Ranveer Chandra

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OBJECTIVE

Excited about bringing cutting-edge technology to the hands of people through innovation and engineering

RESEARCH INTERESTS

Networks, Wireless, Mobile Systems, Distributed Systems, RF, Communications, Network Management, Energy Efficiency

EMPLOYMENT & EDUCATION

Principal Researcher — Aug 2014 – now
Microsoft Research

Senior Researcher — June 2011 – Aug 2014
Microsoft Research

Researcher — Aug 2005 – May 2011
Microsoft Research

PhD in Computer Science — Aug 1999 – Sep 2005
Cornell University

B. Tech. in Computer Science and Engineering — Jul 1995 – May 1999
Indian Institute of Technology (IIT), Kharagpur, India

DISSERTATION

Title: A Virtualization Architecture for Wireless Network Cards
(Web site: http://research.microsoft.com/en-us/um/redmond/projects/virtualwifi/)

- VirtualWiFi shipped as a feature in Windows 7, Windows 8, Windows 10
- Formed the basis for Wi-Fi Direct standard
- Software downloaded more than 500,000 times since September, 2005
- Among top 5 downloaded software ever released by Microsoft Research
- Nominated by Cornell University for the ACM Best Dissertation Award

SELECTED PRODUCT IMPACT

- Designed & Shipped the *XBOX One Wireless Controller* Protocol
- Designed and Coded the *Visual Studio Energy Profiler* for Windows 8.1 and Windows Phone 8 (Initial Idea in research paper at MobiCom 2012)
- Designed the *network management* system that is now in use by various Microsoft product teams (Initial paper at SIGCOMM 2007)
- Designed and prototyped *VirtualWiFi* that later shipped in Windows 7 and Windows 8 (Initial paper in Infocom 2004)
- Designed and built the *white space geo-location database*, which is now being productized by Microsoft product teams (Initial paper in DySPAN 2011)
- Windows 8 tablets *antenna* layout
- Windows 8 tablets *Wi-Fi low power* protocol for connected standby

SELECTED RESEARCH PROJECTS

Dynamic Spectrum Access: I have been leading this project at Microsoft Research since 2005 – from its inception, to building the world's first radios, networks and databases, to showcasing demos to regulators worldwide, and now getting the ecosystem off the ground through active collaboration with industry

Energy Efficiency: I have been leading a virtual team of about 10+ researchers from

different groups worldwide with a goal of significantly increasing the battery life of mobile devices. We have been innovating in battery chemistries, to operating system techniques, and technologies at the application layer.
Low-latency wireless: Most previous research has focused on increasing wireless throughput. In this work I am looking to enable latency-sensitive applications over the wireless network.
Network Management: Designed and built systems for managing the wired and wireless enterprise network. Came up with a dependency graph model to diagnose performance failures in the network.
Mesh Networks: Designed various protocols for making mesh networks deliver more throughput and better performance.

AWARDS & RECOGNITION

Microsoft Research Luminary (10 of more than 1000 researchers)	2014
World Technology Network Fellow of Communications	2012
MIT Technology Review TR35 for Top Innovators Under 35	2010
Microsoft Senior Leader Bench (selected 4% in L65 to L67 band)	2010 - now
Microsoft Gold Star Award	2010
ACM SIGCOMM Best Paper Award	2009
GigaOM's Top 15 Mobile Influencers	2009
Microsoft Research Tech Transfer Award (for VirtualWiFi)	2009
ACM CoNEXT Best Paper Award	2008
Microsoft Research Graduate Fellowship Renewed after review	2002-2004 2004-2005
Sage Fellowship at Cornell University	1999-2000
Telco Award for academic excellence at IIT, all 4 years	1995-1999
SBI Award for all India second rank in higher secondary exam	1995

SELECTED TALKS

Keynote Talk, IEEE Symposium on Dynamic Spectrum Access (DySPAN)	October 2015
Spotlight Talk, MIT Technology Review Digital Summit	June 2014
Keynote Talk, IEEE Workshop on Network Measurements (WinMeE)	May 2014
Keynote Talk, ACM HotPower	November, 2013
Plenary Talk, Wireless World Research Forum on 5G Technologies	October, 2013
4-hour invited tutorial to Government of Malawi	August 2013
Keynote Talk, IIT Bombay TechFest	January 2013
Keynote talk, ACM WinTech	August 2012
Presented research to spectrum regulators from India (TRAI, including its Chairman Dr. J. S. Sarma), China (SARFT), Brazil (ANATEL), Singapore (IDA), US (including FCC Chairman Genachowski), Morocco, Philippines	2009-2013
WINLAB Annual Review, Rutgers University	December, 2010
Keynote talk, ACM DIALM-POMC Workshop	September, 2010
MIT CSAIL Wireless Networks Workshop	June, 2010
Invited by the FCC to present research on white spaces as input to the Broadband Plan	September, 2009
Keynote talk, IEEE SECON Workshop on Cognitive Radios	June, 2008
MSR Cognitive Wireless Networking Summit	June, 2008

