JAYASHREE SUBRAMANIAN

CSAIL, Department of EECS
Massachusetts Institute of Technology
32-G996 Vassar Street
Cambridge, MA USA 02139

(001) 857-654-4423
jaya@mit.edu
http://pdos.csail.mit.edu/~jaya

EDUCATION

2005-till date	**Massachusetts Institute of Technology**	**Massachusetts, USA**

- Ph.D. in Electrical Engineering and Computer Science
- Thesis advisor: Prof. Robert Morris
- Thesis title: Flooding in Wireless Mesh Networks
- Expected graduation: December 2011

2002 – 2005	**Indian Institute of Technology Madras**	**Tamil Nadu, India**

- M.S. by Research in Computer science and engineering
- Thesis advisor: Prof. C. Siva Ram Murthy
- Thesis title: Energy-efficient MAC protocol for adhoc wireless networks

1997 – 2001	**Madurai Kamaraj University**	**Tamil Nadu, India**

- B.E. in Computer science and engineering
- Project title: An online Tracking System

RESEARCH INTERESTS

Wired and Wireless Networks. Sub-interests include: MAC, routing and flooding protocols, random network coding, measurements, simulation and theoretical analysis, power control and bit-rate adaptation for wireless networks.

PROJECTS

Flooding Protocol for Wireless Mesh Networks

Advisors: Prof. Robert Morris and Prof. Hari Balakrishnan   MIT, Cambridge MA

UFlood is an efficient protocol for flooding large amounts of data over multi-hop wireless networks; it is intended for applications such as video distribution and software updates, where throughput (the transfer size divided by the time it takes until all the nodes have received the whole transfer) and efficient use of the wireless channel are both important. Achieving both goals is a challenge. UFlood's key new idea is a distributed heuristic that takes into account, which data nearby receivers already have as well as inter-node channel quality. The mechanism includes a novel bit-rate selection algorithm that trades off the speed of high bit-rates against the larger number of nodes likely to receive low bit-rates. Unusually, UFlood uses both random network coding to increase the usefulness of each transmission and detailed feedback about what data each receiver already has; the feedback is critical in deciding which node's coded transmission will have the most benefit to receivers. The required feedback is potentially voluminous, but UFlood includes novel techniques to reduce its cost. Experimental results on a 25-node wireless test-bed demonstrate that UFlood improves throughput by 2.5-4 times using 65% lower airtime consumption than existing flooding protocols. Tools used: Click Modular Router, python, MATLAB. OS used: Linux. Hardware: Wireless nodes with 500 MHz AMD Geode LX800 CPU and a radio based on the Atheros 5212 chip-set.

WiFi Multicasting

Advisors: Prof. Robert Morris and Prof. Hari Balakrishnan   MIT, Cambridge MA

Multicast is a popular way to distribute live streams, such as seminars and lectures, inside campuses and companies. With the rapid rise in WiFi-connected clients, the delivery of such multicast streams over infrastructure 802.11 networks is becoming important. Unfortunately, multicast over such networks is often inefficient, suffering from low throughput and significantly reducing the capacity available for other traffic. UCast is a system that uses cooperative client flooding to improve the delivery of WiFi multicast streams. UCast clients subscribed to a given multicast group along with the WiFi access points form a cooperative mesh network over which the multicast data is distributed from APs to the clients. The key to making this idea work is to use an efficient and robust flooding of data over the cooperative mesh. Experimental results over an indoor WiFi test-bed show that UCast can achieve about 4-7 times improvement in throughput over a scheme that is similar to it except that only APs send data and over DirCast+, an existing WiFi multicast protocol. Tools used: Click Modular Router, python, MATLAB. OS used: Linux. Hardware: Wireless nodes with 500 MHz AMD Geode LX800 CPU and a radio based on the Atheros 5212 chip-set.

Power Control for Wireless Mesh Networks

Advisors: Prof. Robert Morris and Prof. Hari Balakrishnan   MIT, Cambridge MA

This project analyzes the effect that sophisticated power control mechanism might have on total throughput of wireless networks. Contrary to the popular belief, the project's main conclusion, based on theoretical and experimental studies, is that for any two sender topology the best strategy is either for the stations to send one at a time, or for them to send concurrently at the maximum power level of which they are capable and that there is no use of any adaptive power control mechanisms. The analysis derives the general expression for the transmit power that maximizes the throughput for the two-sender physical topologies. This expression is found to correspond to the cases where one node transmits or both the nodes transmit at a time with maximum transmission power. The project goes on to present measurements from an 802.11 test-bed for the two-sender topology, in order to see if the conclusions from the theoretical analysis hold in practice. Tools Used: Click Modular Router, Python, MATLAB.

