CURRICULUM VITAE

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University of North Carolina at Chapel Hill
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Education

Ph.D. Computer Science, University of Washington.
Honors: IBM Graduate Fellowship.

M.Sc. Computer Science, University of Toronto.
Honors: University of Toronto Open Fellowship.

B.S. Mathematics with Highest Distinction, University of Illinois at Urbana-Champaign.
Honors: Phi Beta Kappa, James Scholar.

Academic Experience

Chairman, Department of Computer Science, University of North Carolina at Chapel Hill, Chapel Hill, NC, 2014–2022.

Gillian T. Cell Distinguished Professor in Computer Science, University of North Carolina at Chapel Hill, Department of Computer Science, Chapel Hill, NC, 2008–present.

S. S. Jones Distinguished Professor in Computer Science, University of North Carolina at Chapel Hill, Department of Computer Science, Chapel Hill, NC, 2001–2008.

S. S. Jones Distinguished Term Associate Professor of Computer Science, University of North Carolina at Chapel Hill, Department of Computer Science, Chapel Hill, NC, 2000.

Associate Professor, University of North Carolina at Chapel Hill, Department of Computer Science, Chapel Hill, NC, 1996–2000.

Visiting Professor, Carnegie Mellon University, School of Computer Science, Pittsburgh, PA, 1994.

Assistant Professor, University of North Carolina at Chapel Hill, Department of Computer Science, Chapel Hill, NC, 1989–1995.

Honors and Awards

Alumni Achievement Award, University of Washington, Department of Computer Science and Engineering, June 2015.

Excellence in Teaching Award, Computer Science Student Association, University of North Carolina at Chapel Hill, Department of Computer Science, May 2011.

Favorite Faculty Award, an award given by the Computer Science majors of the 2010 graduating class, May 2010.

Carolina Women's Center Women's Advocacy Award, University of North Carolina at Chapel Hill, Chapel Hill, NC, March 2010.

Gillian T. Cell Distinguished Professor in Computer Science, University of North Carolina at Chapel Hill, College of Arts and Sciences, Chapel Hill, NC, June 2008.

Outstanding Teaching Award, an award given by the Computer Science majors of the 2008 graduating class, May 2008.

Favorite Faculty Award, an award given by the Computer Science majors of the 2004 graduating class, May 2004.

Edward Kidder Graham Outstanding Faculty Award, an award given by the Class of 2004 and the General Alumni Association, April 2004.

Edward Kidder Graham Advisor of the Year Award, an award given by the Class of 2004 and the General Alumni Association, April 2004.

IEEE Service Award, Service to the IEEE Technical Committee on Real-Time Systems, December 2001.

Outstanding Teaching Award, Computer Science Student Association, University of North Carolina at Chapel Hill, Department of Computer Science, May 2000.

S. Shepard Jones Distinguished Term Professorship, University of North Carolina at Chapel Hill, College of Arts and Sciences, Chapel Hill, NC, March 1999.

Award Papers:

ACM SIGCOMM 2000, 2003.

IEEE International Symposium on High Assurance Systems Engineering 1999, 2000.

IEEE Real-Time Technology and Applications Symposium, 1995.

ACM International Conference on Multimedia, 1994.

Computer Networks and ISDN Systems, 1994.

International Workshop on Network and Operating System Support for Digital Audio and Video, 1991, 1992, 1993, 1997.

Recent Testifying Experience

WSOU Investment, LLC d/b/a Brazos Licensing and Development v. Dell Technologies Inc., Dell Inc., EMC Corporation, and Vmware Inc., United States District Court for the Western District of Texas, Waco Division, Case Nos. 6:20-cv-00481 & -00486-ADA-DTG.

Provided deposition testimony on behalf of defendant Vmware, Inc.

Voxer, Inc. and Voxer IP LLC v. Facebook, Inc. and Instagram LLC, United States District Court for the Western District of Texas, Austin Division, Case No. 1:20-cv-00655 [ADA].

Provided deposition and trial testimony on behalf of defendants Facebook, Inc., and Instagram LLC.