Networking Seminar, UC Berkeley	February, 2008
Boeing Phantom Labs	November, 2007
Workloads of the Future Workshop (UC Berkeley)	October, 2007
Department Colloquia (UIUC, WUSTL, U. Rochester, U. Florida, Texas A&M, U. Washington, Purdue, Wisconsin, Duke, UT Austin, CUHK, University College London, UC Santa Barbara, UC Berkeley, U Wisconsin at Madison)	2005-2011

PROFESSIONAL ACTIVITIES

Program Committee Chair:

ACM Conference on Mobile Computing & Networking (MobiCom)	2013
IEEE Conference on Dynamic Spectrum Access Networks (DySPAN)	2012
IEEE Secon Whitespace/Software Defined Radio Workshop	2010
IEEE Cognitive Wireless Networking Workshop (with IEEE Infocom)	2010
ACM Cognitive Radio Networking Workshop (with ACM MobiCom)	2009
Organized MSR Cognitive Wireless Networking Summit (Participation from leading researchers from academia & industry)	2008
Patron Chair, IEEE DySpan	2010
Steering Committee, ACM CoRoNet (with ACM MobiCom)	2010 -
In the **Program Committee** of conferences and workshops below for at least one year: (ACM MobiCom, ACM SIGCOMM, ACM/USENIX MOBISYS, ACM MOBIHOC, ACM SIGMETRICS, USENIX NSDI, IEEE DYSPAN, ACM HOTMOBILE, IEEE ICDCS, ACM IMC, IEEE Green Computing Conference)	2006-2014
Tutorial Co-Chair, ACM MOBICOM	2008
Ph.D. students graduated: Omid Fatemieh (UIUC), Souvik Sen (Duke), Eric Rozner (UT Austin), George Nychis (CMU), Parya Moinzadeh (UIUC), Farhana Ashraf (UIUC), Mariya Zheleva (UCSB)	

PUBLICATIONS

More than 50 research papers, the latest can be found on this link. Some older ones (pre-2011) below.

1. **"Using Classification to Protect the Integrity of Spectrum Measurements in White Space Networks"**, O. Fatemieh, A. Farhadi, R. Chandra, C. Gunter. *Proceedings of ISOC Network & Distributed System Security Symposium (NDSS)*, February 2011
2. **"dFault: A fault-localization system for Internet scale applications"**, P. Prakash, R. Kompella, R. Ramasubramanian, R. Chandra. *Proceedings of ACM/IFIP/USENIX International Middleware Conference*, December 2010
3. **"Shedding Light on Enterprise Network Failures using SpotLight"**, D. John, P. Prakash, R. Kompella, R. Chandra. *Proceedings of IEEE Symposium on Reliable Distributed Systems (SRDS)*, November 2010
4. **"Low Cost and Secure Smart Meter Communications using the TV White Spaces"**, O. Fatemieh, R. Chandra, and C. Gunter, *Proceedings of IEEE International Symposium on Resilient Control Systems (ISRCS '10)*, August 2010
5. **"MAUI: Making Smartphones Last Longer with Code Offload"**, E. Cuervo, A. Balasubramanian, D. Cho, A. Wolman, S. Saroiu, R. Chandra, P. Bahl, *Proceedings of ACM MobiSys*, June 15-18, 2010
6. **"Virtual Compass: Relative Positioning to Sense Mobile Social Interactions"**, N. Banerjee, S. Agarwal, P. Bahl, R. Chandra, A. Wolman, M. Corner, *Proceedings of*

