

Hui Zang, Ph.D.

1 Adrian Court
Burlingame, CA 94010
Tel: 650-375-4423
Email: hui.zang@sprint.com

SUMMARY

I am currently a research scientist in the Applied Research Group at Sprint Nextel Corp., Burlingame, California. In the past eight years, I have worked on a variety of problems in the context of network measurements, resource allocation, cross-layer adaptation, wireless and IP network security, and mobile user behavior analysis. My research spans across different network layers and both wired and wireless networks. Prior to joining Sprint, I received the B.S. degree in computer science from Tsinghua University, China, and the M.S. and Ph.D. degrees in computer science from the University of California, Davis.

EDUCATION

Ph.D., Computer Science, University of California, Davis, 2001
Dissertation: Design and Analysis of WDM Network Architectures
Advisor: Professor Biswanath Mukherjee

Master of Science, Computer Science, 1998
Department of Computer Science, University of California, Davis

Bachelor of Science, Computer Science, Tsinghua University, P. R. China, 1997
Thesis: Communications in Multi-Agent Systems
Advisor: Professor Chunyi Shi

PROFESSIONAL EXPERIENCE

- **Research Scientist (Jan. 2004 – Present)**, Applied Research Group, Sprint Labs, Burlingame, CA
Identified, executed and managed research projects related to data mining, cellular/IP networks performance and network security; Recruited and supervised summer interns; Represented Sprint at technical committees and forums.
- **Principal Member of the Technical Staff (July 2002 – Jan. 2004)**, Switching and Security Group, Sprint Labs, Burlingame, CA
Performed technology assessment on different vendors' products such as Cisco, Juniper, Vivace (later acquired by Tellabs), Marconi (later acquired by Ericsson), etc.; Identified and recommended key technologies and systems that can benefit Sprint's business; Configured and

maintained test-beds using network elements such as Cisco/Juniper routers and testing equipments; Led and contributed to Sprint's RFI/RFP processes.

- **Principal Member of the Technical Staff (Oct. 2000 – July 2002)**, Optical Research Group, Sprint Labs, Burlingame, CA

Performed research related to WDM networks and IP over WDM; Identified and managed research projects; Recruited and supervised summer interns on research projects.

- **Internship (Oct. 1999 - Sep. 2000)**, Optical Research Group, Sprint Labs, Burlingame, CA

Comprehensively analyzed and compared the cost of deploying a variety of protection, restoration and grooming schemes in Sprint's wavelength-division multiplexed optical backbone network using forecast traffic data.

- **Internship (Jun. 1999 - Sep. 1999)**, IBM Almaden Research Center, San Jose, CA

Designed and implemented in JAVA a robust web server prototype with a combination of web and database technologies.

PUBLICATIONS

Book & Book Chapter

1. Hui Zang, "*WDM Mesh Networks: Management and Survivability*," Kluwer Academic Publishers, 2002.
2. Biswanath Mukherjee and Hui Zang, "Survey of State of the Art", book chapter in "*WDM Optical Networks: Principles and Practice*," Kluwer Academic Publishers, 2000.

Journal Publications

1. Majid Ghaderi, Ashwin Sridharan, Hui Zang, Don Towsley and Rene Cruz, "TCP-aware channel allocation in wireless networks," *IEEE Transactions on Mobile Computing*, vol. 8, no. 1, January 2009.
2. Jing Zhang, Keyao Zhu, Hui Zang, Norman S. Matloff, and Biswanath Mukherjee, "Availability-aware provisioning strategies for differentiated protection services in wavelength-convertible WDM mesh networks", *IEEE/ACM Transactions on Networking (TON)*, vol. 15, no. 5, pp. 1177 – 1190, October 2007.
3. Jianning Mai, Ashwin Sridharan, Chen-Nee Chuah, Hui Zang, and Tao Ye, "Impact of Packet Sampling on Portscan Detection", *IEEE Journal on Selected Areas in Communication*, vol. 24, no. 12, December 2006.
4. Antonio Nucci, Nina Taft, Patrick Thiran, Hui Zang, and Christophe Diot, "Increasing the Link Utilization in IP over WDM Networks using availability as QoS," *Photonic Network Communications*, Kluwer Academic Publishers. vol. 9.1, pp 55-75, Jan. 2005.

