

Victor Bahl

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Employment

DIRECTOR, Mobile Computing Research Center, Microsoft Corporation, Redmond, WA	01/2011 - Present
RESEARCH MANAGER / SENIOR CORP. PARTNER, Microsoft Research, Redmond, WA	01/2006 - 12/2010
PRINCIPAL RESEARCHER & MANAGER, Networking Research, Microsoft, Redmond, WA	01/2002 - 12/2006
SENIOR RESEARCHER, Microsoft Research, Redmond, WA	06/1997 - 12/2002
DIRECTOR, Multimedia Engineering & Systems Division, Digital, Maynard, MA	12/1996 - 05/1997
PRINCIPAL ENGINEER, Digital Equipment Corp., Cambridge, MA	06/1992 - 05/1997
SENIOR ENGINEER, Digital Equipment Corporation, Littleton, MA	06/1988 - 05/1992

Education

DOCTOR OF PHILOSOPHY, Electrical & Computer Engineering Thesis: <i>Real-Time Visual Communications over Narrowband Wireless Radio Networks</i> University of Massachusetts, Amherst, MA (Doctoral Fellowship from Digital)	Sept. 1997
MASTER OF SCIENCE, Electrical & Computer Engineering Thesis: <i>Recognition of Handwritten Script: A Hidden Markov Model Approach</i>	June 1988
BACHELOR OF SCIENCE, Electrical & Computer Engineering Thesis: <i>Conic Shape Detection Using a Non-Linearized Iterative Approach</i> University of Buffalo, New York, NY	June 1986

Awards / Recognition

- ACM FELLOW 2003; IEEE FELLOW 2008; AAAS FELLOW 2010
- DISTINGUISHED ALUMNI AWARD 2012, University of Massachusetts Amherst
- FCC OPEN INTERNET APP. AWARD, Federal Communications Commission Open Internet Challenge 2011
- FCC PEOPLE'S CHOICE APP. AWARD, Federal Communications Commission Open Internet Challenge 2011
- IEEE NORTHWEST OUTSTANDING ENGINEER AWARD 2010
- SIGCOMM BEST PAPER AWARD 2009
- CoNEXT BEST PAPER AWARD 2008
- MICROSOFT INDIVIDUAL PERFORMANCE AWARD Oct. 2007, Sept. 2010, & Sept. 2011
- SIGMOBILE DISTINGUISHED SERVICE AWARD 2001
- DOCTORAL FELLOWSHIP AWARD, Digital Equipment Corporation (now Hewlett Packard) 1994-96
- Chair, ACM Outstanding Contribution Award Committee on Mobility (1996-2011)
- IEEE COMMUNICATIONS SOCIETY DISTINGUISHED LECTURER, (2007-10)
- ACM DISTINGUISHED SPEAKER (2007-10)
- IEEE Fellow Selection Committee, IEEE Computer Society (2009-10)
- Microsoft's nominee and final four for IPO's NATIONAL INVENTOR OF THE YEAR AWARD 2006
- 86 US & international patents granted, 50 additional applications pending
- 15,500+ citations of scientific papers published & multiple product contributions (1997-present)
- 30 keynote and plenary talks at international conferences and workshops
- Over a five hundred press articles in mainstream media including The New York Times, Seattle-Post Intelligencer, EE Times, Information Week, Technology Review, DataQuest, Wired News, etc.
- SENIOR LEADER BENCH PROGRAM, Executive management for high performing Microsoft employees 2005
- RESEARCH FELLOW, Research Foundation of University of Buffalo 1986-1988

Research Highlights

- **Deployed the world's first urban white space network (2003-10):** Led a small team of researchers that built and deployed a WSN, nick-named "WhiteFi", on Microsoft's Redmond campus on Oct. 16, 2009. Spearheaded Microsoft's spectrum etiquette proposals. Published seminal papers in top conferences, started conferences & workshops (DySPAN, INFOCOM's CWCN, MSR's CogNet), edited special issues, wrote book chapters, gave close to a dozen keynotes, influenced government policy (FCC, TRAI, SARFT, ANATEL etc.) & funding (NSF). Became the focus of world-wide press coverage. Co-led the MS strategy team that had a significant hand in the 11/4/08 FCC ruling that opened 180 MHz+ for unlicensed use in the United States.
- **Designed, developed, & deployed the world's first public Wi-Fi hotspot network (2000)** Deployed the network in the Crossroads Shopping Center in Bellevue, Washington from June 11, 1999 to 2001 (New York Times Article, Feb. 28, 2000). The wireless edge server design is being used by all the major Wi-Fi equipment vendors (Aruba, Cisco, Meru, Broadcom etc.), beating out the competing IEEE 801.1x design. Published numerous papers (500+ citations), awarded 6 international patents & received significant favorable press.
- **Invented the world's first RF signal strength based indoor location determination system (1999)** Original papers have been cited over 4,700 times and in large part has created the field of indoor positioning systems using commodity hardware. Several companies including Ekahau, Symbol, Nortel, Intel, Cisco, Nokia, NextNav, and Microsoft have commercialized versions of this system and many universities include it as part of their course work and use it as a foundation for research in location and context aware systems. Awarded 9 U.S. and international patents for this work.
- **Invented the world's first wireless virtualization architecture (2002):** Designed the first wireless virtualization architecture that enables a Wi-Fi card to connect to multiple networks simultaneously. Software downloads in the first year exceeded over 100,000 making it the 3rd most popular download in Microsoft Research's history. *Virtual Wi-Fi* is now part of Windows 7 and is being shipped to millions of users around the world. Received many accolades from mainstream media. The design is fundamental to NSF's GENI WLAN virtualization efforts. Over 1000+ citations related to this work.
- **Invented the world's first multi-radio mesh & wireless LAN system (2003)** Introduced important new design ideas on using multiple radios to improve the performance of wireless mesh networks, wireless LANs, and cell phones. These designs have proliferated deeply into the computer and telecommunication industry. Awarded 5 patents and received considerable coverage from mainstream media for this work.
- **Invented the first wake-on-wireless system (2003)** Introduced the notion of using a low power radio (as a control channel) to "wake up" the high-power system to improve its energy profile. The original MobiCom paper, cited 450 times, opened up a new thread of research on wireless systems incl. UMASS's Turduken, Intel's CoolSpots, Microsoft's Cell2Notify, Somniloquy, etc. Awarded 4 US patents for this work.
- **Community leadership in community mesh networking (2003),** Popularized this networking paradigm as an alternative technology for broadband access in cities, neighborhoods, offices, and rural areas. Helped create the Digital Inclusion Program at Microsoft that provided \$1.5 million in research funding. Developed the **Mesh Networking Academic Resource Kit 2005 & 2007** as a teaching & research aid. The kit was used by over 1200 Universities world-wide. Gave keynotes and taught several courses. Published multiple papers, awarded 8 international patents, received wide press coverage, and licensed out the technology to start-up companies.
- **Co-designed and built the world's first commodity multimedia adapter for PCs (1992).** The hardware / software combination had real-time audio-video coding/decoding and image rendering capabilities. It was used world-wide for research in high-speed (ATM, FDDI) and packet video networks (Sequoia 2000, BERKOM, BAGnet & MBONE) and later successfully productized by Digital.
- **Inventor/Co-inventor in 130 patent applications** of which **85 have issued**. Nominated by Microsoft for IPO *Inventor of the year award*. **Authored 115+ papers** with over **15,000 citations** with an [h-index of 44](#). Portfolio of papers and patents includes various aspects of wireless communication protocols and systems such as Internet access, location determination, energy management, network management, home networking, mobility management, load balancing, security and audio/video communications.

Product Contributions

My work has been incorporated into Microsoft's core products, industry standards, and numerous non-Microsoft commercial products. Examples of direct product contributions include: Digital's FullVideo & FullVideo Supreme A/V multimedia adapter for VAX, Alpha, and Pentium systems; Digital's video compression and image rendering software library SLIB v1 & v2; Image rendering software in Digital's graphic chips; Wireless zero configuration and NDIS programming extensions for Wireless LANs in Microsoft's Windows XP, Windows Vista & Windows 7 (this led to the successful launch of the Native Wi-Fi program), Virtual Wi-Fi in Microsoft's Windows 7 and E-911 support via indoor location determination in Office Communicator Wave 14 product. In addition, the IEEE 802.11e standard incorporates my distributed weighted fair scheduling algorithm. The IEEE 802.11s mesh standard incorporates abstractions related to multiple radios and fast channel switching and the Bluetooth Local Positioning WG incorporated my signal strength matching techniques. Several of my technologies are available for licensing through Microsoft's IP Venture Program and have been used by the company for business negotiations.

Management Highlights

I founded the Networking Research Group at Microsoft. It became one of the strongest and most respected research groups in the world. Till the time I was at its helm, my group dominated the premier computer networking conferences (incl. SIGCOMM, NSDI, and MobiSys). Collectively we published over 250 papers and created a portfolio of over 220 patent applications (over 60% of which have issued). Many of the technologies we invented ship in Microsoft products impacting millions of people world-wide. We had significant impact on the design, implementation, operation, and management of data center and enterprise networks. We contributed significantly to consumer, home and wireless networking. We engaged closely with academia and government organizations world-wide and funded significant number of research work. Our software was downloaded 100,000s times and our academic tool kits have been used by over a 1000 universities world-wide.

Since March 1, 2011 I am heading a research center with a mission *"to invent technologies that make Microsoft's mobile devices and services indispensable to the world"*

Professional Service Highlights

- **Co-Founded the Special Interest Group on Mobility of Systems, Users, Data and Computing.** SIGMOBILE is a non-profit professional R&D organization that promotes research in a broad spectrum of topics sharing mobility as the common theme. I built this international organization from scratch. Founded MobiCom, MobiSys, SenSys and MobiHoc conferences and brought HotMobile and UbiComp conferences under its fold. Instituted prestigious awards and international chapters. The 1500+ members include researchers, academicians, practitioners, and government officials.
- **Founded ACM/USENIX International Conference on Mobile Systems, Applications and Services.** Architected a deal between the two largest computer science professional organizations to jointly produce MobiSys. Authored the bylaws governing the conference were then used as the default framework for other joint events (e.g. NSDI, SenSys). Chair of the Steering Committee since inception.
- **Founded ACM Mobile Computing and Communications Review**, a quarterly scientific journal that publishes peer-reviewed technical papers, standards reports, RF related health articles, conference and workshop reports, opinion columns, news stories etc. related to wireless communications and mobility. 1200+ subscribers worldwide. Editor-in-chief for 5 years, now a Senior Advisor to the editorial board
- **Co-Founded IEEE DySPAN, IEEE COMSNET, IEEE ISWCS, ACM SenSys, ACM MobiHeld and ACM MCS.** Delivered over dozen keynotes & over six dozen departmental seminars. Served on NSF, NRC, FCC & EU Research Panels; Served in over 75 technical program committees; over two dozen conference panels; as General Chair and Program Chair of several conferences; Provided over 16 years of continuous leadership to **MobiCom** the third most cited conference in computer science (2001). Have served as the defacto steering committee chair since 2001

Government Policy & Study Group Contributions

- Federal Communications Commission
 - Best Application and People's Choice Award in FCC Open Internet App. Challenge Award 2011

