switch achieving 100% throughput* [C6]. We propose the Distribute and Match switch which employs a randomization stage and a matching stage, and achieves 100% throughput. This work has been presented at *IEEE Globecom 2011*.
- *Investigation of indoor localization with carrier phase difference (collaborative project)* [C11]. We measure the carrier phase difference with GNU Software Defined Radio and explore the possibilities of accurate indoor localization. This work has been presented at *IEEE RFID 2010*.

II Research Philosophy and Future Directions

I like to work on relevant problems, i.e., problems that tend to have higher correlations with the practical aspect of networks. In part, this is because networking is a highly practical area; a good technological advancement may be adopted and improve the quality of lives. To demonstrate a research idea, we often have to spend more than one year to implement the prototype system and collect data, such as our work on the MU-MIMO scheme, software partial packet recovery, and Coded Relay.

I strive to keep a balance between the system aspect and the theory aspect, even within a single project. System research allows us to solve problems in the real world while theory research allows us to achieve optimality; I believe both are extremely important. My research papers often have a system implementation as well as a theoretical analysis. I find that the theoretical analysis, even if started only as an intellectual pursuit, often reveals the bottleneck of the system and gives directions on how to overcome the bottleneck. In other words, my research is not only to build functional systems but to build optimal systems.

I try to step away from my comfort zone and learn from other disciplines. In some sense, I have benefited from my experience in both Computer Science and Electrical Engineering as my research is in Computer Science but my PhD degree is in Electrical Engineering. I often find problems in existing network protocols that arise due to a misunderstanding between the two disciplines. For example, the inefficiency with partial packets exists because the physical layer cannot decode all codewords in a packet while the current Wi-Fi protocol treats the packet, which has many codewords, as a single entity. Since joining FSU, I have collaborated with colleagues and researchers in signal processing, computer vision, high performance computing, and security. I learned many useful tools such as Gibbs sampling which has been used in my recent project; more importantly, I often get a new and fresh perspective from the conversation with my collaborators.

My future research will stay focused on networking. In particular, I am interested in physical layer wireless security, because the physical layer channel states and waveforms carry very rich information for security purposes. I will focus on practical and provable physical layer security which can provide security in scenarios where traditional encryption methods fail or cannot be applied, such as in a hot-spot Wi-Fi network. I will also continue my research on improving the network performance, including both single-hop networks and multi-hop networks with novel MAC protocols and routing protocols. I will also continue my research in switching networks and work on problems in data center networks.

Teaching Statement

Teaching is one of my core responsibilities as an Assistant Professor. Since joining FSU in August 2007, I have taught both undergraduate level courses and graduate level courses. My class size is typically round 30-60 for the undergraduate level course and 15-35 for the graduate level courses. I have graduated 3 Master students and I am currently advising 3 PhD students.

I discovered that I have a passion for teaching when I was a teaching assistant over 10 years ago. I deeply enjoy communicating with the students, helping them with their questions, and knowing that they are developing into better individuals with more knowledge and skills. I consider it a privilege as a professor to have the opportunities to make positive impacts on the young minds.

1 Classroom Teaching

I have taught the undergraduate level CDA3100 *Computer Organization I*, the graduate level CNT5505 *Data and Computer Communications*, and the graduate level CIS5930 *Wireless Networking*. I have designed and revised course materials for CDA3100, including Verilog design, course projects, homeworks, quizzes, and slides. I have designed and revised course materials for CNT5505, including a new approach for the physical layer, course projects, slides, and homeworks. I have developed the complete set of materials for CIS5930, including the slides and the projects.

I emphasize on training the students to think rather than memorizing materials or tricks that apply only to some cases. Computer science is a fast-developing area; languages and tools that are used today may be outdated after several years. The invariant, however, is the ability to think and learn, which will stay with the students. In my class, I often first present the basics of a topic then bring out more advanced materials by asking questions. This often forces the students to switch from a passive mode of listening to an active mode of thinking and participating.

I also learned that an instructor needs to find the most efficient method to help the students grasp the materials. One challenge I often have to face is the heterogeneity of the student background. For example, CDA3100 lays the foundation for the students on the design of the computer systems and is a required course for degrees in Computer Science, Computer Criminology, and Computational Biology at FSU. The students in my CDA3100 class often include the Computer Science majors, the Computer Criminology majors, and the Computational Biology majors; some may have already written thousands lines of code while others may still be not comfortable with binary numbers. Therefore, I introduce group in-class exercises such that the students can get help from other group members and learn from each other, which has been received well by the students.

In the lectures, I always try to keep the students motivated. I make sure that the students fully understand the background of a topic, such that they see the path and know where they are going before heading into the path. For both graduate level courses and undergraduate level course, whenever possible, I try to ignite the interests by real time illustrations with the devices that I have. For example, CNT5505 is a general networking course which covers a wide range of networking technologies. I find that the students are often not comfortable with concepts in the physical layer. Therefore, I use the Software Defined Radios in my lab to show the wireless waveforms to the class and demystify the physical layer to the students.

I let the students know that I truly care about them, and that I want them to succeed. Although teaching can be time consuming, interesting comments in the evaluation forms filled by the students, such as “give this guy a raise,” sometimes make my day.

2 Graduate Student Mentoring

I have been working with three PhD students, Jin Xie, Wei Hu, and Shuaiyuan Zhou. Among them, Jin Xie has graduated; Wei Hu and Shuaiyuan Zhou are expected to graduate before Summer 2013. All my PhD students have written research papers including papers published in top conferences such as *ACM Mobisys* and *IEEE Infocom*. I have graduated three Master students, Johnathan Jenkins, Bo Sun, and Chakradhar Chillumuntala. A part of Bo Sun's Master thesis appeared in *IEEE ICC* and won a Best Paper Award.