5. Canhui Ou, Hui Zang, NarendraSinghal, Keyao Zhu, Laxman H. Sahasrabudde, Robert MacDonald, and Biswanath Mukherjee, "Sub-Path Protection for Scalability and Fast Recovery in WDM Mesh Networks," *IEEE Journal on Selected Areas in Communications*, vol. 22, pp. 1859-1875, Nov. 2004.
6. Canhui (Sam) Ou, Jing Zhang, Hui Zang, Laxman H. Sahasrabudde, and Biswanath Mukherjee, "New and Improved Approaches for Shared-Path Protection in WDM Mesh Networks," *IEEE/OSA Journal of Lightwave Technology*, May 2004.
7. Canhui (Sam) Ou, Keyao Zhu, Hui Zang, Jing Zhang, Hongyue Zhu, Laxman H. Sahasrabudde, and Biswanath Mukherjee, "Traffic Grooming for Survivable WDM Networks – Dedicated Protection," *OSA Journal of Optical Networking*, vol. 3, pp. 50-74, Jan. 2004.
8. Canhui (Sam) Ou, Keyao Zhu, Hui Zang, Laxman H. Sahasrabudde, and Biswanath Mukherjee, "Traffic Grooming for Survivable WDM Networks – Shared Protection," *IEEE Journal on Selected Areas in Communications*, vol. 21, no. 9, November 2003.
9. Hongyue Zhu, Keyao Zhu, Hui Zang, and Biswanath Mukherjee, "Cost-Effective WDM Backbone Network Design with OXC's of Different Bandwidth Granularities," *IEEE Journal on Selected Areas in Communications*, vol. 21, no. 9, November 2003.
10. Keyao Zhu, Hui Zang, and Biswanath Mukherjee, "A Comprehensive Study on Next-Generation Grooming Switches," *IEEE Journal on Selected Areas in Communications*, vol. 21, no. 7, September 2003.
11. Hui Zang, Pin-Han Ho, Yinghua Ye, Chunsheng Xin, and Wushao Wen, "Issues in Designing Survivable Optical Switched Networks – Topics Overview on APOC 2001," *SPIE Optical Networks Magazine*, vol. 4, no. 3, May/June 2003.
12. Hongyue Zhu, Hui Zang, Keyao Zhu, and Biswanath Mukherjee, "Dynamic Traffic Grooming in WDM Mesh Networks Using a Novel Graph Model," *SPIE Optical Networks Magazine*, vol. 4, no. 3, May/June 2003.
13. Hui Zang and Biswanath Mukherjee, "Path-Protection Routing and Wavelength-Assignment (RWA) in WDM Mesh Networks under Duct-Layer Constraints," *IEEE/ACM Transactions on Networking*, vol. 11, no. 2, Apr. 2003.
14. Hongyue Zhu, Hui Zang, Keyao Zhu, and Biswanath Mukherjee, "A Novel, Generic Graph Model for Traffic Grooming in Heterogeneous WDM Mesh Networks," *IEEE/ACM Transaction on Networking*, vol. 11, no. 2, Apr. 2003.
15. Hui Zang, Jason P. Jue, Laxman Sahasrabudde, S. Ramamurthy, and Biswanath Mukherjee, "Dynamic Lightpath Establishment in Wavelength-Routed WDM Networks," *IEEE Communications Magazine*, Sept. 2001.
16. Hui Zang and Biswanath Mukherjee, "Connection Management for Survivable Wavelength-Routed WDM Mesh Networks," *SPIE Optical Networks Magazine*, vol. 2, no. 4, July 2001.
17. Hui Zang, Jason P. Jue, and Biswanath Mukherjee, "Capacity Allocation and Contention Resolution in Photonic Slot Routing Networks," *IEEE/OSA Journal of Lightwave Technology*, vol. 18, no. 12, Dec. 2000.