- *White Space Networking – Update*, Presentation to the FCC Chairman, Redmond, WA (Aug. 14, 2010)
 - *White-Fi Network using TV white spaces spectrum*, FCC. Ex Parte (Apr. 29, 2010)
 - *Research Recommendation for National Broadband Task Force*, Washington, DC (Nov. 23, 2009)
 - *Broadband Spectrum: A Looming Crisis?* National Broadband Plan Field Hearing on Mobile Broadband, San Diego, CA (Oct. 8, 2009)
- National Science Foundation
- *Reactions & Perspectives on Future Wireless Communication Networks*, Arlington, VA (Nov. 2-3, 2009)
 - *Site Visitor*, \$25M Renew Funding for Center for Embedded Network Sensing, UCLA, (June 7, 2006)
 - *NeTs Program PI Research Review*, UCLA August 5, 2010
 - *Study Group on Perspectives on Peer-to-Peer Networks*, Dagstuhl, Germany, April 20, 2005
 - *Study Group on Residential Broadband Revisited: Research Challenges in Residential Networks, Broadband Access and Applications*, Chicago, Illinois, USA (October 23-24, 2003)
 - *Network Research Testbed*, Chicago, IL, USA (October 17-18, 2002)
 - *Wireless Information Technology and Networking Initiative*, Study conducted by the Division of Advanced Networking Infrastructure and Research (CISE/ANIR) (July 1999)
 - *Networking Research Program*, Division of Advanced Networking Infrastructure and Research, (January 1999)
- COST (European Union), *Exchanges and Trends in Networking*, Chania, Greece (June 23, 2003)
- National Research Council, *The Intersection of Geospatial Information and Information Technology*, Study conducted by the Computer Science and Telecommunications Board (CSTB), sponsored by NASA and NSF (Sept. 2001)

Significant Positions Held

- ADVISORY COUNCIL CHAIR, Mobile & Networked Systems Tech. Community, Microsoft Corp. (2011-present)
- ACM SIGMOBILE CHAIR (2001-05); Vice Chair, ACM SIGMOBILE (1996– 2001), Executive Committee
- STEERING COMMITTEE CHAIR, ACM/USENIX MobiSys (2002-present), ACM MobiCom 2002-present)
- STEERING COMMITTEE MEMBER of IEEE DySPAN (2004 – present), IEEE Technical Committee on Wearable Information Systems (2002 – present), IEEE Communications Systems Software and Middleware (2005- present), IEEE International Symposium on Wireless Com. Systems (2006 – present), ACM SenSys (2002-05), ACM MobiCom (1996 - present), Mobile Computing & Cloud Service (2010 – present)
- SEARCH COMMITTEES: IEEE Pervasive Computing EiC 2009, ACM MC2R EiC 2010, IEEE ISWC 2001-present
- GENERAL CHAIR, IEEE DySPAN 2012, ACM SIGCOMM 2008, IEEE IWCS 2007, IEEE COMSWARE/COMSNET 2005, IEEE ISWC 2001, ACM MobiCom 1999,
- PROGRAM COMMITTEE CHAIR, ACM Vehicular Ad hoc Networking Workshop (2006), IEEE Symposium on Wearable Computers (2001), IEEE Conference on Wireless Mobile Multimedia (2001)
- PROGRAM COMMITTEE MEMBER of over six dozen technical conferences, symposiums, and workshops
- EDITOR-IN-CHIEF, Mobile Computing and Communications Review (1996 - 2001), SENIOR ADVISOR (2001-)
- EDITORIAL BOARD MEMBER, Kulwer's Telecommunications Systems Journal (2001-06), Elsevier's Adhoc Networks Journal (since inception in 2002-05), IEEE Journal on Selected Areas in Communications (1997-1999), ACM Journal on Wireless Networks (1997-2003)
- GUEST EDITOR, IEEE Journal on Selected Topics in Communications, (Sept. 2009), IEEE Journal on Selected Topics in Communications, (May 1999), ACM Mobile Networks and Applications Journal (June 1998), IEEE Communications Magazine (June 1998)
- WORKING GROUP CHAIR, Bluetooth WG on Location Determination & Management (1999-2000)
- PHD COMMITTEES at MIT, Harvard, UCSD, Duke, UCSB, U. Toronto, Cornell, UMD, University of Rome
- PANELIST, DySPAN'10, MobiSys'09, MobiCom'07, ISWCS'07, DySPAN'06, MobiHoc'05, MobiCom'04, NOSSDAV'04, WMASH'03 WoWMoM 2003, Hot Interconnects'02, ISSCC'00, MobiCom'97, IC3N'95

Personal

US Citizen; married (22 years), two children: son (21) and daughter (16)
 Residence: 1311 108th Ave, NE, Bellevue, WA 98004-3620, USA

HIGHLIGHTS

<http://research.microsoft.com/~bahl/highlights.aspx>

Keynotes & Plenaries

Putting the Cloud in the Palm of the hand

- The 47th IEEE International Conference on Communications (ICC), Ottawa, Canada, June 14, 2012
- The 22nd IEEE Symposium on Personal, Indoor, Mobile and Radio Communications (PIMRC), Toronto, Canada, September 12, 2011
- The 20th IEEE International Conference on Computer Communications and Networks (ICCCN), Maui, Hawaii, USA, August 2, 2011
- The 8th IEEE Communications Society Conference on Sensor, Mesh and Ad Hoc Communications and Networks (SECON), Salt Lake City, Utah, USA, June 28, 2011

The Wireless Frontier - from 600 MHz to 60 GHz

- The 5th IEEE International Dynamic Spectrum Access Networks (DySPAN), Aachen, Germany, May 6, 2011
- The 10th Scandinavian Workshop on Wireless Ad-hoc Networks (ADHOC), Johannesburg Castle, Stockholm, May 10, 2011

Green IT: Software Perspective

- The 7th IEEE International Conference on Mobile Ad-hoc and Sensor Systems (MASS), San Francisco, CA, November 8, 2010
- The 1st ACM SIGCOMM Workshop on Green Networking, New Delhi, India, August 30, 2010

White Space Networking

- Wireless Innovation Forum 67th General Meeting, TVWS Workshop: Going to Market with TV Band Devices: Long Term Promises, Near Term Actions”, Schaumburg, Illinois,, Sept. 16, 2010
- The Fifth International Conference on Mobile Computing and Ubiquitous Networking (ICMU), San Francisco, USA, California, April 28, 2010
- The Seventh IEEE/IFIP International Conference on Embedded and Ubiquitous Computing (EUC), Vancouver, Canada, August 31, 2009
- The Sixth International Conference on Wireless On-demand Network Systems and Services, Snowbird, Utah, USA, February 2, 2009
- First Workshop on Wireless Broadband Access for Communities and Rural Developing Regions, Karlstad, Sweden, December 11, 2008
- Second IFIP International Symposium on Wireless Communications and Information Technology in Developing Countries, Pretoria, South Africa, October 7, 2008
- MSR’s Fifth Annual Networking Summit on Cognitive Wireless Networks, Snoqualmie, Washington, USA, June 4, 2008

Revisiting Wi-Fi Design in the Cognitive Radios Era

- First International Workshop on Cognitive Dynamic Systems and Their Applications, Ontario, Canada, May 27, 2008

- The Third International Conference on Communication System Software and Middleware (COMSWARE), Bangalore, India, January 8, 2008
- The Ninth International Conference on Distributed Computing and Networking (ICDCN), Kokatta, India, January 6, 2008

Towards Self-Managing Wireless Networks

- IFIP Symposium on Computer Performance Modeling, Measurements, and Evaluation (PERFORMANCE), Cologne, Germany, October 2, 2007
- ACM Workshop on Mobility in Evolving Internet Architecture (MobiArch), Kyoto, Japan, August 27, 2007
- Conference on Heterogeneous Networking for Quality, Reliability, Security and Robustness (QShine), Vancouver, Canada, August 15, 2007
- IEEE International Symposium on Wireless Pervasive Computing, San Juan, Puerto Rico, February 5, 2007
- SPIE Broadband Access Communication Technologies Conference, Boston, Massachusetts, USA, October 1, 2006,

Wireless Mesh Networking

- First International Workshop on Wireless Mesh: Moving towards Applications, Waterloo, Ontario, Canada, August 10, 2006
- Workshop on Wireless Personal and Local Area Networks, New Delhi, India, January 8, 2006
- Texas Wireless Symposium, Austin, Texas, October 26, 2005
- International Symposium on Wireless Communication Systems (ISWCS), Siena, Italy, September 5, 2005
- International Conference on Mobile Business (ICMB), Sidney, Australia, July 11-13, 2005
- Annual Mobile Information and Communication Systems (MICS) Workshop, ETH Zurich, Zurich, Switzerland, July 6, 2004

Ph.D. Thesis Committees

- [1] Justin Manweiler, "Building Blocks for Tomorrow's Mobile App Store," Duke University (June 2012)
- [2] Rohan N. Murty, "Opportunistic Wireless Network Architecture," Harvard University, June 2011
- [3] Yuvraj Agarwal, "Building Aggressively Duty-Cycled Platforms to Achieve Energy Efficiency," University of California San Diego, June 2009
- [4] Iqbal Mohamed, "Interactive Content Adaptation," University of Toronto, October 2008
- [5] Srikanth Kandula, "Increasing the Robustness of Networked Systems," Massachusetts Institute of Technology, July 2008
- [6] Yuan Yuan, "Enabling Dynamic Spectrum Allocation in Cognitive Radio Networks," University of Maryland, September 2007
- [7] Ranveer Chandra, "A Virtualization Architecture for Wireless Network Cards," Cornell University, September 2005
- [8] Anand Balachandran, "Incorporating Location Awareness in Public-Area Wireless Networks," University of California San Diego, January 2003
- [9] Chiara Petrioli, "Energy Conserving Protocols for Wireless Communications," University of Rome "La Sapienza", June 1998

[10] Tong Liu, Boston University, June 1997

Honored Guest

- *The Future of Wireless Technology*, WINLAB's 20th Anniversary Celebration Event, Rutgers University, New Jersey, December 11, 2009
- *The Future of Information Systems & Communications*, Dept. of Electrical & Computer Engineering Centennial Celebrations 1908-2008, University of Maryland. September 27, 2008
- *The Potential of White Space Networks*, Intel's Senior Leadership Communications Offsite, Stevenson, Washington, USA, April 9, 2008

Conference Panels (Incomplete List)

- *What are the priority 'go to market' hurdles for TV Band Devices*, Wireless Innovation Forum 67th General Meeting, Schaumburg, Illinois, USA, September 16, 2010
- *The Unconventional Role of Networking Technologies for Green World*, US-Korea Conference on Science, Technology, & Entrepreneurship (UKC), Bellevue, Washington, August 13, 2010
- *Towards the Ever-Green future*, The Fifth International Conference on Mobile Computing and Ubiquitous Networking (ICMU), Seattle, Washington, April 27, 2010
- *DSA: An Incipient Revolution or a Technology Fad?* IEEE International Dynamic Spectrum Access Networks, , Singapore, April 8, 2010
- *What Constitutes Great Research?* ACM MobiSys 2009, Kraków, Poland, June 23, 2009
- *Wireless Networks for Rural and Developing Areas - Technologies, Economics and Social Implications*, Mobile Communication Technology For Development, Karlstad, Sweden, December 12, 2008
- *Mobile Computing and Systems: Where is the Tofu? A Discussion with Programs Directors from Agencies and Industry*, ACM MobiCom, Montreal, QC, Canada, September 11, 2007
- *Wireless Futures*, International Symposium on Wireless Communication Systems, Trondheim, Norway, October 18, 2007
- *The Technical and Business Challenges in Wide Deployment of WLAN Hotspot Networks*, Workshop on Wireless Mobile Applications and Services on WLAN Hotspots, San Diego, California, September 19, 2003
- *Which Wireless Network Technology will prevail for Scalable Mobile Multimedia Services: Cellular (3G/4G) vs. WLAN? Both? Neither?*, Workshop on Wireless Mobile Multimedia, Atlanta, GA, USA, September 28, 2002
- *Wi-Fi versus GPRS versus 3G?* Symposium on High Performance Interconnects Panel, Stanford University, Palo Alto, California, USA, August 21, 2002
- *Forget it! A "No-G" Network based on wireless LANs will be coming shortly. Or will it?*, Workshop on Mobile Computing Systems & Applications Panel, Callicoon, New York, USA, June 21, 2002
- *Can Pervasive Networking be Manageable?*, IFIP/IEEE International Symposium on Integrated Network Management, Seattle, Washington, USA, May 14-18, 2001
- *Can Mobile Internet be all Pervasive?* ACM Workshop on Mobile Multimedia 2000, Boston, Massachusetts, USA, August. 11, 2000
- *Home and Small Office Networking: What are the options?*, IEEE International Solid-State Circuits Conference, San Francisco, California, USA, February 15-17, 2000

