Suman Banerjee

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Research Interests

- Networking
  - Peer to Peer systems, Mobile and Ubiquitous Computing, Network Security
- Distributed Systems and Algorithms
- Performance Evaluation

Education

Ph.D., Computer Science (August 2003)
University of Maryland, College Park GPA : 4.0
- A Cooperative Peer-to-peer Framework to Scale Multi-party Applications

M.S., Computer Science (May 1999)
University of Maryland, College Park GPA : 4.0
- Available Bandwidth Estimation for An End-to-end Network Connection

B.Tech., Computer Science and Engineering (May 1996)
Indian Institute of Technology, Kanpur, India (Director's Gold Medal Winner)

Academic Experience

Assistant Professor starting Jan 2004
Dept. of Computer Sciences, University of Wisconsin-Madison

Visiting Researcher Oct - Dec 2003
Intel Research, Cambridge, UK and Dept. of Computer Science, University of Cambridge, UK

Some Research Projects

NICE: A Cooperative Peer-to-peer Framework to Scale Multi-Party Applications

• My thesis work defines NICE, a cooperative framework to scalably implement distributed applications over the Internet. Based on this framework I have designed and implemented a set of protocols that can used to provide different wide-area services, e.g. secure group communication, application-layer multicast, finding nearby application peers, etc. I have demonstrated that the NICE protocols, in some cases, achieve *orders of magnitude* improvement in performance over well-known existing schemes because of the cooperative nature of the protocols. This work involved analysis, extensive simulations and implementation of protocols on multiple platforms to study the real-world system behavior.

Rover: Location-Aware Mobile Computing

• Rover enables location, time and context-aware applications for wireless devices that scale to very large user populations. In our current systems, we have implemented the Rover clients on Compaq IPAQ handheld PDAs running Windows CE and PocketLinux, with the location service being provided to these devices using GPS in the outdoor environment, and using wireless signal-strength based estimation techniques in the indoor environment. In this project, I have been involved in detailed design of the Rover system and have led a team of students in implementation of the system.

Energy Efficient Wireless Networks
• In this work, I proposed new energy-efficient routing techniques, primarily for reliable communication in multi-hop wireless networks. The work illustrates the benefits of these new schemes through detailed analysis and simulations and proved their optimality in the most common cases. I am currently working on extensions to these techniques as well as studying their behavior through actual implementation on wireless devices.

NetCalliper: Network Measurements
• My work in this project, involved developing a new technique to estimate the available and the bottleneck bandwidth for a network connection. I validated this technique through wide-area experiments on the Internet and benchmarking of the NetBSD TCP/IP stack.

Research Internships

Self-Organizing Network of Wireless Devices
Maryland Network Research Corporation, Ashton, MD (May 1999 - December 1999)
• In this work, I (along with another intern) defined protocols and mechanisms to self-organize a set of small wireless sensor devices, that are deployed for collaborative sensing applications. We defined and implemented a suite of protocols that organized the set of devices for data aggregation and efficiently delivering them to remote users across an expensive satellite interface.

I2O for Fast Servers
HP Labs, Palo Alto, CA (May 1997 - August 1997)
• In this work we implemented the Intelligent I/O (I2O) architecture on a (web) server machine. We split the TCP/IP functionality between the main processor and a specialized I/O card for faster response to client file requests. As part of this implementation on the main processor side, I implemented a fast path with minimum data copies for the Windows NT kernel.

Grants

- Rover – Location-Aware Computing. Advanced E-team grant from National Collegiate Inventors and Innovations Alliance in collaboration with Dingman Center for Enterpreneurship, for $11,000. May 2002.

Selected Publications — Journals/Magazines

1. Scalable Secure Group Communication over IP Multicast.
Suman Banerjee, Bobby Bhattacharjee.
JSAC Special Issue on Network Support for Group Communication, Vol. 20, No. 8, October 2002.

2. Rover: Enabling Scalable Location-Aware Computing.
Suman Banerjee, Ronald Larsen, A. Udaya Shankar, Ashok Agrawala et. al.
IEEE Computer Magazine, October 2002.