18. Hui Zang, Jason P. Jue, and Biswanath Mukherjee, "A review of routing and wavelength assignment approaches for wavelength-routed optical WDM networks," *SPIE Optical Networks Magazine*, vol. 1, no. 1, Jan. 2000.

Conference Publications

1. Xin Liu, Ashwin Sridharan, Sridhar Machiraju, Mukund Seshadri, and Hui Zang, "Experiences in a 3G Network: Interplay between the Wireless Channel and Applications", *ACM MOBICOM '08*, San Francisco, CA. September 2008.
2. Soshant Bali, Sridhar Machiraju, and Hui Zang, "PAQ: A starvation-resistant alternative to Proportional Fair", *IEEE ICC 2008*. Beijing, China. May 2008.
3. Hui Zang and Jean C. Bolot, "Mining Call and Mobility Data to Improve Paging Efficiency in Cellular Networks", *ACM Mobicom '07*. Montréal, Québec, Canada. September 2007.
4. Majid Ghaderi, Ashwin Sridharan, Hui Zang, Don Towsley, and Rene Cruz, "Modeling TCP in a Multi-Rate Multi-User CDMA System", *IFIP Networking 2007*. Atlanta, Georgia. May 2007.
5. Soshant Bali, Sridhar Machiraju, and Hui Zang, "Beyond Proportional Fair: Designing Robust Wireless Schedulers", *IFIP Networking*, May 2007.
6. Karim Mattar, Ashwin Sridharan, Hui Zang, Ibrahim Matta, and Azer Bestavros, "TCP Over CDMA2000 Networks : A Cross-Layer Measurement Study", *Passive and Active Measurement Conference (PAM 2007)*. Louvain-la-neuve, Belgium. April 2007.
7. Soshant Bali, Sridhar Machiraju, Hui Zang, and Victor Frost, "A Measurement Study of Scheduler-based Attacks in 3G Wireless Networks", *Passive and Active Measurement (PAM) Conference*. Louvain-la-neuve, Belgium. April 2007.
8. Jianning Mai, Chen-Nee Chuah, Ashwin Sridharan, Tao Ye, and Hui Zang, "Is Sampled Data Sufficient for Anomaly Detection?" *ACM Internet Measurement Conference (IMC) 2006*. Rio de Janeiro, Brazil. October 2006.
9. Majid Ghaderi, Ashwin Sridharan, Hui Zang, Don Towsley, and Rene Cruz, "TCP-Aware Resource Allocation in CDMA Networks", *ACM MOBICOM '06*. Los Angeles, CA, USA. September 2006.
10. Jeremy Serror, Hui Zang, and Jean C. Bolot, "Impact of Paging Channel Overloads or Attacks on a Cellular Network", **Best Paper Award** in *ACM Wireless Security Workshop (WiSE 06)*. Los Angeles, California, USA. September 2006.
11. Wei Wei, Chun Zhang, Hui Zang, Jim Kurose, and Don Towsley, "Inference and Evaluation of Split-Connection Approaches in Cellular Data Networks", *Passive and Active Measurement Conference (PAM 2006)*. Adelaide, Australia. March 2006.
12. Hui Zang and Antonio Nucci, "Optimal NetFlow Deployment in IP Networks", *19th International Teletraffic Congress (ITC 19)*. Beijing, China. August 2005.
13. Canhui (Sam) Ou, Jing Zhang, Hui Zang, Laxman H. Sahasrabudhe, and Biswanath Mukherjee, "Near-Optimal Approaches for Shared-Path Protection in WDM Mesh Networks," *IEEE ICC 2003*.