Koninklijke KPN N.V., *v. Telefonaktiebolaget LM Ericsson and Ericsson, Inc.,* United States District Court for the Eastern District of Texas, Marshall Division, Case No. 2:21-cv-113.

Provided trial testimony on behalf of defendants Telefonaktiebolaget LM Ericsson and Ericsson, Inc.

In re: Inter Partes review of U.S. Patent No. 7,783,788.

Provided deposition testimony on behalf of Petitioner Hewlett Packard Enterprise Company.

Egenera, Inc., v. Cisco Systems, Inc., United States District Court for the District of Massachusetts, Case No. 1-16-cv-11613-RGS.

Provided deposition and trial testimony on behalf of defendant Cisco Systems, Inc.

In re: Inter Partes review of U.S. Patent No. US 8,243,593.

Provided deposition testimony on behalf of Petitioner Cloudflare, Inc. and Sonicwall, Inc.

Flexiworld Technologies, Inc., v. Roku, Inc., United States District Court for the Western District of Texas, Waco Division, Case No. 6:20-cv-00819-ADA.

Provided deposition testimony on behalf of defendant Roku, Inc.

Longhorn HD, LLC v. Netscout Systems, Inc., United States District Court for the Eastern District of Texas, Marshall Division, Case No. 2:20-cv-00349.

Provided deposition and trial testimony on behalf of defendant Netscout Systems, Inc.

ClearDoc, Inc. v. Riverside, Inc., United States District Court for the District of Delaware, Case No. 21-

1422-RGA.

Provided deposition testimony on behalf of defendant RiversideFM, Inc.

AlterWAN, Inc. v. Amazon.com, Inc. and Amazon Web Services, Inc., United States District Court for the District of Delaware, Case No. 1:19-cv-01544-MN.

Provided deposition testimony on behalf of defendants Amazon.com, Inc. and Amazon Web Services, Inc.

In the Matter of: Certain Fitness Devices, Streaming Components Thereof, and Systems Containing Same, United States International Trade Commission, Investigation No. 337-TA-1265.

Provided deposition and trial testimony on behalf of complainants DISH DBS Corporation, DISH Technologies, LLC, and Sling TV LLC.

Huawei Technologies Co., Ltd., Huawei Device Co., Ltd., and Huawei Digital Technologies (Chengdu) Co., Ltd. v. Verizon Communications Inc., Cellco Partnership d/b/a Verizon Wireless, and Verizon Business Network Services, Inc., United States District Court for the Western District of Texas, Waco Division, Case No. 6:20-cv-00900.

Provided deposition testimony on behalf of defendants Verizon Communications Inc., *et al*.

In re: Inter Partes review of U.S. Patent No. US 7,450,507.

Provided deposition testimony on behalf of Petitioner NetApp, Inc.

In the Matter of: Certain Digital Video-Capable Devices and Components Thereof, United States International Trade Commission, Investigation No. 337-TA-1224.

Provided deposition and trial testimony on behalf of respondent Intel Corp.

Gigamon Inc., v. Apcon, Inc., United States District Court for the Eastern District of Texas, Marshall Division, Case No. 2:19-cv-300.

Provided deposition and trial testimony on behalf of plaintiff Gigamon Inc.

In re: Inter Partes review of U.S. Patent Nos. 10,022,590, 10,322,315, & 10,486,026.

Provided deposition testimony on behalf of Petitioner Echelon Fitness Multimedia, Inc.

Citrix Systems, Inc., v. Workspot Inc., United States District Court for the District of Delaware, Case No. 18-588-GMS.

Provided deposition testimony on behalf of defendant Workspot Inc.

In the Matter of: Certain Audio Players and Controllers, Components Thereof, and Products Containing the Same, United States International Trade Commission, Investigation No. 337-TA-1191.

Provided deposition and trial testimony on behalf of respondent Alphabet Inc. and Google LLC.

Monarch Networking Solutions LLC, v. Cisco Systems, Inc., United States District Court for the Eastern District of Texas, Marshall Division, Case No. 2:20-cv-00015-JRG.

Provided deposition testimony on behalf of defendant Cisco Systems, Inc.