- *Building and Managing Large Wireless LANs: Real World Experiences*, ACM/IEEE Annual International Mobile Computing and Networking Conference, MobiCom '97, Budapest, Hungary, September 16-30, 1997
- *A Discussion on the need to Standardize Benchmarking in Industry for Networks*, IEEE International Conference on Computer Communications and Networking, Las Vegas, September 20-23, 1995

Distinguished Lectures / Seminars / Colloquia (Incomplete List)

- Latin America Faculty Summit 2012, Microsoft Research, Cancun, Mexico, May 23, 2012
- Dept. of Computer Science, University of Massachusetts, Amherst, MA, April 18, 2012
- Faculty Summit 2011, Microsoft Research, Redmond, Washington, July 18, 2011
- Bell Labs, Alcatel-Lucent, 600 Mountain Avenue, Murray Hill, NJ June 3, 2011
- Software Summit 2011, Microsoft Research, Paris, France, April 14, 2011
- US-Korea Conference on Science, Technology, & Entrepreneurship, Bellevue, WA, Aug. 14, 2010
- Stanford Networking Seminar, Stanford University, Palo Alto, California, May 6, 2010
- University of Washington, Bothell, Washington, May 4, 2010
- Faculty Summit 2009, Microsoft Research, Redmond, Washington, July 14, 2009
- Dept. of Computer Systems and Networks, University College of London, London, June 3, 2009
- Dept. of Computer Science, Washington University St. Louis, St. Louis, MO, April 10, 2009
- School of Computing, National University of Singapore, May 15, 2008
- School of Information Systems, Singapore Management University, Singapore May 14, 2008
- Dept. of Computer Science, University of Wisconsin, December 11, 2007
- Dept. of Computer Science, University of Pennsylvania, Pennsylvania, December 4, 2006
- Dept. of Computer Science, Purdue University, Lafayette, Indiana, November 29, 2006
- University of Computer Science, University of Trento, Trento, Italy, March 31, 2005
- Dept. of Electrical Engineering, Indian Institute of Technology Delhi, January 20, 2005
- Dept. of Electrical Engineering, Indian Institute of Technology Mumbai, January 17, 2005
- Dept. of Computer Science, Indian Institute of Science Bangalore, January 13, 2005
- Dept. of Computer Science, Swiss Federal Institute of Technology Zurich, July 6, 2004
- MSR's Annual Networking Summit on Wireless Meshes, Snoqualmie, Washington, June 23, 2004
- Berkeley Wireless Research Center Retreat, June 3, 2004
- Intel / Microsoft CTO-Quarterly Summit, Redmond, Washington, April 13, 2004
- Intel's Mesh Networking Workshop, Portland, Oregon, April 2, 2004
- Dept. of Computer Science, Universität Karlsruhe, Germany, August 27, 2003
- Intel / Microsoft CTO-QSR, Portland, Oregon, ACM MobiHoc 2005, September 2003
- COST (EU) - NSF (USA) Workshop, Chania, Greece, June 23, 2003
- Dept. of Computer Science, Stanford University, Stanford, California, USA, March 20, 2003
- Stanford University Law School, Spectrum Policy: Property or Commons?, March 2, 2003
- Washington State Trade Association, SIG Seminar, February 13, 2003
- Center for Communication Networks, University of Maryland, College Park, September 6, 2002
- Dept. of Computer Science, University of Massachusetts, Amherst, Massachusetts, Sept. 5, 2002
- Dept. of Computer Science, Stanford University, Palo Alto, California, USA, August 21, 2002
- Dept. of Computer Science, Federal Institute of Technology Zurich, Switzerland, June 12, 2002
- Dept. of Computer Science, Rice University, Houston, Texas, May 30, 2002
- Dept. of Computer Science, University of California Los Angeles, May 28, 2002
- Computing Sciences Research, Bell Labs, Lucent Technologies, New Jersey, April 19, 2002

- Dept. of Computer Systems, Ecole Polytechnique Fedrale de Lausanne, Switzerland, July 13, 2001
- Columbia Business School, Columbia University, New York, November 3, 2000
- Intel Corporation, Napa Valley, California, October 11, 2000
- Microsoft Research, University Faculty Summit 2000, Redmond, Washington. July 17, 2000
- Microsoft Research, Redmond, Washington, Crash Course/Tutorial, July 20, 2000
- Dept. of Management Studies, State University of New York Buffalo, April 27, 2000
- Systems Seminar, University of California Berkeley, Berkeley, California, April 13, 2000
- Internet Architecture Board, Mountain View, California, March 2000
- National Science Foundation Workshop, University of Cincinnati, June 1999
- Nokia Research, London, January 1999
- Design Automation Conference, New Orleans, June 1999
- Dept. of Comp. Science & Engineering, Indian Institute of Technology, Delhi, India, April 1999
- Dept. of Elect. & Comp. Eng., Georgia Institute of Technology, Atlanta, Georgia, March 1999
- Stanford University, Stanford, California, USA, Host: Dept. of Computer Science, February 1999
- Oregon Center for Advance Technology Education, Portland, Oregon, USA, December 1998
- Wireless Information Day, Microsoft Corporation, Redmond, Washington, USA, June 1998
- Intel Communications Architecture Labs, Hillsborough, Portland, USA, March 1997
- Fujitsu Laboratory of America, San Jose, California, USA, November 1997
- Digital Equipment Corporation, Cambridge Research Lab., Cambridge, MA, USA, November 1996

References Provided

I have spent a significant amount of time on this so I am mentioning it here - I have written evaluation and reference letters for many individuals for getting them awards, research funding, and promotion to full professors, associate professors, technical fellows, and distinguished engineers. Institutes I have written recommendation letter for include: IEEE (multiple), ACM (multiple), Sloan (multiple), NSF (multiple), Massachusetts Institute of Technology (multiple), University of California Berkeley, Carnegie Mellon University (multiple), University of Illinois Urbana Champaign, University of Wisconsin, University of Michigan (multiple), University of California San Diego (multiple), University of California Los Angeles (multiple), Dartmouth College, Columbia University, Harvard University, University of Maryland, University of Massachusetts (multiple), Washington University of St. Louis, University of Waterloo, Rice University (multiple), University of Texas Austin, AT&T Research and Intel Research

Press Coverage (Incomplete List)

Over 500 articles have been written about my projects (too many to track & enumerate here). The three most popular projects have been on white space networking, wireless mesh networking and wake on wireless. Below are some samples:

- *New York Times*, "A Wireless Road Around Data Traffic Jams" by Anne Eisenberg, January 12, 2012
- *Microsoft Research News*, "Multiplayer Gaming for Smartphones" by Douglas Gantenbein, June 28, 2011 (picked up by The Mobile Indian)
- *Microsoft Research News*, "Troubleshooting Small Networks" by Janie Chang, January 29, 2010
- *Shepherd's PI*, "Why a Cloudlet Beats the Cloud for Mobile Apps" by Lewis Shepherd, December 13, 2009
- *Seattle Post Intelligencer*, "WhiteFi: Broadcasting Wireless Internet over TV Airwaves" by Nick Eaton, August 31, 2009

- *Ars Technica*, “Wi-Fi on steroids? First “WhiteFi” prototypes hit testing stage” by Nate Anderson, August 27, 2009
- *Communications of the ACM*, “IT and the World's 'Bottom Billion” by Richard Heeks, Viewpoints, Col. 52, No. 4, 2009
- *DJC Blog*, “SDF White Space Networking” DJCline.com, February 13, 2009
- *Pretoria News*, “Revisiting old technology could bring broadband to masses” by Barry Bateman, Tshwane, South Africa, October 9, 2008 (also available here: IOL Technology)
- *Microsoft PressPass*, Microsoft Patent Portfolio Tops IT Industry Scorecards Redmond, January 28, 2008
- *Broadband Wireless Exchange Magazine*, Microsoft Authorizes Cutting Edge Wi-Fi Technology Licensing by Robert Hoskins, August 2007
- *The Today Show*, “Wi-Fi Ads – Location based Ads on your Smartphone” June 29, 2007
- *The New York Times Podcast Interview*, “Cell Phone Mysteries Revealed,” June 2007
- *Voice & Data*, India, “Wireless Networking Summit 2006 - Steps to Research,” by Sonia Sharma, June 2006 Issue
- *Computer World*, “The Minds behind Microsoft Research,” by Gary Anthes, June 5, 2006
- *Information Week*, “Wireless Meshing: Microsoft is working on software to make Internet access cheaper for remote locations” by Martin J. Garvey, June 13, 2005
- *EE Times*, “Mesh Casts Wider Networks” by Rick Merritt, March 28, 2005
- *DataQuest*, “Microsoft Displays Next-Gen Computing” by Kapil Dev Singh, March 4, 2005
- *Geoplace.com*, “Indoor Location Technology Opens New Worlds” by Kris Kolodziej, June 4, 2004
- *Microsoft Web Report*, “Your Neighborhood Network” by Suzanne Ross, June 2004
- *Technology Review*, “Networking from the Rooftop,” by Erico Guizzo, August 29, 2003, (Also picked up by *MSNBC* and “*Slashdot-ed*”)
- *Microsoft Web Report*, “StudioMIT: A Digital Academic Village” by Suzanne Pierce, March 2002
- MIT iCampus, StudioMIT-Learning Communities in Design Education
- Microsoft Press Pass, “Microsoft Works with Academia, Industry and Government to Advance Technology,” March 12, 2001
- *MicroNews News Service*, “Go Wireless, Go Online at Crossroads” by Holly Longdale, February 2, 2001
- *Microsoft Web Report*, “Wherever You Go, There is Connectivity” by Suzanne Pierce, July 2000
- *The New York Times*, “Serious About Research, Microsoft Has the Time for a Game” by John Markoff, February 28, 2000
- *Sm@rt Reseller*, “Cut the Wires, Once and for All” by Chris Devoney, December 20, 1999,
- *Microsoft Enterprise*, “Infrastructure, Wireless LANs Reach New Heights” by Charles Waltner, October 1999
- *Seattle Post-Intelligencer*, “The Future is in sight at MobiCom”, August 18, 1999
- *Wired News*, “Wireless in Seattle,” by Niall McKay, August 17, 1999
- *Wired News*, “Microsoft Shows off at MobiCom,” by Niall McKay, August 17, 1999
- *IEEE Computer Magazine*, “Moving Towards Effortless Networking,” by John Callahan, November 1998