14. Jing Zhang, Keyao Zhu, Hui Zang, and Biswanath Mukherjee, "A New Provisioning Framework to Provide Availability-Guaranteed Service in WDM Mesh Networks," *IEEE ICC 2003*.
15. Keyao Zhu, Hui Zang, and Biswanath Mukherjee, "Exploiting the Benefits of Virtual Concatenation in Optical Transport Networks," *OFC'03*, March 2003.
16. Jing Zhang, Keyao Zhu, Hui Zang, and Biswanath Mukherjee, "Service Provisioning to Provide Per-Connection-Based Availability Guarantee in WDM Mesh Networks," *OFC'03*, March 2003.
17. Canhui Ou, Keyao Zhu, Hui Zang, Laxman Sahasrabudde, and Biswanath Mukherjee, "Survivable Traffic Grooming in WDM Networks," *OFC'03*, March 2003.
18. Hongyue Zhu, Keyao Zhu, Hui Zang, and Biswanath Mukherjee, "Cost-Effective WDM Backbone Network Design with OXCs of Different Bandwidth Granularities," *OFC'03*, March 2003.
19. Hongyue Zhu, Hui Zang, Keyao Zhu, and Biswanath Mukherjee, "Dynamic Traffic Grooming in WDM Mesh Networks Using a Novel Graph Model," *Globecom2002*, November 2002.
20. Keyao Zhu, Hui Zang, and Biswanath Mukherjee, "The Design of WDM Mesh Networks with Sparse Grooming Capability," *Globecom2002*, November 2002.
21. Hui Zang, Renxiang Huang, and James Pan, "Designing a Hybrid Shared-Mesh Protected WDM Networks with Sparse Wavelength Conversion and Regeneration," *SPIE APOC 2002*, October 2002.
22. Hui Zang, Robert A. MacDonald, and James Pan, "Wavelength Converter Placement in WDM Mesh Networks with Shared Protection Schemes," *NFOEC'02*, September 2002.
23. Keyao Zhu, Hongyue Zhu, Hui Zang, Robert MacDonald, and Biswanath Mukherjee, "Provisioning Connections of Different Bandwidth Granularities in Irregular Mesh-Based Heterogeneous WDM Backbone Networks," *NFOEC'02*, September 2002.
24. Jing Zhang, Keyao Zhu, Hui Zang, and Biswanath Mukherjee, "A New Model, Network Architecture, and Control Mechanism for Connection Provisioning to Satisfy Service-Level Agreements (SLAs) in Optical WDM Backbone Networks," *NFOEC'02*, September 2002.
25. Antonio Nucci, Nina Taft, Patrick Thiran, Hui Zang, and Christophe Diot, "Increasing Link Utilization in IP over WDM Networks," *OptiComm2002*, Boston, MA, July – Aug, 2002.
26. Canhui Ou, Hui Zang, and Biswanath Mukherjee, "Sub-Path Protection for Scalability and Fast Recovery in WDM Mesh Networks," *IEEE/OSA OFC '02*, Anaheim, CA, March 2002.
27. Hui Zang, Canhui Ou, and Biswanath Mukherjee, "Path-Protection Routing and Wavelength-Assignment in WDM Mesh Networks under Shared-Risk-Link-Group Constraints," *Proc. SPIE APOC '01*, Beijing, China, Nov. 2001.
28. Patrick Thiran, Nina Taft, Christophe Diot, Hui Zang and Robert MacDonald, "A protection-based approach to QoS in Packet over fiber networks," *Proc. Tyrrhenian International Workshop on Digital Communications (IWDC 2001)*, Taormina, Italy, Sept 2001. Published

- in 'Evolutionary trends of the Internet', Sergio Palazzo editor, vol. LCNS 2170, Springer-Verlag, pp. 266-278, 2001.
29. Hui Zang, Jason P. Jue, and Biswanath Mukherjee, "Photonic slot routing in all-optical WDM mesh networks," *IEEE GLOBECOM '99*, Rio de Janeiro, Dec. 1999.
 30. Hui Zang, Laxman Sahasrabudde, Jason P. Jue, S. Ramamurthy, and Biswanath Mukherjee, "Connection management for wavelength-routed WDM networks," *IEEE GLOBECOM '99*, Rio de Janeiro, Dec. 1999.