Sprint Communications Company L.P., v. Cequel Communications, LLC d/b/a Suddenlink Communications, and CSC Holdings, LLC d/b/a/ Optimun-Cablevision, United States District Court for the District of Delaware, Case No. 18-1752-RGA.

Provided deposition testimony on behalf of defendants Suddenlink Communications and Optimun-Cablevision.

In re: Inter Partes review of U.S. Patent Nos. 7,710,978, 7,773,588 & 8,560,828.

Provided deposition testimony on behalf of Patent Owner directPacket Research, Inc.

Centripetal Networks, Inc., v. Cisco Systems, Inc., United States District Court for the Eastern District of Virginia, Norfolk Division, Case No. 2:18-cv-00094-HCM-LRL.

Provided deposition and trial testimony on behalf of defendant Cisco Systems, Inc.

In re: Inter Partes review of U.S. Patent Nos. 8,064,935 & 9,602,655.

Provided deposition testimony on behalf of Petitioner Resideo Technologies, Inc.

In the Matter of: Certain Wireless Communication Devices and Related Components Thereof, United States International Trade Commission, Investigation No. 337-TA-1180.

Provided deposition testimony on behalf of respondent HTC Corporation and HTC America, Inc.

Gummarus LLC, v. Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc., United States District Court for the Eastern District of Texas, Sherman Division, Case No. 4:19-cv-00251.

Provided deposition testimony on behalf of defendant Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc.

Uniloc 2017, LLC, v. Netflix, Inc., United States District Court for the Central District of California, Los Angeles Division, Case No. 8:18-cv-02055-JVS-DFM.

Provided a tutorial at a Markman Hearing on behalf of defendant Netflix, Inc.

directPacket Research, Inc. v. Polycom, Inc., United States District Court for the Northern District of California, San Jose Division, Case No. 5:19-cv-03918-LHK.

Provided deposition testimony on behalf of plaintiff directPacket Research, Inc.

Symantec Corp. and Symantec Limited v. Zscalar, Inc., United States District Court for the Northern District of California, San Francisco Division, Case No. 3:17-cv-04426-JST.

Provided deposition testimony on behalf of defendant Zscalar, Inc.

In re: Inter Partes review of U.S. Patent Nos. 8,631,120 & 9,148,493.

Provided deposition testimony on behalf of Petitioner Avi Networks, Inc.

Finite State Machine Labs Inc., v. Spectracom Corporation, Orolia USA, Inc., and Orolia S.A., United States District Court for the Western District of Texas, Austin Division, Case Nos. 1:17-cv-01040-SS.

Provided deposition testimony on behalf of defendants Spectracom Corporation, Orolia USA, Inc. and Orolia S.A.

Implicit LLC, v. NetScout Systems Inc. and Sandvine Corporation, United States District Court for the Eastern District of Texas, Marshal Division, Case Nos. 2:18-cv-0053-JRG and 2:18-cv-0054-JRG.

Provided deposition testimony on behalf of defendants NetScout Systems Inc. and Sandvine Corporation, and trial testimony on behalf of defendant NetScout Systems Inc.

In re: Inter Partes review of U.S. Patent Nos. 7,844,037 and 9,203,940.

Provided deposition testimony on behalf of Patent Owner Qualcomm Inc.

Industry Experience

Consultant, Mälardalen University, Vásteras, Sweden, 2001.

Member, Technical Advisory Board, Ganymede Software Inc., Research Triangle Park, NC, 1996–1999.

Consultant and Author, INTEROP Graduate Institute, SOFTBANK Inc., Foster City, CA, 1996–1997.

Consultant, National Science Foundation, Arlington, VA, 1995–2014.

Consultant, Monterey Technologies Inc., Cary, NC, 1994–1996.

Consultant, Hewlett-Packard Inc., Ink Jet Components Division, Corvallis, OR, 1993–1994.

Visiting Researcher, IBM T.J. Watson Research Center, Computer Systems Principles Group, Yorktown Heights, NY, 1986.

Consultant, Boeing Aerospace, Kent, WA, 1985–1986.

Software Engineer, R.R. Donnelley & Sons Company Inc., Technical Center, Chicago, IL, 1984.