Vision Video Documents

- Leading UK Broadcasters and Technology Companies Form Consortium to Trial TV White Spaces Technology, June 27, 2011

View from:

<http://www.microsoft.com/presspass/emea/presscentre/pressreleases/June2011/CambridgeTVWhiteSpacesConsortium.aspx>

- Interview with Victor Bahl, June 8, 2011
View from <http://www.youtube.com/watch?v=T3QIRKZGxGc>
- Bahl, “*Resource-Rich Mobile Computing*”, September 12, 2010. In this video I describe our vision on how we can achieve resource rich mobile computing by marrying the powerful cloud to the ubiquitous but resource-poor mobile devices. The video explains the purpose of our academic outreach program called Project Hawaii
View from <http://research.microsoft.com/apps/video/default.aspx?id=138664>
- Bahl and Ling, *Mesh Networking Vision*, June 19, 2000. This video was first shown by Richard F. Rashid, Senior Vice President of Microsoft Research during his MobiSys 2005 keynote address. In it I present a vision of how mesh networking can bridge the digital divide in developing nations and rural neighborhoods. It also shows how technologies built for mesh networking can be applied towards managing large enterprise networks.
View from http://research.microsoft.com/~bahl/Video/Networking_Video.wmv
- Bahl, and De Vries, *Microsoft's Proposal for Initiating Discussions on Spectrum Etiquette in the 5 Ghz Band*, March 2, 2003. This video is a recording of a session in a meeting on Spectrum Policy: Property or Commons, organized by Thomas Hazest of the Manhattan Institute, and Lawrence Lessig of the Stanford Law School Center for Internet and Society. It includes a proposal I made on behalf of Microsoft on starting a dialog on spectrum etiquettes in the new emerging unlicensed bands.
View from <http://videotux.stanford.edu:8080/ramgen/cyberlaw/spectrum/spectrum-etiquette-two-proposals.rm>
- Bahl, Acero, Holland, Kneeland, Padmanabhan, and Vaidya, “*Mobile Communications Research at Microsoft*”, August 12, 1999. This video was first shown by Richard F. Rashid, Senior Vice President of Microsoft Research during his MobiCom '99 keynote address and later by MSR Program Managers as they presented Microsoft's vision for the future to audiences around the world. It contains an example of how various technologies being developed by Microsoft Research come together to solve compelling problems.
View from http://research.microsoft.com/~bahl/MS_Projects/Videos/Mobicom.mpg
- Bahl, “*Public Area Wireless Networks*,” February 15, 2000. This video was done as a pitch on why Wireless LAN hotspots make sense. It shows some of the technology being built at MSR, which makes deploying these networks in public places easy and financially lucrative.
View from: http://research.microsoft.com/~bahl/MS_Projects/Videos/Pitch.mpg

PUBLICATION RECORD

<http://research.microsoft.com/~bahl/publications.aspx>

- [1] Paramvir Bahl, Matthai Philipose, Lin Zhong, VISION: Cloud-Powered Visual Cognition for All, ACM Mobile Cloud Computing & Services Workshop (MCS), (Lake District, U.K. June 2012)
- [2] Paramvir Bahl, Richard Han, Li (Eran) Li, Mahadev Satyanarayanan, Advancing the State of Mobile Cloud Computing, ACM Mobile Cloud Computing & Services Workshop (MCS), (Lake District, U.K. June 2012)
- [3] Colin Dixon, Ratul Mahajan, Sharad Agarwal, A. J. Brush, B. Lee, Stefan Saroiu, Paramvir Bahl, Towards Commodity Smarthomes with HomeOS, *NSDI 2012*, Boston, MA (April 2012)
- [4] Daniel Halperin, Srikanth Kandula, Jitendra Padhye, Paramvir Bahl, David Wetherall, Augmenting Data Center Networks with Multi-Gigabit Wireless Links, *SIGCOMM 2011*, Toronto, Canada (August 2011)
- [5] Justin Manweiler, Sharad Agrawal, Ming Zhang, Romit Choudhury, Paramvir Bahl, SwitchBoard: A Matchmaking System for Multiplayer Mobile Games, *MobiSys 2011*, Washington. DC (June 2011)

- [6] Rohan Narayana Murty, Ranveer Chandra, Thomas Moscibroda, Paramvir Bahl, SenseLess: A Database-Driven White Spaces Network, *DySpan 2011*, Aachen, Germany (May 2011)
- [7] Abhinav Pathak, Y. Charlie Hu, Ming Zhang, Paramvir Bahl, Yi-Min Wang, Fine-Grained Power Modeling for Smartphones Using System Call Tracing, *EuroSys 2011*, Salzburg, Austria (April 2011)
- [8] Sharad Agarwal, Ratul Mahajan, Alice Zheng, Paramvir Bahl, "There's an app for that, but it doesn't work. Diagnosing Mobile Applications in the Wild.", *HotNets-IX*, Monterey, California (October 2010)
- [9] Colin Dixon, Sharad Agarwal, A. J. Brush, Bongshin Lee, Ratul Mahajan Stefan Saroiu, Paramvir Bahl, "The Home Needs an Operating System (and an App Store)", *HotNets-IX*, Monterey, California (October 2010)
- [10] Rohan Murty, Ranveer Chandra, Thomas Moscibroda, Paramvir Bahl, "Eliminating the need for low threshold spectrum sensing in white space networks", Microsoft Research Tech Report, MSR-TR-2010-127 (September 20, 2010)
- [11] Paramvir Bahl, Ranveer Chandra, Gerald DeJean, Thomas Moscibroda, "Implementation of Cognitive Networking Over White Spaces," *Book Chapter, Cognitive Networks*, Editors: Danijela Cabric and Bob Brodersen's
- [12] Junxian Huang, Qiang Xu, Birjodh Tiwana, Z. Morley Mao, Ming Zhang, Paramvir Bahl, "Anatomizing Application Performance Differences on Smartphones," ACM MobiSys 2010, San Francisco, California (June 2010)
- [13] Eduardo Cuervoy, Aruna Balasubramanian,, Dae-ki Cho, Alec Wolman, Stefan Saroiu, Ranveer Chandra, Paramvir Bahl, "MAUI: Making Smartphones Last Longer with Code Offload," *ACM MobiSys 2010*, San Francisco, California (June 2010)
- [14] Nilanjan Banerjee, Sharad Agarwal, Paramvir Bahl, Ranveer Chandra, Alec Wolman, Mark Corner, "Virtual Compass: Relative Positioning to Sense Mobile Social Interactions," *Pervasive 2010*, Helsinki, Finland (May 2010)
- [15] Mahadev Satyanarayan, Paramvir Bahl, Ramon Caceres , Nigel Davies, "The Case for VM-based Cloudlets in Mobile Computing," *IEEE Pervasive Computing* (December 2009)
- [16] Srikanth Kandula, Jitendra Padhye, Paramvir Bahl, "Flyways To De-Congest Data Center Networks," *HotNets-VIII* (October 2009)
- [17] Paramvir Bahl, Ranveer Chandra, Patrick Lee, Vishal Mishra, Jitendra Padhye, Daniel Rubenstein, Yan Yu, "Opportunistic Use of Client Repeaters to Improve Performance of WLANs," Volume 17, Number 4, pp. 1160-1171, *IEEE/ACM Transactions on Networking* (August 2009)
- [18] Paramvir Bahl, Ranveer Chandra, Thomas Moscibroda, Rohan Murty (Harvard), Matt Welsh (Harvard), "White Space Networking with Wi-Fi like Connectivity," *SIGCOMM 2009*, Barcelona, Spain (August 2009) **BEST PAPER**
- [19] Srikanth Kandula, Ratul Mahajan, Patrick Verkaik (UCSD), Sharad Agarwal, Jitendra Padhye, Paramvir Bahl, "Detailed Diagnosis in Computer Networks," *SIGCOMM 2009*, Barcelona, Spain (August 2009)
- [20] Lenin Ravindranath, Paramvir Bahl, Ranveer Chandra, David A. Maltz, Jitendra Padhye, Praveen Patel, "Change is hard: Adapting Dependency Graph Models For Unified Diagnosis in Wired/Wireless Networks," *Workshop: Research on Enterprise Networking* (Co-located with SIGCOMM 2009), Barcelona, Spain (August 2009)
- [21] Yuvraj Agarwal, Steve. Hodges, Ranveer Chandra, James Scott, Paramvir Bahl, Rajesh Gupta, "Somniloquy: Augmenting Network Interfaces to Reduce PC Energy Usage," *USENIX NSDI 2009*, Boston, Massachusetts (April 2009)

- [22] Paramvir Bahl, Ranveer Chandra, P. P. C. Lee, Vishal Misra, Jitendra Padhye, Dan Rubenstein, Yuan Yu, "Opportunistic Use of Client Repeaters to Improve Performance of WLANs," *ACM CoNext 2008*, Madrid, Spain (December 2008) **BEST PAPER**
- [23] Xu Chen, Ming Zhang, Z. Morley Mao, Paramvir Bahl, "Automating Network Application Dependency Discovery: Experiences, Limitations, and New Solutions," *OSDI 2008*, San Diego, California, USA (December 2008)
- [24] Thomas Moschibroda, Ranveer Chandra, Y. Wu, Sudipta Sengupta, Paramvir Bahl, "Load-Aware Spectrum Distribution in Wireless LANs," *ICNP 2008*, Seattle, Orlando, Florida, USA (October 2008)
- [25] Ranveer Chandra, Ratul Mahajam, Thomas Moschibroda, Ramya Raghavendra, Paramvir Bahl, "A Case for Adapting Channel Width in Wireless Networks," *SIGCOMM 2008*, Seattle, Washington, USA (August 2007)
- [26] Yuan Yuan, Paramvir Bahl, Ranveer Chandra, Thomas Moscibroda, Y. Wu, "Allocating Dynamic Time-Spectrum Blocks for Cognitive Radio Networks," *ACM MobiHoc 2007*, Montreal, Canada (September 2007)
- [27] Yuan Yuan, Paramvir Bahl, Ranveer Chandra, Thomas Moscibroda, Y. Wu, "UnChannelize the Channels in WLAN," *ACM MobiCom 2007* Poster, Montreal, Canada (September 2007)
- [28] Paramvir Bahl, Ranveer Chandra, Albert Greenberg, Srikanth Kandula, David A. Maltz, M. Zhang, Towards Highly Reliable Enterprise Network Services Via Inference of Multi-level Dependencies, *ACM SIGCOMM 2007*, Kyoto, Japan (August 2007)
- [29] Yuvraj Agarwal, Ranveer Chandra, Alec Wolman, Paramvir Bahl, K. Chin, Wireless Wakeups Revisited- Energy Management for VoIP over Wi-Fi SmartPhones, *ACM MobiSys 2007*, Puerto Rico, San Juan, (June 2007)
- [30] Srikanth Narlanka, Ranveer Chandra, Paramvir Bahl, I. Ferrell, A Hardware Platform for Utilizing TV Bands With a Wi-Fi Radio, *IEEE LANMAN 2007*, Princeton, New Jersey (June 2007)
- [31] Yuan Yuan, Paramvir Bahl, Ranveer Chandra, Phillip A. Chou, Ian Ferrell, T. Moscibroda, S. Narlanka, Y. Wu, Kognitiv Networking Over White Spaces, *IEEE DySPAN 2007*, Dublin, Ireland (April 2007)
- [32] Vladimir Brik, A. Mishra, Suman Banerjee, Paramvir Bahl, "Towards an Architecture for Efficient Spectrum Slicing," *ACM HotMobile 2007*, Tucson, Arizona, (February 2007)
- [33] Paramvir Bahl, M.T. Hajiaghayi, Kamal Jain, V. Mirrokni, Lili Qiu, A. Seberi, "Cell Breathing in Wireless LANs: Algorithms and Evaluation," *IEEE Transactions on Mobile Computing*, Volume 6, Issue 2, Page(s):164 - 178 (February 2007)
- [34] Vladamir Brik, A. Mishra, Suman Banerjee, Paramvir Bahl, "Towards an Architecture for Efficient Spectrum Slicing", *ACM HotMobile 2007*, Tucson, Arizona, (February 2007)
- [35] Paramvir Bahl, Mohammad T. Hajiaghayi, Kamal Jain, Sayyed Vahab Mirrokni, Lili Qiu, Amin Saberi, "Cell Breathing in Wireless LANs: Algorithms and Evaluation", *IEEE Transactions on Mobile Computing* Vol. 6, No.2 (February 2007)
- [36] Paramvir Bahl, Paul Barham, Richard Black, Ranveer Chandra, M. Goldszmidt, Rebecca Isaacs, Srikanth Kandula, Lun Li, J. MacCormick, David A. Maltz, Richard Mortier, M. Wawrzoniak, Ming Zhang, "Discovering Dependencies for Network Management", *HotNets-V* (November 2006)
- [37] Lili Qiu, Paramvir Bahl, Ananth Rao, Lidong. Zhou, "Troubleshooting Wireless Mesh Networks", *Computer Communications Review*, (October 2006)
- [38] Jakob Eriksson, Sharad Agarwal, Paramvir Bahl, Jitendra Padhye, "Feasibility Study of Mesh Networks for All-Wireless Offices", *ACM/USENIX MobiSys*, Uppsala, Sweden (June 2006)

