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INTERESTS

Internet multimedia, policy, architecture, computer networks and performance evaluation. Telecommunication policy; Internet telephony (VoIP), collaboration and media-on-demand; Internet of things; emergency services; signaling and session control; mobile applications; ubiquitous and pervasive computing; network measurements; quality of service; Internet protocols and services; performance analysis of computer networks and systems.

WORK EXPERIENCE

Technology Fellow, Senator Ron Wyden (U.S. Senate), September 2019–August 2020.

Chief Technology Officer, Federal Communications Commission (FCC), January 2017–August 2017.

Senior Advisor for Technology, Federal Communications Commission (FCC), September 2016–December 2016.

Technology Advisor, Federal Communications Commission (FCC), September 2014–August 2016.

Chief Technology Officer, Federal Communications Commission (FCC), January 2012–August 2014.

Engineering Fellow, Federal Communications Commission (FCC), Sept. 2010–May 2011.

Professor (tenured), Dept. of Computer Science and Dept. of Electrical Engineering (joint appointment), Columbia University. August 1996–. Department vice chair, 2002–2003; Department chair, 2004–2009.

Researcher, GMD Fokus[1], Berlin, Germany. March 1994 - July 1996. Multimedia systems, ATM performance issues. Deputy department head; project leader TOMQAT, Multicube, MMTng. Lecturer at Technical University Berlin.

Consultant, 1994-1996: design and implementation of an Internet packet audio tool for a WWW-based "Virtual Places" shared environment (Ubique, Israel). Consultant on real-time packet audio (Vocaltec, Israel).

Postdoc, Distributed Systems Research Department, AT&T Bell Laboratories, Murray Hill, New Jersey. September 1992 – February 1994: designed and implemented BENE network emulator, research in real-time multimedia and electronic publishing.

Teaching Assistant, Dept. of Computer Science, University of Massachusetts, January 1992 – June 1992: co-taught senior-level computer networking course.

Research Assistant, Dept. of Computer Science, University of Massachusetts, July 1988 – September 1992: research in congestion control and performance evaluation related to high-speed computer networks. Also assisted in teaching performance evaluation course.

[1] GMD - Forschungszentrum Informationstechnik (German National Research Center for Information Technology), Research Institute for Open Communication Systems

Research Assistant, Dept. of Electrical and Computer Engineering, University of Massachusetts at Amherst, January 1988 – July 1988: collaboration with Dr. Wei-Bo Gong in the area of perturbation analysis.

Teaching Assistant, Dept. of Electrical and Computer Engineering, University of Massachusetts at Amherst, September 1987 – July 1988: taught discussion section of introductory programming class for engineers (Pascal and Fortran).

Research Assistant, Dept. of Electrical and Computer Engineering, University of Cincinnati, March 1985 – August 1987: planning and implementation of speech processing laboratory and networking, tool development, vector quantization research, system administration.

EDUCATION

PhD Electrical Engineering, Department of Electrical and Computer Engineering at the University of Massachusetts, Amherst, September 1992.

PhD Thesis: *Congestion Control and Packet Loss for Real-Time Traffic in High-Speed Networks*. Principal advisors: Jim Kurose, Don Towsley and Christos Cassandras.

Master of Science, Department of Electrical and Computer Engineering at the University of Cincinnati, Cincinnati, Ohio; with emphasis on digital signal processing (voice coding, software models). August 1987.

Master's thesis: *Multi-Stage Vector Quantization for Speech and Image Coding; The DSP Workbench: Distributed Multiprocess System Simulation*. Experimental and theoretical results for a new method of vector quantization and development of a distributed high-level simulator for signal processing applications. Principal advisor: P. A. Ramamoorthy.

B.S. Electrical Engineering, (combined with B.S. Industrial Engineering), Technical University of Darmstadt, Federal Republic of Germany, June 1984.