Pervasive, May 17-20, 2010

7. **"Secure Collaborative Sensing for Crowdsourcing Spectrum Data in White Space Networks"**, O. Fatemieh, R. Chandra, C. A. Gunter, *Proceedings of IEEE DySPAN*, April 6-9, 2010
8. **"DirCast: A Practical and Efficient Wi-Fi Multicast System"**, R. Chandra, S. Karanth, T. Moscibroda, V. Navda, J. Padhye, R. Ramjee, L. Ravindrananth, , *Proceedings of IEEE ICNP*, October 13-16, 2009
9. **"White Space Networking with Wi-Fi like Connectivity"**, P. Bahl, R. Chandra, T. Moscibroda, R. Murty, M. Welsh, *Proceedings of ACM SIGCOMM* **(Best Paper Award)**, August 17-20, 2009
10. **"Change Is Hard: Adapting Dependency Graph Models For Unified Diagnosis in Wired/Wireless Networks"**, L. Ravindranath, P. Bahl, R. Chandra, D. A. Maltz, J. Padhye, P. Patel, *Proceedings of ACM WREN*, 21 August 2009
11. **"Opportunistic Use of Client Repeaters to Improve Performance of WLANs"**, P. Bahl, R. Chandra, P. Lee, V. Mishra, J. Padhye, D. Rubenstein, Y. Yu, *IEEE/ACM Transactions on Networking, Volume 17, Number 4, pp. 1160-1171*, August 2009
12. **"An Agile Radio Framework for Unmanaged Wireless Environments"**, Z. Wang, R. Chandra, T. Moscibroda, A. Gefflaut, A. de Baynast, P. Bahl, *Proceedings of ACM MobiHoc*, May 18-21, 2009
13. **"Somniloquy: Augmenting Network Interfaces to Reduce PC Energy Usage"**, Y. Agarwal, S. Hodges, R. Chandra, J. Scott, V. Bahl, R. Gupta, *Proceedings of USENIX NSDI*, April 22-24, 2009
14. **"Opportunistic Use of Client Repeaters to Improve Performance of WLANs"**, P. Bahl, R. Chandra, P. P. C. Lee, V. Misra, J. Padhye, D. Rubenstein, Y. Yu, *Proceedings of ACM CoNEXT* **(Best Paper Award)**, December 9-12, 2008
15. "**Load-Aware Spectrum Distribution in Wireless LANs**", T. Moscibroda, R. Chandra, Y. Wu, S. Sengupta, P. Bahl, Y. Yuan, *Proceedings of IEEE ICNP*, October 19-22, 2008
16. **"A Case for Adapting Channel Width in Wireless Networks",** R. Chandra, R. Mahajan, T. Moscibroda, R. Raghavendra, P. Bahl. *Proceedings of ACM SIGCOMM*, Seattle, August 17-22, 2008
17. **"What's Going On? Learning Communication Rules in Edge Networks"**, S. Kandula, R. Chandra, D. Katabi. *Proceedings of ACM SIGCOMM*, Seattle, August 17-22, 2008
18. **"Designing High Performance Enterprise Wi-Fi Networks"**, R. Murty, J. Padhye, R. Chandra, A. Wolman, B. Zill. *Proceedings of USENIX NSDI*, San Francisco, April 16-18, 2008.
19. **"Context Based Routing: Technique, Applications and Experience"**, S. M. Das, Y. Wu, R. Chandra, Y. C. Hu. *Proceedings of USENIX NSDI*, San Francisco, April 16-18, 2008.
20. **"Wi-Fi Neighborcast: Enabling Communication Among Nearby Clients"**, R. Chandra, J. Padhye, L. Ravindrananth. *Proceedings of ACM HotMobile*, Napa Valley, February 25-26, 2008
21. **"Towards Highly Reliable Enterprise Network Services via Inference of Multi-level Dependencies"**, P. Bahl, R. Chandra, A. Greenberg, S. Kandula, D. A. Maltz, M. Zhang. *Proceedings of ACM SIGCOMM*, Kyoto, Japan, August 27-31, 2007
22. **"Allocating Dynamic Time-Spectrum Blocks in Cognitive Radio Networks"**, Y. Yuan, P. Bahl, R. Chandra, T. Moscibroda, Y. Wu. *Proceedings of ACM MobiHoc*, Montreal, Canada, September 9-14, 2007
23. **"Wireless Wakeups Revisited: Energy Management for VoIP Over Wi-Fi Smartphones"**, Y. Agarwal, R. Chandra, A. Wolman, P. Bahl, K. Chin, R. Gupta.