3. Secure-Spaces: Location-based Secure Group Communication for Wireless Networks.
Suman Banerjee, Arunesh Mishra.
Mobile Computing and Communications Review, Vol. 1, No. 2, October 2002.
Also appears as a student poster in *ACM Mobicom*, September 2002.

4. Energy Efficient Reliable Communication for Multi-hop Wireless Networks.
Suman Banerjee, Archan Misra.
Accepted for publication in *Journal of Wireless Networks (WINET).*

Under submission

5. Efficient Peer Location on the Internet.
Suman Banerjee, Christopher Kommareddy, Bobby Bhattacharjee.
Submitted to *JSAC Special Issue on Recent Advances in Service Overlay Nerworks* (Preliminary version approved).

6. Scalable Application Layer Multicast.
Suman Banerjee, Bobby Bhattacharjee, Christopher Kommareddy.
Submitted to *Transactions on Networking.*

Selected Publications — Conferences

1. Implementation of a Scalable Context-Aware Computing System.
Tamer Nadeem, Suman Banerjee, et. al.
Personal Wireless Communications, Venice, Italy, September, 2003.

2. Resilient Multicast using Overlays.
Suman Banerjee, Seungjoon Lee, Bobby Bhattacharjee, Aravind Srinivasan.
Accepted (conditionally) for publication in ACM Sigmetrics 2003, San Diego, CA, June 2003. Final version pending approval.

3. Construction of an Efficient Overlay Infrastructure for Real-time Applications.
Suman Banerjee, Christopher Kommareddy, Koushik Kar, Bobby Bhattacharjee, Samir Khuller.
To appear in IEEE Infocom 2003, San Francisco, CA, April 2003.

4. Scalable Application Layer Multicast.
Suman Banerjee, Bobby Bhattacharjee, Christopher Kommareddy.
ACM Sigcomm 2002, Pittsburgh, PA, August 2002.

5. Scalable Peer Finding on the Internet.
Suman Banerjee, Christopher Kommareddy, Bobby Bhattacharjee.
Global Internet Symposium, Globecom 2002, Taipei, Taiwan, November 2002.

6. Energy-Efficient Broadcast and Multicast Trees for Reliable Wireless Communication
Suman Banerjee, Archan Misra, Jihwang Yeo, Ashok Agrawala.
To appear in IEEE Wireless Communications and Networking Conference (WCNC), New Orleans, Louisiana, March 2003.

7. Minimum Energy Paths for Reliable Communication in Multi-hop Wireless Networks.
Suman Banerjee, Archan Misra.
ACM MobiHoc 2002, Lausanne, Switzerland, June 2002.

8. Adapting Transmission Power for Optimal Energy Reliable Multi-hop Wireless Communication.
Suman Banerjee, Archan Misra.
To appear in Wireless Optimization (WiOpt) Workshop, Sophia-Antipolis, March 2003.

9. Scalable Secure Group Communication over IP Multicast.
Suman Banerjee, Bobby Bhattacharjee.
International Conference on Network Protocols (ICNP) 2001, Riverside, California, November 2001.

10. A Clustering Scheme for Hierarchical Control in Multi-hop Wireless Networks.
Suman Banerjee, Samir Khuller.
IEEE Infocom 2001, Anchorage, Alaska, April 2001.

11. MRPC: Maximizing Network Lifetime for Reliable Routing in Wireless Environments.
    Archan Misra, Suman Banerjee.
    IEEE Wireless Communications and Networking Conference (WCNC), Orlando, Florida, March 2002.

12. Estimating Available Capacity of a Network Connection.
    Suman Banerjee, Ashok Agrawala.
    IEEE International Conference on Networks, Singapore, September 2000.

13. Virtual Time in Complex Systems.
    Ashok Agrawala, Suman Banerjee.
    Artificial Neural Networks in Engineering 1999, St Louis, MO, November 1999.

Under submission

13. A Comparative Study of Application Layer Multicast Protocols.
    Suman Banerjee, Bobby Bhattacharjee.
    Manuscript available on request, October 2002.

14. Energy-Efficient Reliable Paths for On-Demand Routing Protocols.
    Tamer Nadeem, Suman Banerjee, Archan Misra, Ashok Agrawala.
    Manuscript available on request, September 2002.