- [39] Paramvir Bahl, Ranveer Chandra, Jitendra Padhye, Lenin Ravindranath, Manpreet Singh, Alec Wolman, Brian Zill, "Enhancing the Security of Corporate Wi-Fi Networks Using DAIR", *ACM/USENIX MobiSys*, Uppsala, Sweden (June 2006)
- [40] Paramvir Bahl, Jitendra Padhye, L. Ravindranath, M. Singh, A. Wolman, B. Zill, "DAIR: A Framework for Troubleshooting Enterprise Wireless Networks Using Desktop Infrastructure", *ACM HotNets-IV*, College Park, Maryland, USA (November 2005)
- [41] Vladimir Brik, E. Rozner, Suman Banerjee, Paramvir Bahl, "DSAP: A Protocol for Coordinated Spectrum Access", *IEEE Dynamic Spectrum Access Networks* (DySPAN), Baltimore, Maryland, USA (November 2005)
- [42] Pradeep Kyasanur, Jitendra Padhye, Paramvir Bahl, "On the Efficacy of Separating Control and Data into Different Frequency Bands", *IEEE Conference on Broadband Networks 2005*, Boston, Massachusetts, USA (October 2005)
- [43] Li Li, Joel Y. Halpern, Paramvir Bahl, Yi-Min Wang, Roger Wattenhofer, "A Cone-Based Distributed Topology-Control Algorithm for Wireless Multi-Hop Networks", *IEEE/ACM Transactions on Networking* (February 2005)
- [44] Anand Balachandran, Geoff M. Voelker, Paramvir Bahl, "Wireless Hotspots: Current Challenges and Future Directions", *Mobile Networks and Applications Journal*, Springer Science Publishers, pp. 265-274, 2005
- [45] Nitin Vaidya, Anurag Dugar, Seema Gupta, Paramvir. Bahl, "Distributed Fair Scheduling in a Wireless LAN," *IEEE Transactions on Mobile Computing*, Volume 4, Issue 6, Page(s):616 - 629 (December 2005)
- [46] Atul Adya, Paramvir Bahl, Lili. Qiu, "Characterizing Web Workload for Mobile Clients," Book Chapter in *Content Networking in the Mobile Internet* John Wiley & Sons. ISBN 0-471-46618-2, 2004
- [47] Paramvir Bahl, Atul Adya, Jitendra Padhye, Alec Wolman, "Reconsidering Wireless Systems with Multiple Radios," *ACM SIGCOMM Computer Communications Review*, Volume 34, Number 5 (October 2004)
- [48] Atul Adya, Paramvir Bahl, Jitendra Padhye, Alec Wolman, Lidong. Zhou, "A Multi-Radio Unification Protocol for IEEE 802.11 Wireless Networks," *IEEE Conference on Broadband Networks 2004*, San Jose, California, USA (October 2004)
- [49] Paramvir Bahl, Ranveer Chandra, John Dunagan, "SSCH: Slotted Seeded Channel Hopping for Capacity Improvement in IEEE 802.11 Ad-Hoc Wireless Networks," *Proceedings of ACM MobiCom*, Philadelphia, PA, (September 2004)
- [50] Atul Adya, Paramvir Bahl, Ranveer Chandra, Lili. Qiu, "Architecture and Techniques for Diagnosing Faults in IEEE 802.11 Infrastructure Networks," *Proceedings of ACM MobiCom 2004*, Philadelphia, PA, USA (September 2004)
- [51] Ranveer Chandra, Paramvir Bahl, Pradeep Bahl, "MultiNet: Connecting to Multiple IEEE 802.11 Networks Using a Single Wireless Card," *Proceedings of IEEE INFOCOM 2004*, Hong Kong (March 2004)
- [52] Eugene Shih, Paramvir Bahl, and Michael Sinclair, "Wake on Wireless: An Event Driven Energy Saving Strategy for Battery Operated Devices", *Proceedings of ACM MobiCom 2002*, Atlanta, GA (September 2002)
- [53] Anand Balachandran, Paramvir Bahl, and Geoff Voelker, "Hot-Spot Congestion Relief and Service Guarantees in Public-Area Wireless Networks", *Proceedings of WMCSA 2002*, Callicoon, New York (June 2002)

- [54] Atul Adya, Paramvir Bahl, and Lili Qiu, "Mobile Web Workload Characterization", Chapter in an upcoming book on *Content Delivery in the Mobile Internet*
- [55] Anand Balachandran, Geoff. M. Voelker, and Paramvir Bahl, "Wireless Hotspots: Current Challenges and Future Directions," *Proceedings of the First ACM Workshop on Wireless Mobile Applications and Services on WLAN Hotspots*, San Diego (September 2003)
- [56] Anand Balachandran, Geoff Voelker, Paramvir Bahl, and Venkat Rangan, "Characterizing User Behavior and Network Performance in a Public Wireless LAN", *Proceedings of ACM SIGMETRICS 2002*, Marina Del Rey, California (June 2002)
- [57] Atul Adya, Paramvir Bahl, and Lili Qiu, "Characterizing and Analyzing Alert and Browse Services of Mobile Clients", *Proceedings of 2002 USENIX Annual Technical Conference*, Monterey, California, (June 2002)
- [58] Li Li, Joseph, Y. Halpern, Paramvir Bahl, Yi Ming Wang, and Roger Wattenhofer, "Analysis of a Cone-based Distributed Topology Control Algorithm for Wireless Multi-hop Networks", *ACM/IEEE Transactions on Networking*
- [59] Lili Qiu, Paramvir Bahl, and Atul Adya, "The Effect of Wireless First-Hop Bandwidth Allocation on End-to-End Network Performance", *Proceedings of NOSSDAV 2002*, Miami Beach, Florida (May 2002)
- [60] Paramvir Bahl, Anand Balachandran, Allen Miu, Wilf Russell, Geoff Voelker and Yi-Min Wang, "PAWNs: Satisfying the need for Ubiquitous Connectivity and Location Services," *IEEE Personal Communications* (now *IEEE Wireless Communications*), Vol. 6, (November 2001)
- [61] Atul Adya, Paramvir Bahl, and Lili Qiu, "Understanding the Browse Patterns of Mobile Clients," *Proceedings of the SIGCOMM Internet Measurement Workshop: IMW 2001*, San Francisco, CA (November 2001)
- [62] Anurag Dugar, Nitin H. Vaidya, and Paramvir Bahl, "Priority and Fair Scheduling in a Wireless LAN," *Proceedings of the IEEE Conference on Military Communications: MILCOM 2001*, McLean, VA (October 28-31, 2001)
- [63] Li Li, Joseph Y. Halpern, Paramvir Bahl, Yi-Min Wang, and Roger Wattenhofer, "Analysis of Distributed Topology Control Algorithms for Wireless Multi-hop Networks," *Proceedings of the ACM Symposium on Principles of Distributed Computing: PODC 2001* (August 26-29, 2001)
- [64] Gavin Holland, Nitin H. Vaidya and Paramvir Bahl, "A Rate-Adaptive MAC Protocol for Wireless Networks," *Proceedings of the ACM International Conference on Mobile Computing and Networking: MobiCom 2001*, Rome, Italy, USA (July 16-21, 2001)
- [65] Yi-Min Wang, Paramvir Bahl, and Wilf Russell, The SIMBA User Alert Service Architecture for Dependable Alert Delivery, *Proceedings of the International Conference on Dependable Systems and Networks: DSN 2001*, Göteborg, Sweden (June 30 – July 4, 2001)
- [66] Paramvir Bahl, Anand Balachandran, and Srinivasan Venkatchary, Secure Wireless Internet Access in Public Places, *Proceedings of the IEEE Conference on Communications: ICC 2001*, Helsinki, Finland (June 11-14, 2001)
- [67] Roger Wattenhofer, Li Li, Paramvir Bahl, Yi-Min Wang, "Distributed Topology Control for Wireless Multihop Ad-hoc Networks," *Proceedings of IEEE INFOCOM 2001*, Fairbanks, Alaska, USA (April 22-26, 2001)
- [68] Allen Miu and Paramvir Bahl, "Dynamic Host Configuration for Managing Mobility between Public and Private Networks," *Proceedings of the 3rd Usenix Internet Technical Symposium: USITS '01*, San Francisco, California, USA (March 26-28, 2001)