HONORS AND AWARDS

- ACM SIGCOMM Award for Lifetime Contributions 2022 for "impactful and sustained contributions to the design of protocols, applications, and algorithms for Internet multimedia."
- Honorary Doctorate, University of Oulu, Finland (June 2022)
- IEEE CQR (Communication Quality and Reliability) Chairman's Award 2019
- IEEE Infocom 2018 *Test of Time Paper Award* for "An Analysis of the Skype Peer-to-Peer Internet Telephony Protocol" (with Salman Baset).
- IEEE Internet award, 2016.
- ACM Fellow, 2015.
- WCNC 2015, "Intelligent Content Delivery over Wireless via SDN", best paper award.
- IEEE Communications Society Internet Technical Committee Distinguished Service Award, 2014.
- Internet Hall of Fame, 2013
- GREE 2013 best paper award ("Wimax in the classroom: Designing a cellular networking hands-on lab")
- 2011 Internet2 IDEA Award winner for "Do You See What I See" tool (Kyung Hwa Kim, PhD Student)

- Region 1 William Terry Award for Lifetime Distinguished Service to IEEE Region 1 (2010)
- IPTComm 2010 best paper award ("Reliability and Relay Selection in Peer-to-Peer Communication Systems")
- IMSAA-08 3rd best paper award for *A New SIP Event Package For Group Membership Management in Advanced Communications* (co-authored with Vishal Singh and Piotr Boni)
- VDE ITG Preis 2008 for *Ubiquitous Device Personalization and Use: The Next Generation of IP Multimedia Communications* (co-authored with Ron Shacham, Srisakul Thakolsri and Wolfgang Kellerer)
- IPTCOMM 2008 Best Student Paper Award for *SIP Server Overload Control: Design and Evaluation* (co-authored with Charles Shen)
- CATT lifetime innovation award (Brooklyn Polytech University) (2007)
- Sputnik Innovator Award (2005)
- IEEE Fellow (2006)
- IEEE ComSoc Technical Committee on Computer Communications (TCCC) Outstanding Service Award 2005
- IEEE Senior Member (2004)
- Internet Telephony 2004 Product of the Year
- Mayor's Award for Excellence in Science and Technology (2004)
- VON Pioneer Award, 2000
- *IEEE Communication Society* Lecturer, 1997
- nominated for ACM Best Dissertation award
- University of Massachusetts Graduate School Fellowship, 1990-1991
- University Summer Research Fellowship 1987
- University Summer Research Fellowship 1985
- German Fulbright Scholarship 1984
- President Electrical Engineering Graduate Student Association 1985/86
  Graduate Outstanding Service award 1986
- German National Scholarship Foundation ("Studienstiftung des deutschen Volkes")
- Regional finalist German Young Scientists Competition (Jugend forscht)

PROFESSIONAL ACTIVITIES

Editorial positions:

- Editor, *Foundations and Trends in Networking*, 2005–2018.
- Associate Editor, *Computer Communications*, 2009–2012.
- Editor, *ACM Transactions on Multimedia Computing, Communications and Applications*, 2005–2010
- Associate Editor, *ACM/IEEE Transactions on Networking*, 2000–2008
- Associate Editor, *IEEE Transactions on Image Processing*, 1999–2000
- Guest editor for *IEEE Network Magazine* and *IEEE Internet Computing* on Internet Telephony, May/June 1999

- *Journal of Communications and Networks*, editor (1998–2001), division editor (2001–2004)
- *IEEE Communication Surveys & Tutorials*, member editorial board, 1996–2000.
- *Internet Computing*, Communications Society liaison editor, 1996–1999, editor, 2008–2009.
- *IEEE Communications Magazine*, Internet Technology feature series editor (1996–1998)
- Guest editor for *IEEE Journal on Selected Areas in Communications* on the Global Internet

Technical program committees:

- ACM *SIGCOMM* 2022
- IEEE *INFOCOM* 1994–1996, 1998, 2000–2004, 2006–2022 (2022 Distinguished Member)
- *IFIP Networking* 2018–2022
- ACM *CoNEXT* 2019
- NSF review panel, 1999, 2002, 2003, 2004, 2006, 2007, 2008, 2010, 2011, 2015, 2017, 2018, 2020
- *Network and Operating System Support for Digital Audio and Video* (NOSSDAV), 1997–2010, 2012–2014
- ACM *MobiArch* 2007–2009
- *International Conference on Network Protocols (ICNP)*, 1996, 2008
- *SIP 2000–2008*
- *P2P* 2008
- *IEEE Global Internet* 1996–2000, 2005, 2007
- *IEEE International Symposium on a World of Wireless, Mobile and Multimedia Networks* (WoWMoM) 2005, 2006
- *ANCS (Architectures for Networking and Communication Systems)* 2005
- *ACM Multimedia* 2005
- *Feature Interaction Workshop (FIW)* 2003, 2005
- *International Conference on Distributed Computing Systems (ICDCS)* 2005
- ACM *Mobihoc* 2002, 2005
- *Packet Video Workshop*, 1999, 2000
- *Open Architectures and Network Programming (OPENARCH)* 1998, 1999
- *ACM/SPIE Multimedia Computing and Networking*, 1998
- *IEEE Global Internet*, 1996 (conference technical program vice chair)
- W3C *Real-Time Multimedia Workshop* (RTMW), 1996
- *Workshop on Integration of IP and ATM*, 1996

Advisory boards and committees:

- Technological Advisory Council (TAC), a federal advisory committee (Federal Communications Commission (FCC), 2022–), working group co-chair

- National Science Foundation: *Broadband Research Workshop and Report*, 2020–2021
- National Association of Attorneys General (NAAG) robocall working group, 2018–2019
- North American Numbering Council (NANC), a federal advisory committee (Federal Communications Commission (FCC), 2017–2019)
- Computing Community Consortium, Intelligent Infrastructure Task Force (2017–2019)
- Applied Technology Council (ATC) - ATC-126 (*Community Resilience of Lifeline Systems*) project technical committee (2016)
- *IEEE/ACM Transactions on Networking* steering Committee (member, chair) (2007–2017)
- ACM publication board technology committee (2015)
- ACM SIGCOMM vice chair (2007–2013)
- Member of the Board, Armstrong Memorial Research Foundation (2009–)
- Internet2 Applications, Middleware and Services Advisory Council (AMSAC) (2008–2012)
- GENI OptIn working group co-chair (2008–2009)
- board of directors, *SIP Forum* (1998–2002)
- Member of Internet Architecture Board (IAB), the technical advisory group of the Internet Society and the architectural oversight body of the IETF (1999–2001)
- Co-chair, *Internet Technical Committee* of the IEEE Communications Society (1994-2000)
- Chair, *IEEE Communications Society Technical Committee on Computer Communications* (1999–2001)
- SIP Bake-Offs, Columbia University (April 1999, August 1999, December 1999)
- IEEE *Infocom* Executive Committee (1995–2000)
- Internet2 Applications, Middleware and Services Advisory Council (AMSAC) 2008–2010
- GENI OptIn working group co-chair, 2008–2009
- IEEE Travel Reduction Task Force, 2009
- member-at-large, Board of Governors, IEEE *Communications Society*, 2002
- board of directors, *SIP Forum*, 1998–2002
- past co-Chair, *Internet Technical Committee* of the IEEE Communications Society
- Chair, *IEEE Communications Society Technical Committee on Computer Communications* (1999–2001)
- member IEEE Electronic Processes Steering Group, 2000

Conference leadership:

- *ACM 9th ACM Conference on Information-Centric Networking (ICN 2022)* technical program co-chair
- *DNAC 6G Conference 2022* technical program co-chair
- *ACM SIGCOMM 2020* co-general chair
- *Mobiquitous 2018* general co-chair