Proceedings of ACM/USENIX MobiSys, Puerto Rico, June 11-14, 2007

24. **"A Hardware Platform for Utilizing the TV Bands with a Wi-Fi Radio"**, S. Narlanka, R. Chandra, P. Bahl, J. I. Ferrell. *Proceedings of IEEE LANMAN*, Princeton, NJ, June 10-13, 2007 *(Invited paper)*
25. **"KNOWS: Kognitiv Networking Over White Spaces"**, Y. Yuan, P. Bahl, R. Chandra, P. A. Chou, I. Ferrel, T. Moscibroda, S. Narlanka, Y. Wu. *Proceedings of IEEE DySpan*, Dublin, April 17-20, 2007.
26. **"A Location-based Management System for Enterprise Wireless LANs"**, R. Chandra, J. Padhye, A. Wolman, B. Zill. *Proceedings of USENIX NSDI*, Cambridge, April 11-13, 2007.
27. **"BeaconStuffing: Wi-Fi Without Associations"**, R. Chandra, J. Padhye, L. Ravindrananth, A. Wolman. *Proceedings of IEEE HotMobile*, Tucson, February 26-27, 2007.
28. **"Routing with a Markovian Metric to Promote Local Mixing"**, Y. Wu, S. M. Das, R. Chandra. *Proceedings of IEEE INFOCOM Minisymposium*, Anchorage, May 6-12, 2007.
29. **"Discovering Dependencies for Network Management"**, P. Bahl, P. Barham, R. Black, R. Chandra, M. Goldszmidt, R. Isaacs, S. Kandula, L. Li, J. MacCormick, D. A. Maltz, R. Mortier, M. Wawrzoniak, M. Zhang. *Proceedings of ACM HotNets-V*, Irvine, November 29-30, 2006.
30. **"WiFiProfiler: Cooperative Diagnosis in Wireless LANs"**, R. Chandra, V. N. Padmanabhan and M. Zhang. *Proceedings of ACM/USENIX MobiSys*, Uppsala, June 19-22, 2006.
31. **"Enhancing the Security of Corporate Wi-Fi Networks Using DAIR"**, P. Bahl, R. Chandra, J. Padhye, L. Ravindranath, M. Singh, A. Wolman and B. Zill. *Proceedings of ACM/USENIX MobiSys*, Uppsala, June 19-22, 2006.
32. **"Optimizing the Placement of Integration Points in Multi-hop Wireless Networks"**, R. Chandra, L. Qiu, K. Jain and M. Mahdian. *Proceedings of IEEE ICNP,* Berlin, October 6-8, 2004
33. **"Architecture and Techniques for Diagnosing Faults in IEEE 802.11 Infrastructure Networks"**, A. Adya, P. Bahl, R. Chandra and L. Qiu. *Proceedings of ACM Mobicom*, Philadelphia, September 26-30, 2004
34. **"SSCH: Slotted Seeded Channel Hopping for Capacity Improvement in IEEE 802.11 Ad Hoc Networks"**, P. Bahl, R. Chandra and J. Dunagan. In *Proceedings of ACM Mobicom*, Philadelphia, September 26-30, 2004
35. **"MultiNet: Connecting to Multiple IEEE 802.11 Networks Using a Single Wireless Card"**, R. Chandra, P. Bahl and P. Bahl. *Proceedings of IEEE Infocom*, Hong Kong, March 7-11, 2004
36. **"Adaptive Topology Discovery Algorithm for Hybrid Wireless Networks"**, R. Chandra, C. Fetzer and K. Högstedt. *Proceedings of 1st International Conference on Ad Hoc Networks and Wireless,* and *Journal of Informatics*, *Vol. 16*, September 2002, Pages: 1-16
37. **"Providing a Bidirectional Abstraction for Unidirectional Ad Hoc Networks"**, V. Ramasubramanian, R. Chandra and D. Mossé. *Proceedings of IEEE Infocom*, New York, June 23-27 2002
38. **"Anonymous Gossip: Improving Multicast Reliability in Mobile Ad Hoc Networks"**, R. Chandra, V. Ramasubramanian, K. P. Birman. *Proceedings of IEEE ICDCS*, Phoenix, April 16-19, 2001

SELECTED PRESS ARTICLES

On white spaces:

"Microsoft flaunts WISER method of identifying TV white space", Tammy Parker, FierceWireless, October 2, 2013

"New white spaces research from Microsoft and China makes it easier to find vacant spectrum", John Cox, Network World, October 2, 2013

"Wi-Fi via White Spaces", Erica Naone, MIT's Technology Review, August 18, 2009

"Microsoft Makes White-Spaces Breakthrough for Rural Broadband", Simon Juran, GigaOM, August 18, 2009