- [69] Jim Lansford and Paramvir Bahl, "The Design and Implementation of HomeRF: A Radio-Frequency Wireless Networking Standard for the Connected Home," *Proceedings of the IEEE*, Vol. 88, No. 10 (October 2000): 1662-1676
- [70] Paramvir Bahl, "Wireless is not Ethernet," *Proceedings of the OpenSIG 2000*, Napa Valley, California, USA (October 11-12, 2000)
- [71] Nitin H. Vaidya, Paramvir Bahl, and Seema Gupta, "Distributed Fair Scheduling in a Wireless LAN," *Proceedings of the ACM International Conference on Mobile Computing and Networking: MobiCom 2000*, Boston, Massachusetts, USA (August 6-11, 2000)
- [72] Paramvir Bahl and Venkata N. Padmanabhan, "RADAR: An In-Building RF-Based User Location and Tracking System," *Proceedings of IEEE INFOCOM 2000*, Vol. 2, Tel-Aviv, Israel (March 26-30, 2000)
- [73] Paramvir Bahl, "A Report on the IEEE Wireless Standardization Activities," *ACM Mobile Computing and Communications Review*, Vol. 4, No. 1 (January 2000)
- [74] Paramvir Bahl, and Venkata Padmanabhan, "Location Aware Services in an In-building Environment," *Proceedings of the IEEE Wireless Communications and Networking Conference*, New Orleans, LA, USA (September 23-28, 1999)
- [75] Paramvir Bahl, "Networking the Home - Wireless Technologies and Protocols," 36th Design Automation Conference, New Orleans, LA, USA (Invited paper) (June 21-25, 1999)
- [76] Paramvir Bahl, "ARMAP - An Energy Conserving Protocol for Wireless Multimedia Communications," *Proceedings of the IEEE International Symposium on Personal, Indoor and Mobile Radio Communications*, Boston, Massachusetts, USA (September 1998)
- [77] Tong Liu, Paramvir Bahl, and Imrich Chlamtac, "Mobility Modeling, Location Tracking, and Trajectory Prediction in Wireless Networks," *IEEE Journal on Special Areas in Communications*, special issue on Wireless Access Broadband Networks, Vol. 16, No. 6, (August 1998): 922-936
- [78] Jason Redi and Paramvir Bahl, "Mobile IP: A Solution for Transparent Seamless Mobile Computer Communications," Fuji-Keizai's Report on upcoming trends in Mobile Computing and Communications, (July 1998)
- [79] Paramvir Bahl, "Supporting Digital Video in a Managed Wireless Network," *IEEE Communications Magazine*, special issue on Wireless Video, Vol. 36, No. 6, (June 1998): 94-102
- [80] Paramvir Bahl, Imrich Chlamtac, and Andras Farago, "Resource Assignment for Integrated Services in Wireless Networks," *International Journal of Communication Systems*, Special issue on Personal Communication Systems, John Wiley, (April 1998):29-41 (Invited Paper)
- [81] Tong Liu, Paramvir Bahl, and Imrich Chlamtac, "A Hierarchical Position-Prediction Algorithm for Efficient Management of Resources in Cellular Networks," *Proceedings of the IEEE GLOBECOM '97*, Phoenix, Arizona, USA (November 1997)
- [82] Paramvir Bahl, Tong Liu, and Imrich Chlamtac, "Aggressive Handoff Management in Third Generation Integrated Cellular Networks," *Proceedings of the International Symposium on Voice, Video and Data Communications*, Dallas, Texas, USA (November 1997)
- [83] Paramvir Bahl and Wei Hsu, "Adaptive Region Based, Multi-Scale, Motion Compensated Video Coding for Error Prone Communication Channels," *Proceedings of Multimedia Networks and Applications, SPIE's International Symposium on Voice, Video & Data Communications* (November 1997)
- [84] Tong Liu, Paramvir Bahl, and Imrich Chlamtac, "An Optimal Self Learning Estimator for Predicting Inter-Cell User Trajectory in Wireless Radio Networks," *Proceedings of the International Conference on Universal Personal Communications '97*, San Diego, California, USA (November 1997): 438-442

- [85] Paramvir Bahl, and Imrich Chlamtac, "H.263 Based Video Codec for Real-Time Visual Communications over Wireless Radio Networks," *Proceedings of the International Conference on Universal Personal Communications '97*, San Diego, California, USA (November 1997): 773-779
- [86] Paramvir Bahl, Imrich Chlamtac, and Andras Farago, "Optimizing Resource Utilization in Wireless Multimedia Networks, in the *IEEE Conference on Communications '97*, Montreal, Canada, (June 1997)
- [87] Paramvir Bahl, "Bandwidth Allocation in Wireless Networks for Multiresolution VBR Video Traffic," in the *11th Annual IEEE Computer Communications Workshop*, Reston, Virginia, USA (September 1996)
- [88] Paramvir Bahl, "Strategies for Transmitting Compressed Video Over Error-Prone Radio Channels," in the *3rd International Workshop on Mobile Multimedia Communications*, Princeton, New Jersey, (September 1996)
- [89] Paramvir Bahl, "The J300 Family of Audio and Video Adapters -- Software Architecture," *Digital Technical Journal*, Vol. 7, No. 4, (March 1996): 40-50
- [90] Paramvir Bahl, Paul Gauthier, Robert Ulichney, "Software-Only Compression, Rendering, and Playback of Digital Video," *Digital Technical Journal*, Vol. 7, No. 4, (March 1996): 20-30
- [91] Amlan Kundu, Paramvir Bahl and Yonguang Yang, "Recognition of Handwritten Word: First and Second Order Hidden Markov Model Based Approach," *Journal of the Pattern Recognition Society*, Pergamon Press, Vol. 22, No. 3, (1989): 283-297
- [92] Amlan Kundu, and Paramvir Bahl, "Recognition of Conic Shapes: A Non-Linear Iterative Approach," in the *Proceedings of the IEEE 9th International Conference on Pattern Recognition*, Vol. 2, (1988):795-797
- [93] Amlan Kundu, and Paramvir Bahl, "Recognition of Handwritten Script: A Hidden Markov Model Based Approach," in the *Proceedings of International Conference on Acoustic Speech and Signal Processing*, (1988): 928-931
- [94] Paramvir Bahl, and Amlan Kundu, "Recognition of Handwritten Word: First and Second Order Hidden Markov Model Based Approach," in the *Proceedings of IEEE Conference on Computer Vision and Pattern Recognition*, (1988): 457-462
- [95] Nilanjan Banerjee, Sharad Agarwal, Paramvir Bahl, Ranveer Chandra, A. Wolman, M. Corner Virtual Compass: relative positioning to sense mobile social interactions, Microsoft Technical Report, MSR-TR-2010-5, January 2010
- [96] Paramvir Bahl, Ranveer Chandra, Patrick Lee, Vishal Misra, Jitender Padhye, Daniel Rubenstein, Y. Yu, Opportunistic Use of Client Repeaters to Improve Performance of WLANs Microsoft Technical Report, MSR-TR-2008-149 (October 2008)
- [97] Yuvraj Agarwal, Steve Hodges, James Scott, Ranveer Chandra, Paramvir Bahl, Somniloquy: Maintaining Network Connectivity While Your Computer Sleeps Microsoft Technical Report, MSR-TR-2008-42 (March 2008)
- [98] Paramvir Bahl, Ranveer Chandra, David A. Maltz; Praveen Patel; Jitender Padhye, Towards Unified Management of Networked Services in Wired and Wireless Networks Microsoft Technical Report, MSR-TR-2008-148 (October 2008)
- [99] Lili Qiu, Paramvir Bahl, Anath Rao, Lidong. Zhou, Fault Detection, Isolation, and Diagnosis in Multi-hop Wireless Networks, Microsoft Technical Report, MSR-TR-2004-11 (December 2003)
- [100] Paramvir Bahl, Pradeep Bahl, and Ranveer Chandra, "MultiNet: Enabling Simultaneous Connections to Multiple Wireless Networks Using a Single Radio," Microsoft Tech Report, MSR-TR-2003-46 (June 2003)

- [101] Atul Adya, Paramvir Bahl, Jitendra Padhye, Alec Wolman, and Lidong Zhou, "A Multi-Radio Unification Protocol for IEEE 802.11 Wireless Networks", Microsoft Technical Report, MSR-TR-2003-41 (June 2003)
- [102] Paramvir Bahl, Atul Adya, Jitendra Padhye, and Alec Wolman, "Reconsidering the Wireless LAN Platform with Multiple Radios," Microsoft Technical Report, MSR-TR-2003-45 (June 2003)
- [103] Paramvir Bahl, and Amer Hassan, Draft Proposal for Comment: Etiquette Rules and Procedures for Unlicensed Bands, Proposal to the Industry and the FCC (January 27, 2003)
- [104] Atul Adya and Paramvir Bahl, "Analysis and Characterization of Browse and Alert Services for Mobile Clients Using a Popular Web Server," *Microsoft Research Technical Report MSR-TR-2001-55* (January 2001)
- [105] Yi-Min Wang, Paramvir Bahl, and W. Russell, "The SIMBA User Alert Service Architecture for Dependable Alert Delivery," *Microsoft Research Technical Report MSR-TR-2000-117* (December 2000)
- [106] Allen Miu and Paramvir Bahl, "The CHOICE Network - Dynamic Host Configuration for Managing Mobility between Public and Private Networks," *Microsoft Research Technical Report: MSR-TR-2000-85* (August 2000)
- [107] Gavin Holland, Nitin H. Vaidya, and Paramvir Bahl, "A Rate-Adaptive MAC Protocol for Wireless Networks," *Texas A&M University, Computer Science Dept. Technical Report: 00-019* (August 2000)
- [108] Paramvir Bahl, Li Li, Roger Wattenhofer, and Yi-Min Wang, "Distributed Topology Control in wireless Sensor Networks," *Microsoft Research Technical Report: MSR-TR-2000-78* (August 2000)
- [109] Gavin Holland and Paramvir Bahl, "Enhancing the Windows Network Device Interface Specification for Wireless Networking," *Microsoft Research Technical Report: MSR-TR-2000-84* (July 2000)
- [110] Paramvir Bahl, Venkata. N. Padmanabhan, and A. Balachandran, "Enhancements to the RADAR User Location and Tracking System," *Microsoft Research Technical Report: MSR-TR-00-12* (February 2000)
- [111] Paramvir Bahl, Srinivasan Venkatchary, Anand Balachandran, "The CHOICE Network - Broadband Wireless Internet Access in Public Spaces," MSR-TR-2000-21. (Feb. 2000)
- [112] Nitin H. Vaidya and Paramvir Bahl, Fair Scheduling in Broadcast Environment, *Microsoft Research Technical Report: MSR-TR-99-62* (August 1999)
- [113] Paramvir Bahl and Venkata N. Padmanabhan, "User Location and Tracking in an In-Building Radio Network," *Microsoft Research Technical Report: MSR-TR-99-12* (February 1999)
- [114] Paramvir Bahl, "A Novel Approach to Bandwidth Partitioning in Wireless ATM Networks," University of Massachusetts, Electrical & Computer Systems Engineering Department Technical Report, TR-96-CSE-10 (1996)
- [115] Paramvir Bahl, "Influence of Available Bandwidth on the Statistical Characterization of Compressed Video," University of Massachusetts, Electrical & Computer Systems Engineering Department Technical Report, TR-96-CSE-7 (February 1996)
- [116] Imrich Chlamtac, Paramvir Bahl, Jim Llinas, and Allan Herman, "A Scaleable All-Optical Network for Data Fusion," U.S. Dept. of Defense Focused Research Initiative Technical Report (September 1994)
- [117] Paramvir Bahl, "Real Time Visual Communications over Narrowband Wireless Networks," Ph.D. Thesis, University of Massachusetts, Amherst, MA, 1997

[118] Paramvir Bahl, "Recognition of Handwritten Script: A Hidden Markov Model Approach," M.S. Thesis, State University of New York, Buffalo, NY, 1987

PROFESSIONAL SERVICE

<http://research.microsoft.com/~bahl/prof.html>

Founder/Co-Founder

ACM Special Interest Group on Mobility of Systems, Users, Data, and Computing (SIGMOBILE) (1997) URL: <http://www.acm.org/sigmobile>

- First Elected Chair (July 2001 – June 2005)
- Vice Chair (June 1997 – June 2001)
- Executive Committee Member (June 1997 – present)

ACM Mobile Computing and Communications Review (1996 - 2001)

URL: <http://www.sigmobile.org/MC2R>

- Senior Advisor (2001 - present)
- Editor-in-Chief (1996 - 2001)

ACM/USENIX International Conference on Mobile Systems, Applications and Services (MobiSys)

URL: <http://www.sigmobile.org/mobisys>

- Steering Committee Chair (March 2002 – present)

ACM Workshop on Mobile Cloud Computing & Services (MCS)

- Steering Committee Chair (2009 – present)