- *e-Energy 2011* technical program co-chair
- *IEEE COMSNETS 2010* general co-chair
- *IEEE P2P 2009* general co-chair
- *IEEE ICNP 2009* general co-chair
- *IFIP Networking 2009* technical program co-chair
- *IEEE IM 2009* technical program co-chair
- *ACM IPTCOMM 2008* technical program co-chair
- *ACM IPTCOMM 2007* general co-chair
- *CoNEXT 2007* general co-chair
- *ACM Multimedia* 2004 general co-chair
- technical program co-chair Internet Telephony Workshop 2001
- IEEE *Infocom* 2000 technical program co-chair
- IEEE *Infocom* information systems chair 2000–2002
- *NOSSDAV* technical program co-chair 2001
- IEEE *Infocom* 1998 vice general chair
- Organizer, SIP Bake-Offs, Columbia University (April 1999, August 1999, December 1999)
- IEEE *Infocom* Executive Committee 1995–2000
- IEEE *IEEE ICIN* (2018–), *ACM EdgeSys* (2018–), *IFIP Networking* (2010–) and *IPTComm* (2007–) steering committees
- *IEEE Infocom*, *ACM MobiArch* (2008–2012) steering committees

Referee for *IEEE Transactions on Networking*, *Springer/ACM Multimedia Systems Journal*, *IEEE Transactions on Communications*, *Computer Networks and ISDN Systems*, *Internetworking*, IEEE Infocom, ACM Sigcomm, IC^{3}N, National Science Foundation, and others.

University service (selected):

- Columbia University Senate (2020–); executive committee (2021–)
- Columbia University Financial Conflict of Interest Committee (2015–); chair (2021–)

PATENTS

US patent 5,509,074: *Method of protecting electronically published materials using cryptographic protocols* (issued April 1996)

US patent 6,141,788: *Method And Apparatus For Forward Error Correction In Connection In Packet Networks* (October 2000)

US patent 6,446,108: *Method For Network Address Translation* (September 2002)

US patent 6,538,416: *Border Gateway Reservation Protocol for Tree-Based Aggregation of Inter-Domain Reservations* (March 2003)

US patent 6,771,644: *Program insertion in real time IP multicast* (August 2004)

US patent 6,937,597: *Signaling Method For Internet Telephony* (August 2005)

US patent 6,970,909: *Multi-protocol data communication systems supporting wireless telephony and content delivery* (November 2005)

US patent 7,257,201: *System and method for unified messaging in inter/intranet telephony* (August 2007)

US patent 7,266,091: *System and method for conferencing in inter/intranet telephony* (September 2007)

US patent 7,296,091: *System and method for receiving over a network a broadcast from a broadcast source* (November 2007)

US patent 7,319,689: *Method for handling the simultaneous mobility of mobile hosts in infrastructure-based networks* (January 2008)

US patent 7,610,384: *Network telephony appliance and system for inter/intranet telephony* (October 2009)

US patent 7,610,384: *Network telephony appliance and system for inter/intranet telephony* (October 2009)

US patent 7,636,336 *Methods and systems for reducing MAC layer handoff latency in wireless networks* (December 2009)

US patent 8,027,251 *Systems and methods for implementing protocol-aware network firewall* (September 2011)

US patent 8,166,102 *Signaling method for internet telephony* (April 2012)

US patent 8,302,186 *System and method for testing network firewall for denial-of-service (DOS) detection and prevention in signaling channel* (October 2012)

US patent 8,522,344 *Theft of service architectural integrity validation tools for session initiation protocol (SIP)-based systems* (August 2013)

US patent 8,565,384 *Systems, methods, and media for connecting emergency communications* (October 2013)

US patent 8,689,328 *Malicious user agent detection and denial of service (DOS) detection and prevention using fingerprinting* (March 2014)

US patent 8,719,926 *Denial of service detection and prevention using dialog level filtering* (April 2014)

US patent 8,737,220 *Systems for providing feedback to sending entities* (May 2014)

US patent 8,737,351 *Methods and systems for reducing MAC layer handoff latency in wireless networks* (May 2014)