Computer Programmer, US Army Corps of Engineers Construction Engineering Research Lab,

Champaign, IL, 1981–1982.

Community Service

Consultant (unpaid), Children's Museum About the World (now called *Exploris*), Raleigh, NC, 1995–1996.

Professional Activities

Editor

Associate Editor, *Real-Time Systems*, Kluwer Academic Publishers, The Netherlands, 2003-2012.

Editor in Chief, *Multimedia Systems*, ACM/Springer-Verlag, Heidelberg, Germany, 2000–2001.

Editorial Board

Journal of Multimedia Tools and Applications, Kluwer Academic Publishers, 1994–1999.

Guest Editor

Computer Communications, special issue on system support for multimedia computing, Volume 18, Number 10, October 1995.

Executive Committees

ACM/SIGCOMM Internet Measurement Conference Steering Committee, 2005-2009.

College of Reviewers, Canada Research Chairs Program, 2004-2008.

Statistical and Applied Mathematical Sciences Institute (SAMSI) program on Network Modeling for the Internet, 2002-2004.

IEEE Technical Committee on Real-Time Systems, 2000-2007.

ACM Special Interest Group on Multimedia, 2000-2002.

Other Committees

IEEE Distinguished Visitors Program, 2004–2007.

Conference Program Chair

11th International Workshop on Quality-of-Service (Co-Chair), Monterey, CA, June 2003.

Sixth IEEE Symposium on Computers and Communications, Hammamet, Tunisia, July 2001.

21st IEEE Real-Time Systems Symposium, Orlando, FL, November 2000.

Tenth International Workshop on Network and Operating System Support for Digital Audio and Video, Chapel Hill, NC, June 2000.

Seventh ACM International Conference on Multimedia (Co-Chair), Orlando, FL, November 1999.

SPIE/ACM Multimedia Computing and Networking 1999 (Co-Chair), San Jose, CA, January 1999.

Sixth ACM International Conference on Multimedia (Associate Chair), Bristol, UK, September 1998.

IEEE International Conference on Multimedia Computing Systems (Associate Chair), Austin, TX, June 1998.

SPIE/ACM Multimedia Computing and Networking 1998 (Co-Chair), San Jose, CA, January 1998.

SPIE/ACM Multimedia Computing and Networking 1997 (Associate Chair), San Jose, CA, February 1997.

IEEE Workshop on Resource Allocation Problems in Multimedia Systems, Washington D.C., December 1996.

Second IEEE Real-Time Technology and Applications Symposium, Boston, MA, June 1996.

Conference General Chair

ACM SIGCOMM Internet Measurement Conference, San Diego, CA, October 2007.

22nd IEEE Real-Time Systems Symposium, London, UK, December 2001.

Tenth International Workshop on Network and Operating System Support for Digital Audio and Video, Chapel Hill, NC, June 2000.

Third IEEE Real-Time Technology and Applications Symposium, Montreal, Canada, June 1997.

IEEE Workshop on Resource Allocation Problems in Multimedia Systems, Washington D.C., December 1996.

Member of Conference Program Committee

21st IEEE International Conference on Network Protocols, Goettingen, Germany, October 2013.

18th IEEE International Conference on Network Protocols, Kyoto, Japan, October 2010.

ACM SIGCOMM 2010, New Delhi, India, August 2010.

17th IEEE International Conference on Network Protocols, Princeton, NJ, October 2009.

9th Passive and Active Measurement Conference 2008, Cleveland, OH, April 2008.

ACM SIGMETRICS 2008, Annapolis, MA, June 2008.

IEEE INFOCOM 2008, Phoenix, AZ, April 2008.

6th ACM SIGCOMM Workshop on Hot Topics in Networks, Atlanta, GA, November 2007.

15th IEEE International Conference on Network Protocols, Beijing, China, October 2007.

5th IEEE Workshop on Embedded Systems for Real-Time Multimedia, Salzburg, Austria, October 2007.

Workshop on Experimental Computer Science, ACM FCRC, San Diego, CA, June 2007.