Steering Committees

- ACM Conf. on Mobile Computing & Networking (MobiCom) (since 1995) [founding member]
- ACM Conf. on Embedded Networked Sensor Systems (SenSys) (2002-06) [founding member]
- IEEE Dynamic Spectrum Access Networks (DySPAN) (2005 - present) [founding member]
- ACM Mobile HandHeld (MobiHeld) (2009 - present) [founding member]
- ACM/USENIX International Conference on Mobile Systems, Applications and Services (MobiSys)
- IEEE Technical Committee on Wearable Information Systems (2002 – present)
- IEEE International Symposium on Wireless Communication Systems (2006 – present)
- IEEE Communication System Software and Middleware/ COMSNET (2005 – present)
- IEEE Wireless Conference Board Member, IEEE Communications Society (1999 - 2001)

Selection Committees

- IEEE Pervasive Computing Search Committee for Editor-in-Chief (2009)
- IEEE Computer Society Fellows Evaluation Committee (2008, 2010, 2011)
- ACM Mobile Computing and Communications Review Committee (2001, 2003, 2005, 2007, 2010)

IEEE Distinguished Lecturer 2008-2010

ACM Distinguished Speaker 2007-2010

Journal Editorial Boards

- Editorial Board Member, NoW's Foundations and Trends in Networking (2004 –2009)
- Editorial Board Member, IEEE Journal on Selected Areas in Communications - Wireless Communications Series (1998–2000)

- Editorial Board Member, Kluwer's Telecommunications Systems: Modeling, Analysis, Design and Management (2001-06)
- Editorial Board Member, Elsevier's Adhoc Networks Journal (2002-05)
- Editorial Board Member, ACM/URSI Wireless Networks Journal (1998-2003)
- Senior Advisor, ACM Mobile Computing and Communications Review (2002 to present)
- Editor-in-Chief, ACM Mobile Computing and Communications Review (1996-2001)
- Special issue on Advances in Cognitive Radio Networking and Communications, IEEE Journal on Selected Topics in Communications, Co-edited with Ying-Chang Liang (Infocomm Research), Kwang-Cheng Chen (National Taiwan University), Ye Li (Georgia Tech) and Petri Mähönen (RWTH Aachen)
- Special issue on Multimedia Network Radios, IEEE Journal on Selected Topics in Communications, Vol. 17, No.5, (May 1999); Co-edited with Ender Ayanoglu (Bell Labs), Roger Cheng (Hong Kong University), Ramesh Rao (UCSD) and Michele Zorzi (UCSD)
- Special issue on Wireless Video, IEEE Communications Magazine, Vol. 36, No. 6, (June 1998); Co-edited with Bern Girod (Stanford University)
- Special issue on Mobile Multimedia Communications, *ACM Mobile Networking and Applications Journal*, Vol. 3, No. 1 (June 1998); Issue co-edited with Hamid Aghvami (King's College, U.K.) and Fumio Watanabe (KDD, Japan)

Conference Executive Committees

- General Chair, IEEE Dynamic Spectrum Access Networks Conference 2012, Bellevue, Washington, April 2012
- General Co-Chair, ACM SIGCOMM Conference 2008, Seattle, Washington, August 17-22, 2008
- General Chair, IEEE International Symposium on Wireless Communication Systems (ISWCS) 2007, Trondheim, Norway, October 17-19, 2007
- General Co-Chair, IEEE Communication System Software and Middleware (COMSWARE) 2007, New Delhi, India, January 8-12, 2006
- Program Co-Chair (with Hannes Hartenstein, Universität Karlsruhe) ACM Workshop on Vehicular Ad Hoc Networking (VANET), September 29, 2006
- Program Co-Chair (with Tom Martin, Virginia Tech.), IEEE International Symposium on Wearable Computers, ETH Zurich, October 8-9, 2001
- Program Co-Chair (with Adam Wolisz, Technical University of Berlin), IEEE International Symposium on a World of Wireless Mobile and Multimedia Networks, Rome, Italy, July 21, 2001
- Advisory Board, IEEE International Conference on Wireless LANs and Home Networks (ICWLNH 2001), Singapore, December 5-7, 2001
- General Vice Chair, ACM/IEEE International Conference on Mobile Computing and Networking (MobiCom '99), Seattle, Washington, USA, August 15-20, 1999

Collaborator & Technical Advisory Board

- National Science Foundation, Network Science and Engineering (NetSE) Program "*Large Urban-Scale Polymorphic Wireless Networks: Community-Driven Assessment, Design, and Access*" Rice University, (PIs: Knightly, Reed, Stein and Zhong, July 2010)
- National Science Foundation, Networking Technology and Systems (NeTS) Program, "*From Sensing to Sharing across White Space Networks*, University of Texas Austin (PI: Lili Qiu) December 2009
- Department of Education Science and Training, International Science Linkages project, "*Next Generation Municipal Mesh Network Technologies for Rural and Regional Broadband Provision and Community Development*," University of Sidney (PI: Robert Steele), June 2006

- National Science Foundation, Funding for “*WHYNET: Scalable Testbed for Next Generation Mobile Wireless Networking Technologies*”, University of California Los Angeles (PI: Rajive Bagrodia), October 2004

Tutorials

- *White Space Networking - Past, Present & Future*, Illinois Wireless Summer School, Illinois Center for Wireless Systems, Urbana, Illinois, August 4, 2009
- *Special Topics in Wireless System Design*, Microsoft Research India Summer School on Networking, Bangalore, India, June 15-17, 2009
- *A Crash Course in Wireless Mesh Networks*, IEEE GLOBECOM 2008, Washington DC, November 26, 2007
- *A Crash Course in Wireless Mesh Networks*, IEEE INFOCOMM 2007, Anchorage, Alaska, May 6, 2007
- *Wireless Mesh Networks: From Theory to Deployed Systems*, ACM SIGCOMM 2006, Pisa, Italy, September 11, 2006

Conference Program Committees (Incomplete List)

- ACM Annual International Conference on Mobile Computing and Networking: MobiCom (Served on the program committee for over fifteen years - every year since 1996)
- ACM International Workshop on Vehicular Inter-NETworking (VANET) (2006,07,08-09)
- International Conference on Cognitive Radio Oriented Wireless Networks and Communications, Orlando, Florida, July 31- August 3, 2007
- IEEE Workshop on Local and Metropolitan Area Networks (LANMAN) 2007, June 10-13, 2007
- IEEE International Conference on Distributed Computing Systems (ICDCS) 2007, Toronto, Canada, June 25-29, 2007
- ACM Fourth Annual International Conference on Mobile Systems, Applications, and Services: MobiSys 2006, Uppsala, Sweden, June 19–22, 2006
- Thirteenth International World Wide Web Conference: WWW 2004, New York, USA, May 17-22, 2004
- IEEE Third International Symposium on Information Processing in Sensor Networks: IPSN 2004, Berkeley, California, USA, April 27-28, 2004
- IEEE International Symposium on Personal, Indoor & Mobile Radio Communications: PIMRC 2003, Beijing, China, September 7-10, 2003
- IEEE Second International Symposium on Information Processing in Sensor Networks: IPSN 2003, Palo Alto Research Center, California, USA, April 22-23, 2003
- IEEE International Symposium on Wearable Computers: ISWC 2002, Seattle, Washington, USA October 7-10, 2002
- ACM Workshop on Wireless Sensor Networks and Applications: WSNA 2003, Atlanta, Georgia, USA, September 28, 2002
- IEEE International Symposium on Personal, Indoor & Mobile Radio Communications: PIMRC 2002, Lisboa, Portugal, September 15-18, 2002
- IEEE Hot Interconnect 10, Stanford University, Palo Alto, California, USA, August 21-23, 2002
- IEEE Networking 2002, Pisa, Italy, May 19-24, 2002
- IEEE International Symposium on Wearable Computers, Zurich, Switzerland, October 4-5, 2001
- IEEE Workshop on Wireless Local Area Networks, Massachusetts, USA, Sept. 27-28, 2001

- IEEE Symposium on Wireless Mobile Multimedia: ACM WoWMoM 2001, Rome, Italy, USA, July 21, 2001
- IEEE International Conference on Distributed Computing Systems: ICDCS-21, Phoenix (Mesa), Arizona, USA, April 16-19, 2001
- IEEE Third Workshop on Mobile Computing Systems and Applications: WMCSA 2000, Monterey, California, USA, December 7-8, 2000
- IEEE, International Symposium on Personal, Indoor & Mobile Radio Communications: PIMRC 2000, London, U.K, September 18-21, 2000
- IEEE Workshop on Research issues in Data Engineering: RIDE 2000, San Diego, California, USA, February 28-29, 2000
- IEEE Sixth International Workshop on Mobile Multimedia Communications: MoMuC 99, San Diego, California, USA, November 15-17, 1999
- IEEE International Symposium on Personal, Indoor & Mobile Radio Communications: PIMRC 1999, Osaka, Japan, September 12-15, 1999
- IEEE International Conference on Distributed Computing Systems: ICDCS-20, Taipei, Taiwan, April 10-13, 2000
- International Workshop on Mobile Multimedia Communications: MoMuC 1999, Berlin, Germany, USA, October 12-14, 1999
- IEEE International Conference on Computer Communications: INFOCOM 1998, San Francisco, USA (March 29-April 2, 1998
- IEEE International Symposium on Personal, Indoor & Mobile Radio Communications: PIMRC 1998, Boston, Massachusetts, USA, September 8-11, 1998
- Workshop on Multiaccess, Mobility and Teletraffic for Wireless Communications: MMT 1998, Washington D.C, USA, October 21-23, 1998
- IEEE Fifth International Workshop on Mobile Multimedia Communications: MoMuC 1998, Berlin, Germany, October 12-14, 1998
- IEEE Conference on Computer Communications: INFOCOM, Kobe, Japan, April 7-11, 1997
- IEEE International Conference on Computer Communications: INFOCOM 1996, San Francisco, California, USA, March 24-28, 1996

Research Mindswap Events

Since 2004, I have organized annual networking summits at Microsoft for researchers from academia, industry and government institutes. These highly focused events generally include 50-70 participants from all over the world. Our discussions and presentations are video-taped and made available to the research community at large.