US patent 8,750,242 *Methods, media, and devices for moving a connection from one point of access to another point of access* (June 2014)

US patent 8,804,513 *Methods and systems for controlling SIP overload* (August 2014)

US patent 8,966,619 *Prevention of denial of service (DoS) attacks on session initiation protocol (SIP)-based systems using return routability check filtering* (February 2015)

US patent 8,995,742 *Methods and systems for controlling traffic on a communication network* (March 2015)

US patent 9,036,605 *Methods, media, and devices for moving a connection from one point of access to another point of access* (May 2015)

US patent 9,118,814 *Set-top box peer-assisted video-on-demand* (August 2015)

US patent 9,374,342 *System and method for testing network firewall using fine granularity measurements* (June 2016)

US patent 8,750,242 *Methods, media, and devices for moving a connection from one point of access to another point of access* (July 2016)

US patent 9,473,529 *Prevention of denial of service (DoS) attacks on Session Initiation Protocol (SIP)-based systems using method vulnerability filtering* (October 2016)

US patent 10,039,033 *Systems, methods, and media for implementing call handoff between networks* (July 2018)

US patent 10,541,926 *Unified networking system and device for heterogeneous mobile environments* (January 2020)

TUTORIALS

Partial listing:

- *IDMS/PROMS*, Coimbra, November 2002;
- *Mobicom* tutorial, Atlanta, September 2002;
- *Sigcomm* tutorial, Stockholm, August 2000;
- *International Conference on Multimedia (ICME)*, July 2000;
- *Networking 2000* tutorial, Paris, May 2000;
- *IEEE Real Time Applications Symposium*, May 2000;
- *VON Developers Conference*, semi-annually since 1999;
- BellSouth (Atlanta), February and March 1998, November 1999;
- *IEEE International Conference on Network Protocols* (ICNP), October 1999;
- ASSET conference (Dallas, Texas), March 1999;
- CEFRIEL (Milan), May 1999;
- MCI Corp. (Colorado Springs), August 1998;
- EPFL summer school (Lausanne, Switzerland), June 1998;
- 16th Brazilian Symposium on Computer Networks, May 1998;
- IEEE Infocom, March 1998

SOFTWARE

MICE: Web-based information management for departmental personnel, student, space and financial data;

CINEMA: Columbia InterNet Extensible Multimedia Architecture (with Jonathan Lennox, Kundan Singh, and others);

EDAS: editor's assistant; conference paper management software used for IEEE ICC, IEEE Globecom, Mobicom, IEEE Infocom, ICNP, NOSSDAV, Packet Video (about 8,000 total), with roughly 770,000 users;

e*phone: Ethernet packet audio device; the first SIP-speaking embedded Internet phone (with Jianqi Yin).

graph++: graphing tool with matrix manipulation facilities.

NeVoT: network voice terminal, first RTP-capable Internet voice application.

rtptools: set of tools for analyzing, recording and playing back RTP packets; used in a number of media-on-demand projects.

RTP library: library implementing RTP (with Jonathan Lennox, Jonathan Rosenberg and Dan Rubenstein);

rtspd: RTSP multimedia server (with Jonathan Lennox and Kundan Singh).

sipc: SIP user agent (Internet telephony agent) (with Xiaotao Wu).

sipconf: SIP-based software conferencing server (with Kundan Singh);

sipd: First publically available SIP proxy and redirect server (with Jonathan Lennox);

sipum: SIP-based unified messaging system (with Kundan Singh);

simul: discrete-event simulator emulating SIMAN.

JOURNAL PUBLICATIONS

[1] A. Y. Ding, E. Peltonen, T. Meuser, A. Aral, C. Becker, S. Dustdar, T. Hiessl, D. Kranzlmüller, M. Liyanage, S. Maghsudi, N. Mohan, J. Ott, J. S. Rellermeyer, S. Schulte, H. Schulzrinne, G. Solmaz, S. Tarkoma, B. Varghese, and L. Wolf, "Roadmap for edge AI: A Dagstuhl perspective," *SIGCOMM Computer Communications Review (CCR)*, Vol. 52, pp. 28–33, Mar. 2022.