Mentoring the graduate students is a highly rewarding and highly challenging job. Every student is different in terms of strength and personality. First and foremost, I make sure that the students are working on the right topics that are interesting to them as well as best matching their own strengths. I also make sure that certain types of skills are needed to solve the research problems; some the students may already have, some they may have to learn.

I adopt a progressive approach to get students involved in research. At the beginning, they only help in setting up experiments and collecting data. They will then work on simple projects which will likely result in short papers of 5-6 pages. They will then work on major projects which may require more than one year to finish, often including the algorithm design, system implementation, and testing. I make sure that students are working on achievable goals in every step to help them gradually develop into mature researchers.

I keep a very close watch on my students. I have frequent meetings with all my PhD students, at least twice a week and sometimes even daily. I understand that this approach may be uncommon; however, I find that students, especially at the beginning of their PhD careers, may be blocked for a week by a simple problem that can be resolved in a short meeting. I have suffered drawbacks from such incidents and I came to believe that sometimes multiple short meetings are more productive than long weekly meetings.

I try to make best use of the meeting time with the students to sharpen their skills and train them on critical thinking. I learned from my own experience that technical discussions with the advisor is often the best time for the student to grow as a researcher. In the meetings, I discuss high level questions as well as technical details with the students. I find that students tend to settle at functional solutions when working on a system; they are often satisfied at making something work rather than pushing things to the limit. I like to question them on their detailed design choices and make them realize that their solutions are not optimal, and during the process, discuss with them on the possibilities of making further optimizations.

I make sure that the students understand the importance of their research and are highly motivated. I am fortunate to have a group of students who are extremely hardworking; when needed, they often stay overnight to run the experiments. It is most rewarding to see the students taking initiatives and finding their own research ideas after their hardwork.

Service Statement

I believe that services to the department, the university, and the professional community are my duty. I have served in various departmental committees since joining FSU in August 2007. I am currently serving as the Faculty Representative of the Association for Computing Machinery (ACM) FSU Chapter. I co-organized the Next Generation Networking Symposium of *IEEE Globecom* 2011. I have served in 10 program committees since joining FSU, including top conference such as *IEEE Infocom* since 2009. I have also reviewed many papers for journals.

1 Service to the Department

Since joining FSU in August 2007, I served on various departmental committees. I was a member of the *Faculty Evaluation Committee* in 2011, and my responsibilities included viewing the CVs and evidence of performance documents of all faculty members in our department and giving numerical evaluations. I was a member of the *Faculty Recruitment Committee* in 2012, my responsibilities included viewing the application materials of over 160 applicants, ranking the applicants, picking up candidate at the airport, and joining lunches with the candidates. I have been a member of the *PhD Portfolio Committee* every semester since 2008, and my responsibility is to participate in the oral exam and question the students. I served in the *Graduate Admission Committee* in 2012 and my responsibilities included viewing the students materials.

In addition, I have been serving as the Faculty Representative of the Association for Computing Machinery (ACM) FSU Chapter since Fall 2011. My responsibilities include overseeing the organization of the programming contests which are held twice a year, overseeing the election of ACM officers, and driving the students to the regional programing contest. I drove 5 students to the programing contest at University of West Florida in Pensacola, Florida on October 27, 2011 and drove back to Tallahassee on October 28, 2011.

2 Service to the Profession

I served as a co-chair for the Next Generation Networking Symposium of *IEEE Globecom* 2011. *IEEE Globecom* is one of the biggest conferences in the area of communications and networking; it is held each year with usually around 1000 papers and 1000-2000 participants. My duties as one of the four symposium co-chairs included advertising our symposium in various mailing lists, inviting the technical committee members, manually assigning the papers to the technical committee members, verifying the validity of the reviews, making paper selections, and nominating a best paper for award in our symposium. There were 162 submissions in our symposium and we accepted 57 papers.

I have also served or will serve as program committee members for 10 international conferences: *IEEE Infocom* 2013, *IEEE Infocom* 2012, *IEEE Infocom* 2011, *IEEE International Conference on RFID* 2011, *IEEE Infocom* 2010, *IEEE International Communications Conference (ICC)* 2010, *IEEE Globecom* 2010, *International Conference on High Performance Computing (HiPC)* 2009, *International Conference on Parallel Processing (ICPP)* 2008, and *International Conference on Computer Communications and Networks (ICCCN)* 2007. Among the committee works, most worth mentioning is the committee for *IEEE Infocom* for which I have become a regular committee member since 2009. *IEEE Infocom* is one of the most prestigious conferences in the computer networking area with paper acceptance ratio usually below 18%. In each year since 2009, I reviewed around 15 papers for *IEEE Infocom*, as well as attending the one-day committee meeting in person.

I have also served as a panelist for the National Science Foundation (NSF) in 2012. I reviewed 9 proposals and attended the 2-day panel meeting in Washington DC. I also served as a reviewer for the Austrian Science Fund (FWF) in 2011.

I have reviewed many papers for leading and well-known journals, including *IEEE Transactions on Parallel and Distributed Systems, IEEE Transactions on Computers, IEEE Transactions on Signal Processing, IEEE Transactions on Systems Man & Cybernetics, Journal of Parallel and Distributed Computing, IEEE/ACM Transactions on Networking, IEEE Journal of Selected Areas on Communications, IEEE Journal of Lightwave Technology, Journal of Optical Networking, IEEE Communications Letters, IEEE Transactions on Wireless Communications, IEEE Transactions on Vehicular Technology, Computer Communications*, and *IEEE Transactions on Mobile Computing*.