- MOBILE + CLOUD 2010, Bellevue, Washington, USA (June 2-3, 2010)
- COGNITIVE NETWORKING 2008, Snoqualmie, Washington, USA (June 5-6, 2008)
- LIFE AT THE EDGE 2006, Snoqualmie, Washington, USA (June 1-2, 2006)
- WIRELESS NETWORKING 2006, Goa, India (April 7-8, 2006)
- SELF-MANAGING NETWORKS 2005, Kirkland, Washington, USA (June 1-2, 2005)
- MESH NETWORKING 2004, Snoqualmie, Washington, USA (June 23-24, 2004)

Members of my group organized summits on High Speed TCP in 2007 and Home Networking in 2009

UNITED STATES PATENTS

<http://research.microsoft.com/~bahl/patents.aspx>

In addition to the issued patents listed below, 52 additional applications are pending

- [1] U. S. PATENT NUMBER 8,050,212: Opportunistic use of wireless network stations as repeaters (Granted: November 1, 2011)
- [2] U. S. PATENT NUMBER 8,041,815: Systems and methods for managing network connectivity for mobile users (Granted: October 18, 2011)
- [3] U. S. PATENT NUMBER 8,015,139: Inferring candidates that are potentially responsible for user-perceptible network problems (Granted: September 6, 2011)
- [4] U. S. PATENT NUMBER 8,000,698: Detection and management of rogue wireless network connections (Granted: August 16, 2011)
- [5] U. S. PATENT NUMBER 7,974,226: Separating control and data in wireless networks (Granted: July 5, 2011)
- [6] U. S. PATENT NUMBER 7,876,786: Dynamic time-spectrum block allocation for cognitive radio networks (Granted: January 25, 2011)
- [7] U. S. PATENT NUMBER 7,778,170: Spectrum and medium access allocation for fairness (Granted: August 17, 2010)
- [8] U. S. PATENT NUMBER 7,760,654: Using a connected wireless computer as a conduit for a disconnected wireless computer (Granted: June 20, 2010)
- [9] U. S. PATENT NUMBER 7,720,045: Method to enable simultaneous connections to multiple wireless networks using a single radio (Granted: May 18, 2010)
- [10] U. S. PATENT NUMBER 7,715,353: Wireless LAN cell breathing (Granted: May 11, 2010)
- [11] U. S. PATENT NUMBER 7,668,513: Platform for enterprise wireless network management applications (Granted: February 23, 2010)
- [12] U. S. PATENT NUMBER 7,665,126: Mesh networks with exclusion capability (Granted: February 16, 2010)
- [13] U. S. PATENT NUMBER 7,664,054: Neighbor location discovery with directional antennas in a mesh network (Granted: February 16, 2010)
- [14] U. S. PATENT NUMBER 7,640,460: Detect user-perceived faults using packet traces in enterprise networks (Granted: December 29, 2009)
- [15] U. S. PATENT NUMBER 7,613,138: Separating control and data in wireless networks (Granted: November 3, 2009)
- [16] U. S. PATENT NUMBER 7,613,105: Removing data inconsistencies for a network simulation (Granted: November 3, 2009)
- [17] U. S. PATENT NUMBER 7,610,057: Selecting a wireless networking technology on a device capable of carrying out wireless network communications via multiple wireless technologies (Granted: October 27, 2009)
- [18] U. S. PATENT NUMBER 7,606,165: What-if analysis for network diagnostics (Granted: October 20, 2009)
- [19] U. S. PATENT NUMBER 7,603,460: Detecting and diagnosing performance problems in a wireless network through neighbor collaboration (Granted: October 13, 2009)

- [20] U. S. PATENT NUMBER 7,590,720: Systems and methods for locating geographical regions of mobile computer users (Granted: September 15, 2009)
- [21] U. S. PATENT NUMBER 7,583,587: Fault detection and diagnosis (Granted: September 1, 2009)
- [22] U. S. PATENT NUMBER 7,580,995: Systems and methods for locating mobile computer users in a wireless network (Granted: August 25, 2009)
- [23] U. S. PATENT NUMBER 7,558,851: Locating a mobile computing unit (Granted: July 7, 2009)
- [24] U. S. PATENT NUMBER 7,552,349: User configurable power conservation through LCD display screen reduction (Granted: June 23, 2009)
- [25] U. S. PATENT NUMBER 7,548,976: Methods and systems for providing variable rates of service for accessing networks (Granted: June 16, 2009)
- [26] U. S. PATENT NUMBER 7,539,508: Reducing idle power consumption in a networked battery operated device (Granted: May 26, 2009)
- [27] U. S. PATENT NUMBER,522,551: Method and apparatus for wireless routing on a plurality of different wireless channels (Granted: April 21, 2009)
- [28] U. S. PATENT NUMBER 7,516,049: Wireless performance analysis system (Granted: April 7, 2009)
- [29] U. S. PATENT NUMBER 7,500,263: Methods and systems for accessing networks, methods and systems for accessing the Internet (Granted: March 3, 2009)
- [30] U. S. PATENT NUMBER 7,489,645: Mesh networks with end device recognition (Granted: February 10, 2009)
- [31] U. S. PATENT NUMBER 7,444,669: Methods and systems for providing variable rates of service for accessing networks and the Internet (Granted: October 28, 2008)
- [32] U. S. PATENT NUMBER 7,444,510: Methods and systems for accessing networks and the Internet (Granted: October 28, 2008)
- [33] U. S. PATENT NUMBER 7,440,754: System and method for concurrent operation of a wireless device in two disjoint wireless networks (Granted: October 21, 2008)
- [34] U. S. PATENT NUMBER 7,440,728: Use of separate control channel to mitigate interference problems in wireless networking (Granted: October 21, 2008)
- [35] U. S. PATENT NUMBER 7,406,707: Methods and systems for accessing networks methods and the Internet (Granted: July 29, 2008)
- [36] U. S. PATENT NUMBER 7,379,447: Slotted seeded channel hopping for capacity improvement in wireless networks (Granted: May 27, 2008)
- [37] U. S. PATENT NUMBER 7,363,375: Adaptive allocation of last-hop bandwidth based on monitoring of end-to-end throughput (Granted: April 22, 2008)
- [38] U. S. PATENT NUMBER 7,363,008: Spectrum sharing in the unlicensed band (Granted: April 22, 2008)
- [39] U. S. PATENT NUMBER 7,330,893: Adaptive allocation of last-hop bandwidth based on monitoring of end-to-end throughput (Granted: February 12, 2008)
- [40] U. S. PATENT NUMBER 7,317,914: Collaboratively locating disconnected clients and rogue access points in a wireless network (Granted: January 8, 2008)
- [41] U. S. PATENT NUMBER 7,313,237: Methods and systems for providing variable rates of service for accessing networks and the Internet (Granted: December 25, 2007)

- [42] U. S. PATENT NUMBER 7,283,834: Multi-radio unification protocol (Granted: October 16, 2007)
- [43] U. S. PATENT NUMBER 7,248,570: System and method for coordinating bandwidth usage of a communication channel by wireless network nodes (Granted: July 24, 2007)
- [44] U. S. PATENT NUMBER 7,245,936: Power efficient channel scheduling in a wireless network (Granted: July 17, 2007)
- [45] U. S. PATENT NUMBER 7,230,933: Reducing idle power consumption in a networked battery operated device (Granted: June 12, 2007)
- [46] U. S. PATENT NUMBER 7,209,740: Power efficient channel scheduling in a wireless network (Part 2) (Granted: April 24, 2007)
- [47] U. S. PATENT NUMBER 7,203,463: Power efficient channel scheduling in a wireless network (Part 1) (Granted: April 10, 2007)
- [48] U. S. PATENT NUMBER 7,194,263: System and method for concurrent operation of a wireless device in two disjoint wireless networks (Granted: March 20, 2007)
- [49] U. S. PATENT NUMBER 7,158,780: Information management and processing in a wireless network (Granted: January 2, 2007)
- [50] U. S. PATENT NUMBER 7,149,896: Methods and systems for providing security for accessing networks, methods and systems for providing security for accessing the internet (Granted: December 12, 2006)
- [51] U. S. PATENT NUMBER 7,142,855: Power efficient channel scheduling in a wireless network (Granted: November 28, 2006)
- [52] U. S. PATENT NUMBER 7,133,909: Systems and methods for locating mobile computer users in a wireless network (Granted: November 7, 2006)
- [53] U. S. PATENT NUMBER 7,110,783: Power efficient channel scheduling in a wireless network (Granted: Sept. 19, 2006)
- [54] U. S. PATENT NUMBER 7,099,689: Energy-aware communications for a multi-radio system (Granted: Aug. 29, 2006)
- [55] U. S. PATENT NUMBER 7,089,415: Authentication methods and systems for accessing networks authentication methods and systems for accessing the internet (Granted: August 8, 2006)
- [56] U.S. PATENT NUMBER 7,085, 924: Authentication methods and systems for accessing networks, authentication methods and systems for accessing the internet (Granted: August 1, 2006)
- [57] U.S. PATENT NUMBER 7,075, 943: Channel access scheme for use in network communications (Granted: July 11, 2006)
- [58] U.S. PATENT NUMBER 7,075,943: Methods and Systems for Accessing Networks, Methods and Systems for Accessing the Internet (Granted: April 18, 2006)
- [59] U.S. PATENT NUMBER 7,009,994: Channel access scheme for use in network communications (Granted March 7, 2006)
- [60] U.S. PATENT NUMBER 7,020,475: Using a derived table of signal strength data to locate and track a user in a wireless network (Granted: March 28, 2006)
- [61] U.S. PATENT NUMBER 7,110,783: Power efficient work conserving weighted fair scheduling using multiple radios (Granted : September 19, 2006)
- [62] U.S. PATENT NUMBER 7,099,689: Energy aware communications for a multi-radio system (Granted: August 29, 2006)
- [63] U.S. PATENT NUMBER 7,065,376: Multi-radio unification protocol (Granted: June 20, 2006)

- [64] U.S. PATENT NUMBER 7,016,705: Reducing power consumption in a networked battery-operated device using sensors, (Granted: March 21, 2006)
- [65] U.S. PATENT NUMBER 6,990,080: Distributed topology control for wireless multi-hop sensor networks (Granted January 24, 2006)
- [66] U.S. PATENT NUMBER 6,961,763: Automation system for controlling and monitoring devices and sensors (Granted: November 1, 2005)
- [67] U.S. PATENT NUMBER 6,885,860: Information management and processing in a wireless Network (Granted: April 26, 2005)
- [68] U.S. PATENT NUMBER 6,870,809: Fair scheduling in broadcast environments (Granted: March 22, 2005)
- [69] U.S. PATENT NUMBER 6,834,341: Authentication methods and systems for accessing networks, authentication methods and systems for accessing the Internet (Granted: December 21, 2004)
- [70] U.S. PATENT NUMBER 6,839,560: Using derived table of signal strength data to locate and track a user In a wireless network (Granted: January 4, 2005)
- [71] U.S. PATENT NUMBER 6,795,865: Adaptively changing weights for fair scheduling in broadcast environments (Granted: September 21, 2004)
- [72] U.S. PATENT NUMBER 6,799,047: Method and apparatus for locating and tracking a user in a wireless network through environmentally profiled data (Granted: September 28, 2004)
- [73] U.S. PATENT NUMBER 6,664,925: Methods and system for determining the location of a mobile computer (Granted: December 16, 2003)
- [74] U.S. PATENT NUMBER 6,629,151: Method and system for querying the dynamic aspects of wireless connection (Granted: September 30, 2003)
- [75] U.S. PATENT NUMBER: 6,754,266: Method and apparatus for transmitting digital video over a communication network (Granted: June 22, 2004)
- [76] U.S. PATENT NUMBER: 6,618,363: Method for Adapting Video packet generation and transmitting rates to available resources in a communication network (Granted: September 9, 2003)
- [77] U.S. PATENT NUMBER: 6,519,004: Method for transmitting video information over a communication channel (Granted: February 11, 2003)
- [78] U.S. PATENT NUMBER 6,507,587: A method for specifying the amount of bandwidth to reserve for use in network communications (Granted: January 14, 2003)
- [79] U.S. PATENT NUMBER 6,445,701: Channel access scheme for use in network communications (Granted: September 3, 2002)
- [80] U.S. PATENT NUMBER 6,438,136: A Method for scheduling time slots in a communications network channel to support on-going video transmissions (Granted: August 20, 2002)
- [81] U.S. PATENT NUMBER 6,385,454: Apparatus and method for management of resources in cellular networks (Granted: December 2001)
- [82] U.S. PATENT NUMBER 6,289,297: Method for reconstructing a video frame received from a video source over a communication channel (Granted: September 11, 2001)
- [83] U.S. PATENT NUMBER 5,508,822: Imaging system with multilevel dithering using single memory (Granted: April 1996)