15th International Workshop on Quality-of-Service, Chicago, IL, June 2007.

17th International Workshop on Network and Operating System Support for Digital Audio and Video, Urbana-Champaign, IL, June 2007.

10th IEEE Global Internet Symposium 2007, Anchorage, AK, May 2007.

ACM SIGMETRICS 2007, San Diego, CA, June 2007.

14th IEEE International Conference on Network Protocols, Santa Barbara, CA, October 2006.

ACM Internet Measurement Conference 2006, Rio de Janeiro, Brazil, October 2006.

Second ACM SIGCOMM Conference on Future Networking Technologies, Lisbon, Portugal, December 2006.

16th International Workshop on Network and Operating System Support for Digital Audio and Video, Newport, RI, June 2006.

IEEE Workshop on Research Directions for Security and Networking in Critical Real-Time and Embedded Systems, San Jose, CA, April 2006.

IEEE INFOCOM 2006, Barcelona, Spain, April 2006.

13th IEEE International Conference on Network Protocols, Boston, MA, November 2005.

15th International Workshop on Network and Operating System Support for Digital Audio and Video, Skamania, WA, June 2005.

IEEE INFOCOM 2005, Miami, FL, March 2005.

SPIE/ACM Multimedia Computing and Networking 2005, San Jose, CA, January 2005.

ACM Multimedia 2004, New York, NY, October 2004.

ACM Internet Measurement Conference 2004, Taormina, Italy, October 2004.

16th EUROMICRO Conference on Real-Time Systems, Catania, Italy, June-July 2004.

14th International Workshop on Network and Operating System Support for Digital Audio and Video, Cork, Ireland, June 2004.

12th International Workshop on Quality-of-Service, Montreal, Canada, June 2004.

10th IEEE Real-time and Embedded Technology and Applications Symposium, Toronto, Canada, May 2004.

IEEE INFOCOM 2004, Hong Kong, March 2004.

24nd IEEE Real-Time Systems Symposium, Cancun, Mexico, December 2003.

19th ACM Symposium on Operating Systems Principles, Lake George, New York, October 2003.

15th EUROMICRO Conference on Real-Time Systems, Porto, Portugal, July 2003.

Ninth IEEE Real-Time and Embedded Technology and Applications Symposium, Toronto, CA, May 2003.

SPIE/ACM Multimedia Computing and Networking 2003, San Jose, CA, January 2003.

23nd IEEE Real-Time Systems Symposium, Austin, TX, November 2002.

10th International Conference on Network Protocols, Paris, France, November 2002.

Second Workshop on Embedded Software, Grenoble, France, October 2002.

22nd IFIP International Symposium on Computer Performance Modeling, Measurement and Evaluation (Performance 2002), Rome, Italy, September 2002.

Eighth IEEE Real-Time and Embedded Technology and Applications Symposium, San Jose, CA, September 2002.

10th International Workshop on Quality-of-Service, Miami, FL, June 2002.

Seventh Global Internet Symposium (held in conjunction with Globecom 2002), Taipei, Taiwan, November 2002.

14th EUROMICRO Conference on Real-Time Systems, Vienna, Austria, June 2002.

ACM SIGMETRICS 2002, Marina del Rey, CA, June 2002.

SPIE/ACM Multimedia Computing and Networking 2002, San Jose, CA, January 2002.

22nd IEEE Real-Time Systems Symposium, London, UK, December 2001.

Sixth Global Internet Symposium (held in conjunction with Globecom 2001), San Antonio, TX, November 2001.

27th EUROMICRO Conference, Warsaw, Poland, September 2001.

Sixth IEEE Symposium on Computers and Communications, Hammamet, Tunisia, July 2001.

Seventh IEEE Real-Time Technology and Applications Symposium, Taipei, Taiwan, June 2001.

Ninth IFIP International Workshop on Quality of Service, Karlsruhe, Germany, June 2001.

SPIE/ACM Multimedia Computing and Networking 2001, San Jose, CA, January 2001.

Fifth Global Internet Mini-Conference (held in conjunction with Globecom 2000), San Francisco, CA, November 2000.