[2] H. Celebi, Y. Yapici, I. Guvenc, and H. Schulzrinne, "Load-based on/off scheduling for energy-efficient delay-tolerant 5G networks," *IEEE Transactions on Green Communications and Networking*, Vol. 3, no. 4, pp. 955–970, 2019.

[3] V. Bajpai, A. Brunstrom, A. Feldmann, W. Kellerer, A. Pras, H. Schulzrinne, G. Smaragdakis, M. Wählisch, and K. Wehrle, "The Dagstuhl beginners guide to reproducibility for experimental networking research," *Computer Communications Review*, Jan. 2019.

[4] H. Schulzrinne, "Network neutrality is about money, not packets (invited paper)," *IEEE Internet Computing*, Vol. 22, November/December 2018.

[5] H. Schulzrinne, "Networking research – a reflection in the middle years (invited paper)," *Computer Communications*, Oct. 2018.

[6] S. G. Hong, S. Seo, H. Schulzrinne, and P. Chitrapu, "ICOW: Internet access in public transit systems," *IEEE Communications Magazine*, Vol. 53, pp. 134–141, June 2015.

[7] M. Berman, P. Demeester, J. W. Lee, K. Nagaraja, M. Zink, D. Colle, D. K. Krishnappa, D. Raychaudhuri, H. Schulzrinne, I. Seskar, and S. Sharma, "Future internets escape the simulator," *Communications ACM*, Vol. 58, pp. 78–89, May 2015.

[8] E. Piri and H. Schulzrinne, "Scaling network information services to support hetnets and dynamic spectrum access," *Journal of Communications and Networks*, Vol. 16, Apr. 2014.

[9] S. G. Hong and H. Schulzrinne, "PBS: Signaling architecture for network traffic authorization," *IEEE Communications Magazine*, Vol. 51, pp. 89–96, July 2013.

[10] O. Boyaci, V. Beltran, and H. Schulzrinne, "Bridging communications and the physical world," *IEEE Internet Computing*, Vol. 16, no. 2, pp. 35–43, 2012.

[11] D. Touceda, J. Sierra, A. Izquierdo, and H. Schulzrinne, "Survey of attacks and defenses on P2PSIP communications," *IEEE Communications Surveys Tutorials*, Vol. 14, no. 3, pp. 750–783, 2012.

[12] C. Shen, E. Nahum, H. Schulzrinne, and C. P. Wright, "The impact of TLS on SIP server performance: Measurement and modeling," *IEEE/ACM Transactions on Networking*, Vol. 20, pp. 1217–1230, Aug. 2012.

[13] J. Kayfetz, H. Schulzrinne, T. Sherwood, and M. Tiwari, "Your desktop or mine: Extending the reach of writing instruction," *Ubiquitous Learning*, Vol. 3, no. 3, 2011.

[14] E. Brosh, S. A. Baset, V. Misra, D. Rubenstein, and H. Schulzrinne, "The Delay-Friendliness of TCP for Real-Time traffic," *IEEE/ACM Transactions on Networking*, Oct. 2010.

[15] H. Tschofenig and H. Schulzrinne, "Emergency services for internet multimedia," *The Internet Protocol Journal*, Dec. 2010.

[16] S. Subramanya, X. Wu, H. Schulzrinne, and S. Buriak, "VoIP-based air traffic controller training," *IEEE Communications Magazine*, Nov. 2009.

[17] S. Alexander, Y.-H. Cheng, B. Coan, A. Ghetie, V. Kaul, B. Siegell, S. Bellovin, N. Maxemchuk, and H. Schulzrinne, "The dynamic community of interest and its realization in ZODIAC," *IEEE Communications Magazine*, Oct. 2009.