Energy-Efficient MAC Protocol for Ad hoc Networks

Advisor: Prof. Siva Ram Murthy   IIT Madras, India

Designed a MAC protocol that exploits the chemical effects and behavior of the batteries, which power the nodes of ad hoc networks. BAMAC is the first protocol to explicitly use battery state for designing a MAC scheme. It maximizes battery lifetime using a round robin node scheduling of ad hoc node. Probabilistic model using a Discrete–time Markov chain and a simulator designed using GloMoSim was developed to analyze BAMAC. Both the models show that lifetime of ad hoc nodes that use BAMAC improve by 30% compared to 802.11 and other known MAC protocols. HBAMAC is a variation of BAMAC that works for heterogeneous batteries in the network. Tools used: GloMoSim Simulator, MATLAB 6.1

TEACHING AND WORK EXPERIENCE

2002-2005	**Project Associate**, Department of Science and Technology, India. Resource Management in High-Performance Real-Time systems and Networks
Summer 2000	**Internship** at T.V.S. and Sons (P) Ltd, India
2005-2008	**Research Assistant**, Computer science and Artificial Intelligence Laboratory, MIT
Spring 2008	**Teaching Assistant** for 6.829 (Computer Networks) Instructors: Prof. Hari Balakrishnan and Dr. Bruce Davie
2009-Fall 2010	**Research Assistant,** CSAIL, MIT
Spring 2010	**Teaching Assistant** for 6.02 (Introduction to EECS: Digital Communications) Instructors: Prof. Chris Terman, Prof. Hari Balakrishnan, and Prof. Jacob White.

REFEREED PUBLICATIONS

- Jayashree Subramanian, Robert Morris, and Hari Balakrishnan, "UFlood: Flooding in Wireless Mesh Networks", To be published in *INFOCOM* 2012.
- S. Jayashree, B.S. Manoj and C. Siva Ram Murthy, " Network Lifetime Driven MAC Protocols for Ad hoc Wireless Networks", *WINET Journal*, Vol 14, No. 6, 2008.
- S. Jayashree and C. Siva Ram Murthy, "A Taxonomy of Energy Management Protocols for Ad hoc Wireless Networks", *IEEE Communication Magazine*, Vol. 25, No. 4, 2007.
- S. Jayashree, B.S. Manoj, and C. Siva Ram Murthy, ``A Novel Battery Aware MAC Protocol for Ad hoc Wireless Networks", in *Proc. 11th International Conference on High Performance Computing (HiPC)*, Bangalore, December, 2004.
  (Won the best paper award)
- S. Jayashree, B.S. Manoj, and C. Siva Ram Murthy, ``On Using Battery State for Medium Access Control in Ad hoc Wireless Networks", in *Proc. 12th ACM Annual International Conference on Mobile Computing and Networking (MOBICOM)*, Philadelphia, USA, September, 2004**.**

SKILLS & TOOLS

Languages	: C, C++, UNIX Scripting, HTML, PHP, PERL.
Packages	: CLICK Modular Router, MATLAB, GloMoSim
Operating system	: Linux

AWARDS & ACHIEVEMENTS

- Recipient of the **Best Paper Award** for the paper entitled "**A Novel Battery Aware MAC Protocol For Ad hoc Wireless Networks**", co-authored with B. S. Manoj and C. Siva Ram Murthy at the 11th International Conference on High Performance Computing to be held in Bangalore, India during December 19-22, 2004.
- Won IBM IRL, India Scholarship to attend the ACM MobiCom Conference held in Pennsylvania, PA, USA.
- Won the academic excellence award for B.E.

PROFESSIONAL ACTIVITIES AND TALKS

- 'On Using Battery State for Medium Access Control in Ad hoc Wireless Networks', MOBICOM 2004
- 'A Novel Battery Aware MAC Protocol for Ad hoc Wireless Networks': HIPC 2004 (**Best paper talk**)
- Visited BELL LABS, Murray hill, USA and presented a talk on my research findings
- Reviewer: IEEE Transactions on Mobile Computing
- Worked as Information Technology Chair (2006-2011) for Tang Hall Residence of MIT, designed their webpage: http://tang.mit.edu

REFERENCES

Prof. Robert Morris
Dept. of EECS
Massachusetts Institute of Technology, USA
Ph: (001) 617-253-5983
Email: rtm@lcs.mit.edu

Prof. Hari Balakrishnan
Dept. of EECS
Massachusetts Institute of Technology, USA
Ph: (001) 617-253-8713
Email: hari@mit.edu