

## Anand Kashyap

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### Objective

Research position utilizing experience in analytical modeling, system development, algorithm design, and experimental analysis in the area of computer networking.

### Summary

- Proficient in analytical modeling, simulation design, and empirical techniques to analyze the performance of protocols and systems.
- Strong knowledge in the areas of computer networking, wireless networking, algorithm design, and operating systems.
- Extensive experience in solving problems attributed to wireless interference, having proposed techniques to model interference-limited wireless network capacity, and designed interference-aware algorithms for QoS applications like voice and video over wireless mesh networks.
- Skilled in building systems, such as wireless network systems and testbeds, with hands-on implementation on embedded platforms.
- Ability to lead and conduct research focused towards product and technology development.

### Education

- **PhD, Computer Science (Expected graduation: Fall 2008)**  
Stony Brook University, Stony Brook, NY, USA.  
Advisor: Prof. Samir Das.  
Dissertation Title: *Measurement-Based Modeling of Interference in Wi-Fi Networks: Techniques and Applications.*
- **Bachelor of Technology, Computer Science and Engineering (1998–2002)**  
Indian Institute of Technology, Kanpur, India.

### Awards and Honors

- Student Travel Grant for ACM MobiCom Conference, 2007.
- NEC Labs Student Research Grant from Fall 2005 to Spring 2007.
- NSF Travel Award for visiting C-DAC: Center for Development of Advanced Computing, Pune, India in Jan, 2005 for collaborative research.
- Presidential Fellowship at Stony Brook University for the year 2003-2004.
- Awarded the Notional Prize for Academic Excellence for the year 1998-99 at IIT Kanpur.

### Experience

#### *University Appointments*

- **Research Assistant in Wireless Networking and Simulation (WINGS) Laboratory at Computer Science Department, Stony Brook University (May, 2004–present)**
  - ◊ Developed an architecture for providing improved connectivity to a moving vehicle using roadside WiFi access points. Cached geographic information about APs is used to optimize the link-layer handoff mechanism, and to build an efficient session-based transport protocol.
  - ◊ Developed a machine learning approach to estimate interference in wireless networks.
  - ◊ Designed algorithms for resource assignment (e.g., channel, transmit power, client association) in wireless LANs to maximize network capacity.

- ◊ Proposed and implemented enhancements to wireless network simulators by augmenting them with measurement-based models, and measurements from a real network.
- ◊ Designed, built, and evaluated iMesh, an infrastructure-mode wireless mesh network, for providing seamless access to mobile clients using an efficient network-layer handoff mechanism.
- **Teaching Assistant in Computer Science Department at Stony Brook University (Fall 2004, Spring 2004, and Fall 2003)**
  - ◊ TA for two entry level undergraduate courses, and a graduate level course (Computer Networking).

### *Internships*

- **Intern at Microsoft Research, Bangalore, India (Dec, 2007–Feb, 2008)**
  - ◊ Developed accurate empirical models of energy consumption for various wireless interfaces (e.g., WiFi, GPRS/EDGE) in a multi-radio mobile smartphone. The energy models were used to develop a traffic shaping algorithm to prolong the battery life of the phone.
- **Intern at NEC Labs, Princeton, NJ, USA (Summer 2007, Summer 2006, and Summer 2005)**
  - ◊ Developed a method for estimating interference in a deployed wireless LAN using load and throughput measurements available through SNMP traces.
  - ◊ Developed a measurement-based model for estimating link capacity in WiFi networks, in the presence of multiple interfering links carrying specified load. This required modeling interference at the PHY and the MAC layer, on both the sender and the receiver. This model is solved either analytically or by simulations.
  - ◊ Designed and evaluated algorithms for admission control and routing of VoIP flows over wireless mesh networks using a model to predict path capacity in the network.
  - ◊ Designed and evaluated routing techniques to support multiple simultaneous video streams over a wireless mesh network, such as in a surveillance system.
- **Intern at Institute of Informatics, ETH Zurich, Switzerland (Summer 2001)**
  - ◊ Worked in the database group at the Institute of Informatics, ETH Zurich and developed a distributed version of the hitherto centralized cluster of databases called “PowerDB”.

### *Employment*

- **Research and Development Engineer at Tejas Networks, Bangalore, India (May, 2002 – July, 2003)**
  - ◊ Worked on design and development of switching/routing/signaling software in their state-of-the-art intelligent optical networks.

### **Patent Applications**

- Samrat Ganguly and Anand Kashyap. “**Measurement Based Link Capacity for Multiple Interferences in an 802.11-based Wireless Network**”. Patent (Filing No: 12/036,328) filed in Feb, 2008.

### **Publications**

#### *Journal Publications / Book Chapters*

- Vishnu Navda, Anand Kashyap and Samir Das. “**Design and Evaluation of iMesh: An Infrastructure-mode Wireless Mesh Network**”. Book Chapter in Marco Conti, Jon Crowcroft and Andrea Passarella, (Editors), Multi-hop Ad hoc Networks: from Theory to Reality, pp. 203–224, Nova Science Publisher, New York, 2007.
- Samrat Ganguly, Vishnu Navda, Kyungtae Kim, Anand Kashyap, Dragos Niculescu, Rauf Izmailov, Sangjin Hong and Samir Das. “**Performance Optimizations for Deploying VoIP Services in Mesh Networks**”. IEEE Journal on Selected Areas in Communications (JSAC),

vol. 24, no. 11, pp. 2147-2158, Nov. 2006. (Special issue on Multi-Hop Wireless Mesh Networks).