"Microsoft 'White-Fi' to solve interference worries in white space", Marguerite Reardon, CNet, August 19, 2009

"WiFi on steroids? First "WhiteFi" prototypes hit testing stage", Nate Anderson, Ars technica, August 27, 2009

"Microsoft tests limits of powerful Internet access in 'white spaces'", Todd Bishop, TechFlash, September 15, 2010

"Taking Waves: FCC Green Lights Unlicensed Use of Wireless "White Space" Frequencies", Larry Greenemeier, Scientific American, October 15, 2010

On Energy Efficiency:

"Microsoft has a crazy plan to make your batteries last a lot longer," Matt Weinberger, Business Insider, October 4, 2015

"Gadgets Could Get Longer Lives by Combining Batteries", Tom Simonite, MIT Technology Review, October 5, 2015

"A laptop battery system that knows your habits and lasts a lot longer", Allison Linn, Next at Microsoft, October 2, 2015

"Power up! The hunt is on to extend battery life for mobile devices", Sandra Gittlen, ComputerWorld, January 19, 2015

"Microsoft Aims for Smartphones that Run for a Week", Tom Simonite, MIT Technology Review, June 8, 2014

"Making mobile storage energy efficient", Robin Harris, ZDNet, February 19, 2014

"The surprise power hog for mobile storage: software", Stephen Lawson, Network World, February 19, 2014

"Microsoft Research doesn't want you to plug your phone in for a week", Rich Edmonds, WPCentral, January 29, 2014

"Microsoft To Develop Long-Lasting Smartphone", Tyler Lee, January 29, 2014

"Making Computers Talk in their Sleep", Will Knight, MIT's Technology Review, August 18, 2009

"Microsoft, UC San Diego want your PCs to talk in their sleep", Alpha Doggs, NetworkWorld, April 27, 2009 (also featured in NetworkWorld's 20 kick-ass projects)

"'Sleep talking' PCs save energy and money", PHYSORG.com, April 24, 2009 (also on Science Daily, May 1, 2009)

On Channel Widths:

"Microsoft develops smart wireless networks", Marie Boran, siliconrepublic.com, August 19, 2008

"Tweaking Channel Widths to Improve Wireless Communication", Rob Knies, Microsoft Research, August 19, 2008

"Microsoft Research hits the road with mobile tech", Briony Smith, ITWorldCanada, March 10, 2008

On VirtualWiFi:

"Microsoft Tests Virtual Wi-Fi Software", Chris Preimesberger, eWeek, October 20,

2005

"Virtual Wi-Fi doubles your adapter", Peter Judge, Techworld, October 19, 2005

"Microsoft's VirtualWiFi clones your WiFi card", Paul Miller, Engadget, October 17, 2005

"Microsoft Incorporates Virtual WiFi Technology into Windows 7", John Messina, PHYSORG.com, May 18, 2009

Personal:

"Finding more space in spectrum", Microsoft Research Feature Story, January 29, 2014

"3 Indians appear in MIT's prestigious Technology Review List", Press Trust of India (PTI), August 26, 2010 (appeared in Times of India, NDTV, among others)

"Delivering high-speed wireless Internet connections over longer distances", Tom Simonite, MIT's Technology Review TR35 article

"GigaOM's Top 15 Mobile Influencers", Om Malik & Stacy Higginbotham, GigaOM, September 10, 2009

"Microsoft names 5 South Asians as research fellows", Indiatimes, March 4, 2004

"Microsoft Research Fellowship Awards Underwrite Academic Excellence", Microsoft PressPass, February 23, 2004

WORK EXPERIENCE

Researcher, Microsoft Research, Redmond	Aug 2005 - Now
Visiting Assistant Professor, Cornell University	Jan – Jun 2005
Research Fellow - Intern, Microsoft Research, Redmond	May-Aug 2002, 2003, 2004
Summer Intern, AT&T Labs Research, Florham Park	Jun-Aug 2001
Research Assistant at Cornell	Jan-May 2001
Research Assistant at Cornell	May-Aug 2000

TEACHING EXPERIENCE

INSTRUCTOR

CS 414/415 Systems Programming and Operating Systems	Spring 2005
CS 415 Operating Systems Practicum	Fall 2000
CS 414 Operating Systems	Summer 2000

TEACHING ASSISTANT

CS 519 Computer Networks	Prof. J. Matthews	Spring 2002

PATENTS

More than 100 patents filed, 65+ of which have been granted by the USPTO to date.