[18] H. Schulzrinne, "Double submissions: publishing misconduct or just effective dissemination?," *CCR*, July 2009.

[19] H. Schulzrinne, "Double-blind reviewing: more placebo than miracle cure?," *CCR*, Apr. 2009.

[20] S. Shin and H. Schulzrinne, "Measurement and analysis of the VoIP capacity in IEEE 802.11 WLAN," *IEEE Transactions on Mobile Computing*, Sept. 2009.

[21] R. Dantu, S. Fahmy, H. Schulzrinne, and J. Cangussu, "Issues and challenges in securing VoIP," *Computers & Security*, May 2009.

[22] X. Fu, H. Schulzrinne, H. Tschofenig, C. Dickmann, and D. Hogrefe, "Overhead and performance study of the general internet signaling transport (GIST) protocol," *IEEE/ACM Transactions on Networking*, Feb. 2009.

[23] D. Chopra, H. Schulzrinne, E. Marocco, and E. Ivov, "Peer-to-peer overlays for real-time communication: security issues and solutions," *IEEE Communications Surveys & Tutorials*, Jan. 2009.

[24] H. Schulzrinne, "Conferences as organizations: advising, steering and establishing expectations," *ACM SIGCOMM Computer Communication Review*, Jan. 2009.

[25] G. Camarillo, H. Schulzrinne, S. Loreto, and J. Hautakorpi, "Effect of head of the line blocking on session initiation protocol session establishment delays," *Journal of Communications and Networks*, Feb. 2009.

[26] S. G. Hong, V. Hilt, and H. Schulzrinne, "Evaluation of control message overhead of DHT-based P2P system," *Bell Labs Technical Journal*, Nov. 2008.

[27] A. Dutta, D. Famolari, S. Das, Y. Ohba, V. Fajardo, K. Taniuchi, R. Lopez, and H. Schulzrinne, "Media-independent pre-authentication supporting secure interdomain handover optimization," *IEEE Wireless Communications*, Apr. 2008.

[28] X. Wang and H. Schulzrinne, "Measurement and analysis of LDAP performance," *IEEE/ACM Transactions on Networking*, Feb. 2008.

[29] K. Arabshian and H. Schulzrinne, "An ontology-based hierarchical Peer-to-Peer global service discovery system," *Journal of Ubiquitous Computing and Intelligence (JUCI)*, Vol. 1, pp. 133–144, Dec. 2007.

[30] W. Yuen and H. Schulzrinne, "Improving search efficiency using bloom filters in partially connected ad hoc networks: A node-centric analysis," *Computer Communications*, Nov. 2007.

[31] A. Dutta, S. Das, D. Famolari, Y. Ohba, K. Taniuchi, V. Fajardo, R. M. Lopez, T. Kodama, and H. Schulzrinne, "Seamless proactive handover across heterogeneous access networks," *Wireless Personal Communications*, Nov. 2007.

[32] R. Shacham, H. Schulzrinne, S. Thakolsri, and W. Kellerer, "Ubiquitous device personalization and use: The next generation of IP multimedia communications," *ACM Transactions on Multimedia Computing, Communications, and Applications*, Aug. 2007.

[33] R. Dantu, D. Ghosal, and H. Schulzrinne, "Securing voice over IP," *IEEE Network*, Vol. 20, pp. 4–5, Sept. 2006.

[34] X. Wang and H. Schulzrinne, "Pricing network resources for adaptive applications," *IEEE/ACM Transactions on Networking*, Vol. 14, pp. 506–519, June 2006.

[35] K. Wong, A. Dutta, H. Schulzrinne, and K. Young, "Simultaneous mobility: analytical framework, theorems, and solutions," *Wireless Communication and Mobile Computing*, June 2006.

[36] K. Singh and H. Schulzrinne, "Failover, load sharing and server architecture in SIP telephony," *Computer Communications*, Mar. 2007.