PATENTS

1. Ashwin Sridharan, Hui Zang and Jianning Mai. Fast Filtered Sampling. Filed in November 2008.
2. Hui Zang and Jean C. Bolot. Methods and Systems for Paging in a Communication System. Filed in September 2008.
3. Sridhar Machiraju, Hui Zang and Soshant Bali. Adaptive Initialization for Wireless Schedulers. Filed in July 2007.
4. Sridhar Machiraju, Hui Zang and Soshant Bali. Parallel Wireless Scheduler. Filed in July 2007.
5. Sridhar Machiraju, Hui Zang and Soshant Bali. Parallel Adaptive Quantile Wireless Scheduler. Filed in July 2007.
6. Majid Ghaderi, Ashwin Sridharan and Hui Zang, Adaptive Rate Allocation for Multiple TCP Sources in Wireless Networks. Filed in May 2007.
7. Majid Ghaderi, Ashwin Sridharan and Hui Zang, TCP-aware resource allocation in wireless networks. Filed in August 2006.
8. Hui Zang, Jean C. Bolot and Jeremy Serror. Paging Channel Queue Management Based On Load. Filed in August 2006.
9. Hui Zang and Antonio Nucci, Optimal NetFlow deployment in operational communication networks. Filed in 2005.
10. Hui Zang, Communication network design with wavelength converters. Granted, US Patent No. 7,218,851.
11. Hui Zang and Canhui Ou, Area-based sub-path protection for communication networks. Granted, US Patent No. 7,209,975.
12. Hui Zang and Hongyue Zhu, Software model for communication networks. Granted, US Patent No. 6,711,324.

PROFESSIONAL ACTIVITIES

- Guest Editor, IEEE Network special issue on traffic engineering in optical networks (March/April 2003)

- Conference organization:
 - Publication co-chair, IEEE Broadnets 2005
 - Panel co-chair, SPIE OptiComm'02
- Technical program committee:
 - IEEE INFOCOM 2009
 - IEEE Globecom 2009 - Wireless Networking Symposium
 - WinMee 2007 (the 3rd International Workshop on Wireless Network Measurement)
 - IEEE Globecom 2006 - General Symposium
 - Chinacom 2006 - Wireless Communications and Networking Symposium
 - IEEE Broadnets 2006 - Optical Communications, Networks, and Systems Symposium
 - IEEE Broadnets 2005 - Optical Networking Symposium
 - WirelessCom 2005 - Symposium on Network Management
 - IEEE Broadnets 2004 - Broadband Optical Networking Symposium
 - IEEE Globecom 2003 - Optical Networking and Systems symposium
 - SPIE/IEEE/ACM OptiComm'03
 - DRCN (International Workshop on Design of Reliable Communication Networks) '03, '05
 - SPIE APOC (Asia-Pacific Optical Communications) '02
 - IPoW (IP over WDM conference) '00, '01, '02
- NSF proposal reviewer/panelist
- Panelist: IEEE Infocom 2003 Panel on "Optical Networking: What is Its Future?"
- Reviewer for various conferences and journals

AWARDS

- Best paper award, ACM Wireless Security Workshop (WiSe), 2006
- Sprint Values Excellence Award.
- Sprint "On-The-Spot" Award.
- NRTF Fellowship, University of California, Davis, Department of Computer Science, 1997-2000
- IEEE student travel award, 1999
- Tsinghua University Academic Excellence Award, 1993, 1994, 1995, 1996
- Tsinghua University Dissertation Award (1992)
- Silver medalist in the 2nd National "Hope Cup" mathematics Tournament (1991, www.hopecup.org).

- Ranked 9th place among about 100,000 students in Shanxi Province in the National College Entrance Examination (1992).
- Ranked 1st place among the students in the city of Datong, Shanxi Province in the Senior High School Entrance Examination (1989).

PROFESSIONAL MEMBERSHIP

- Senior member of IEEE
- Member of ACM

REFERENCES

Available upon request