Other Technical Reports

1. Analysis of the NICE Application Layer Multicast Protocol.
   Suman Banerjee, Bobby Bhattacharjee.
   UMIACS TR-2002-60 and CS-TR 4380, Department of Computer Science, University of Maryland, College Park, June 2002

2. A Cooperative Framework to Scale Multi-Party Applications.
   Suman Banerjee.
   Ph.D. Proposal submitted to Graduate School, University of Maryland College Park, August 2000.

3. Spatial Clustering for IP Multicast : Algorithms and an Application
   Suman Banerjee, Bobby Bhattacharjee.
   CS-TR 4177, Department of Computer Science, University of Maryland, College Park, July 2000.

4. Estimating Available Capacity of a Network Connection.
   Suman Banerjee.
   Master's Scholarly Paper submitted to Graduate School, University of Maryland College Park, May 1999.

Tutorials

- Mutli-hop Wireless Networks: State-of-the-Art, Research Directions and Future Challenges. Suman Banerjee and Prashant Mohapatra, Full-day tutorial at IEEE International Conference on Networks, Sydney, September 28, 2003.

Talks/Panels

- A Cooperative Framework to Scale Multi-party Applications. *Invited talk*, University of New South Wales, Sydney, September 26, 2003.
- A Cooperative Framework to Scale Multi-party Applications. *Invited talk*, IIT Delhi, India, August 22, 2003.

- A Cooperative Framework to Scale Multi-party Applications. *Invited talk*, IIT Kanpur, India, August 21, 2003.
- A Cooperative Framework to Scale Multi-party Applications. *Invited talk*, Lucent Technologies, Holmdel, NJ, July 14, 2003.
- A Cooperative Framework to Scale Multi-party Applications. *Invited talk*, University of Cambridge, UK, February 28, 2003.
- Scaling Distributed Applications using End-host Cooperation: Resilient Application-layer Multicast. *Invited talk*, Columbia University, November 6, 2002.
- Future of Ah-hoc Wireless Networks: 802.11+ and Bluetooth - ? *Panelist*, ACM Mobihoc 2002, June 2002.
- Scaling Distributed Applications using End-host Cooperation: Secure Group Communication. *Invited talk*, Georgia Institute of Technology, October 26, 2001.

Teaching Experience

Teaching Assistant (Fall 1996 to Spring 1998, Spring 2000)
Department of Computer Science, University of Maryland, College Park
• Graduate courses: *Computer Networking* and *Advanced Database Implementation*
• Undergraduate courses: *Discrete Mathematics* and *Introduction to Information Technology*

Awards and Scholarships

- ACM/Conference student travel grant awards: *HotNets-I 2002, IEEE Globecom 2002, Sigcomm 2001, Infocom 2001, Sigcomm 2000, Dial M 2000, Dial M 1999.*
- J.N. Tata Scholarship for graduate studies, awarded by J.N. Tata Endowment for Higher Education, Bombay, India, 1996.
- Director's Gold Medal Class of 1996 (awarded for academic and all-round achievement) IIT Kanpur, 1996.
- Awards of Academic Proficiency, IIT Kanpur, 1992 - 1996.
- Polar Science Scholarship, awarded by Polar International Inc., 1991.
- National Talent Search scholarship, awarded by National Council of Education, Research and Training, India, 1990.

Professional Activities

- PC Member, International Conference on High Performance Computing (HiPC) 2004
- PC Member, International Conference on Parallel Processing (ICPP) 2004

- Session Chair, Modeling and Optimization in Mobile, Ad Hoc and Wireless Networks Workshop (WiOpt) 2003

- Reviewer, Transactions on Networking, Journal on Selected Areas of Communication, Journal of High Speed Networks, The Computer Journal, Transactions on Mobile Computing, IEEE Transactions on Wireless, IEEE Network, Computer Networks Journal, IEEE Infocom 1999-2004, ICNP 2001-2003, IEEE ICC 2003-2004, IEEE Globecom 1999-2003, Performance and Architecture for Web Servers, 2001, OpenArch 2000-2001

Citizenship and Status

Indian, H1-B work permit in the US

References

Available on Request