[37] W. Zhao and H. Schulzrinne, "Enhancing service location protocol for efficiency, scalability and advanced discovery," *The Journal of Systems & Software*, Vol. 75, pp. 193–204, Feb. 2005.

[38] X. Wang and H. Schulzrinne, "Incentive-Compatible adaptation of internet Real-Time multimedia," *IEEE Journal on Selected Areas in Communications*, Vol. 23, pp. 417–436, Feb. 2005.

[39] W. Kellerer, M. Wagner, W.-T. Balke, and H. Schulzrinne, "Preference-based session management for IP-based mobile multimedia signaling," *European Transactions on Telecommunications*, Vol. 15, pp. 415–427, Aug. 2004.

[40] L. Amini, A. Shaikh, and H. Schulzrinne, "Issues with inferring internet topological attributes," *Computer Communications*, Vol. 27, pp. 557–567, Apr. 2004.

[41] P. Mendes, H. Schulzrinne, and E. Monteiro, "How to increase the efficiency of receiver-driven adaptive mechanisms in a new generation of IP networks," *Computer Communications*, Vol. 27, pp. 345–354, Feb. 2004.

[42] A. Dutta and H. Schulzrinne, "MarconiNet: overlay mobile content distribution network," *IEEE Communications Magazine*, Feb. 2004.

[43] H. Schulzrinne, X. Wu, S. Sidiroglou, and S. Berger, "Ubiquitous computing in home networks," *IEEE Communications Magazine*, pp. 128–135, Nov. 2003.

[44] D. Wong, A. Dutta, J. Burns, K. Young, and H. Schulzrinne, "A multilayered mobility management scheme for auto-configured wireless IP networks," *IEEE Wireless Magazine*, Oct. 2003.

[45] A. Dutta, J. Chennikara-Varghese, W. Chen, O. Altintas, and H. Schulzrinne, "Multicasting streaming media to mobile users," *IEEE Communications Magazine*, Oct. 2003.

[46] P. Mendes, H. Schulzrinne, and E. Monteiro, "How to increase the efficiency of receiver-driven adaptive mechanisms in a new generation of IP networks," *Computer Communications*, Vol. 26, 2003.

[47] G. Camarillo, H. Schulzrinne, and R. Kantola, "Evaluation of transport protocols for the session initiation protocol," *IEEE Network*, 2003.

[48] P. Mendes, H. Schulzrinne, and E. Monteiro, "Session-aware popularity resource allocation for assured differentiated services," *IEEE Communications Magazine*, Sept. 2002.

[49] J. Brassil and H. Schulzrinne, "Enhancing Internet streaming media with cueing protocols," *IEEE/ACM Transactions on Networking*, Vol. 10, Aug. 2002.

[50] H. Schulzrinne and K. Arabshian, "Providing emergency services in Internet telephony," *IEEE Internet Computing*, Vol. 6, pp. 39–47, May 2002.

[51] W. Jiang, J. Lennox, S. Narayanan, H. Schulzrinne, K. Singh, and X. Wu, "Integrating Internet telephony services," *IEEE Internet Computing*, Vol. 6, pp. 64–72, May 2002.

[52] H. Schulzrinne, "Internet telefonie – mehr als nur ein telefon mit paketvermittlung," *PIK – Praxis der Informationsverarbeitung und Kommunikation*, Vol. 24, Jan. 2001.

[53] X. Wang and H. Schulzrinne, "An integrated resource negotiation, pricing, and QoS adaptation framework for multimedia applications," *IEEE Journal on Selected Areas in Communications*, Vol. 18, pp. 2514–2529, Dec. 2000.

[54] H. Schulzrinne and J. Rosenberg, "The session initiation protocol: Internet-centric signaling," *IEEE Communications Magazine*, Vol. 38, Oct. 2000.

[55] H. Schulzrinne and E. Wedlund, "Application-layer mobility using SIP," *Mobile Computing and Communications Review (MC2R)*, Vol. 4, pp. 47–57, July 2000.

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