#### *Conference Publications*

- Anand Kashyap, Samrat Ganguly and Samrat Ganguly. “**Measurement-Based Approaches for Accurate Simulation of 802.11-Based Wireless Networks**”. Proceedings of the 11th ACM International Conference on Modeling, Analysis and Simulation of Wireless and Mobile Systems (MSWiM), Vancouver, Canada, Oct. 2008. To appear.
- Anand Kashyap, Samrat Ganguly and Samir Das. “**A Measurement-Based Approach to Modeling Link Capacity in 802.11-based Wireless Networks**”. Proceedings of the 13th Annual International Conference on Mobile Computing and Networking (ACM MobiCom), pp. 242–253, Montreal, QC, Canada, Sept. 2007.
- Anand Kashyap, Samrat Ganguly, Samir Das and Suman Banerjee. “**VoIP on Wireless Meshes: Models, Algorithms and Evaluation**”. Proceedings of the 26th Annual IEEE Conference on Computer Communications (INFOCOM), pp. 2036–2044, Anchorage, AK, USA, May 2007.
- Vishnu Navda, Anand Kashyap, Samrat Ganguly and Rauf Izmailov. “**Real-time Video Stream Aggregation in Wireless Mesh Network**”. Proceedings of the 17th Annual IEEE Symposium on Personal, Indoor and Mobile Radio Communications (PIMRC), pp. 1–7, Helsinki, Finland, Sept. 2006.
- Samrat Ganguly, Hung-Yu Wei, Anand Kashyap and KyungTae Kim. “**On Admission of VoIP Calls over Wireless Mesh Network**”. Proceedings of the IEEE International Conference on Communications (ICC), vol. 5, pp. 1990–1995, Istanbul, Turkey, June 2006.
- Bin Tang, Zongheng Zhou, Anand Kashyap and Tzi-cker Chiueh. “**An Integrated Approach for P2P File Sharing on Multi-hop Wireless Networks**”. Proceedings of the IEEE International Conference on Wireless and Mobile Computing, Networking and Communications (WiMob), vol. 3, pp. 268–274, Montreal, Canada, Aug. 2005.
- Vishnu Navda, Anand Kashyap and Samir Das. “**Design and Evaluation of iMesh: an Infrastructure-mode Wireless Mesh Network**”. Proceedings of the IEEE Symposium on a World of Wireless, Mobile and Multimedia Networks (WoWMoM), pp. 164–170, Taormina, Italy, June 2005.
- Swapnil Patil, Anand Kashyap, Gopalan Sivathanu, Erez Zadok. “**T<sup>3</sup>FS: In-Kernel Integrity Checker and Intrusion Detection File System**”. Proceedings of 18th Large Installation System Administration Conference (LISA), pp. 67–78, Atlanta, GA, USA, Nov. 2004.

#### *Current Submissions*

- Anand Kashyap and Samir Das. “**A Machine Learning Approach to Understanding Interference in Wireless Networks**”. Paper under submission.
- Anand Kashyap, Ramachandran Ramjee and Venkat Padmanabhan. “**Measurement, Modeling and Optimization of Radio Energy Consumption in Mobile Smartphones**”. Paper under submission.
- Vishnu Navda, Samrat Ganguly, Anand Kashyap and Samir Das. “**Deflect – Interference-aware Fast Path Adaption in Mesh Networks**”. Submitted to Ad hoc Networks Journal, Elsevier Science.

#### *Posters and Demos*

- Anand Kashyap and Samir Das. “**Model-based Resource Assignment and Fault Detection for Enterprise Wireless LANs**”. Poster in CEWIT Commercialization Conference, Stony Brook, NY, USA, Oct. 2007.

- Anand Kashyap, Samrat Ganguly and Samir Das. **“A Measurement-Based Model for Estimating Transmission Capacity in a Wireless Mesh Network”**. Poster in the 1st International Workshop on Wireless Network Testbeds, Experimental Evaluation and Characterization (WiNTECH), 2006, in conjunction with ACM MobiCom, Los Angeles, CA, USA, Sept. 2006.
- Samir Das, Vishnu Navda, Mahesh Marina and Anand Kashyap. **“Stony Brook Mesh Router: Architecting Multi-Radio, Multihop Wireless LANs”**. Presented at Microsoft Research Mesh Networking Summit, Snoqualmie, WA, USA, June 2004.
- Samir Das, Vishnu Navda, Salil Gokhale, and Anand Kashyap. **“Design of a High Capacity Multihop Wireless LAN”**. Poster and Demo in the 2nd International Conference on Mobile Systems, Applications, and Services (MobiSys), Boston, MA, USA, June 2004.

### Talks

- A Measurement-Based Approach to Modeling Link Capacity in 802.11-based Wireless Networks. ACM MobiCom, Montreal, QC, Canada, Sept. 2007.
- VoIP on Wireless Meshes: Models, Algorithms and Evaluation. IEEE INFOCOM, Anchorage, AK, USA, May 2007.
- Design and Evaluation of iMesh: an Infrastructure-mode Wireless Mesh Network. WOW-MOM, Taormina, Italy, June 2005.
- Stony Brook Mesh Router: Architecting Multi-Radio, Multihop Wireless LANs. At C-DAC: Center for Development of Advanced Computing, Pune, India, Jan. 2005.

### Professional Activities

- Student member of ACM.
- Member of the Technical Program Committee of IEEE Globecom 2007.
- Reviewer for ACM/IEEE Transactions on Networking, IEEE Transactions on Mobile Computing, Ad Hoc Networks Journal, Percom 2008, MobiCom 2007, WCNC 2007, COMSWARE 2007, Globecom 2007.

### Technical Skills

- *Languages*: C, C++, C#, Perl, Java.
- *Programming Environments*: Linux kernel programming, Visual Studio, Windows Mobile SDK.
- *Applications/Libraries*: ns-2 network simulator, Mathematica, Click modular router, GNU tools.

### Personal Information

- *Citizenship*: Indian.
- *Visa Status*: F-1.