21st IEEE Real-Time Systems Symposium, Orlando, FL, December 2000.

Tenth International Workshop on Network and Operating System Support for Digital Audio and Video, Chapel Hill, NC, June 2000.

Sixth IEEE Real-Time Technology and Applications Symposium, Washington, D.C., June 2000.

SPIE/ACM Multimedia Computing and Networking 2000, San Jose, CA, January 2000.

19th IEEE Real-Time Systems Symposium, Phoenix, AZ, December 1999.

Fourth Global Internet Mini-Conference (held in conjunction with Globecom '99), Rio de Janero, Brazil, November 1999.

Fifth International Workshop on Multimedia Information Systems, Palm Springs, CA, October 1999.

Ninth International Workshop on Network and Operating System Support for Digital Audio and Video, Basking Ridge, NJ, June 1999.

IEEE Workshop on QoS Support for Real-Time Internet Applications, Vancouver, Canada, June, 1999.

Second ACM Workshop on Internet Server Performance (held in conjunction with SIGMETRICS '99), Atlanta, GA, May 1999.

Seventh IEEE International Workshop on Parallel and Distributed Real-Time Systems, San Juan, Puerto Rico, April 1999.

SPIE/ACM Multimedia Computing and Networking 1998, San Jose, CA, January 1999.

19th IEEE Real-Time Systems Symposium, Madrid, Spain, December 1998.

Third Global Internet Mini-Conference (held in conjunction with Globecom '98), Sydney, Australia November 1998.

Sixth ACM International Conference on Multimedia, Bristol, UK, September 1998.

Third IEEE/ACM International Workshop on Multimedia Database Management Systems, Dayton, OH, August 1998.

Eighth International Workshop on Network and Operating System Support for Digital Audio and Video, Cambridge, UK, July 1998.

SPIE Interactive Multimedia Services and Equipment, Zurich, Switzerland, May 1998.

IEEE Workshop on Dependable and Real-Time E-Commerce Systems, Denver, CO, June 1998.

Fourth IEEE Real-Time Technology and Applications Symposium, Denver, CO, June 1998.

IEEE International Conference on Multimedia Computing Systems, Austin, TX, June 1998.

SPIE/ACM Multimedia Computing and Networking 1998, San Jose, CA, January 1998.

16th IEEE Symposium on Reliable Distributed Systems, Durham, NC, October 1997.

Third IEEE Real-Time Technology and Applications Symposium, Montreal, Canada, June 1997.

IEEE Real-Time Education Workshop, Montreal, Canada, June 1997.

Seventh International Workshop on Network and Operating System Support for Digital Audio and Video, St. Louis, MO, May 1997.

17th International Conference on Distributed Computing Systems, Distributed Real-Time Systems Track, Performance of Distributed Systems Track, Distributed Multimedia Track, Baltimore, MD, May 1997.

Fifth IFIP International Workshop on Quality of Service, New York, NY, May 1997.

Third International Conference on Computer Science & Informatics, Raleigh-Durham, NC, March 1997.

SPIE/ACM Multimedia Computing and Networking 1997, San Jose, CA, February 1997.

Fourth ACM International Conference on Multimedia, Boston, MA, November 1996.

Second USENIX Symposium on Operating Systems Design and Implementation, Seattle, WA, October/November 1996.

ACM SIGSOFT '96: Fourth Symposium on the Foundations of Software Engineering, San Francisco, CA, October 1996.

Second IEEE International Workshop on Multimedia Database Management Systems, Blue Mountain Lake, NY, August 1996.

Second IEEE Real-Time Technology and Applications Symposium, Boston, MA, June 1996.

Sixth International Workshop on Network and Operating System Support for Digital Audio and Video, Zushi, Japan, April 1996.

First International Workshop on Real-Time Databases: Issues and Applications, Newport Beach, CA, March 1996.

SPIE Multimedia Computing and Networking 1996, San Jose, CA, February 1996.

16th IEEE Real-Time Systems Symposium, Pisa, Italy, December 1995.

Third ACM International Conference on Multimedia, Technical Paper Program, San Francisco, CA, November 1995.

Third ACM International Conference on Multimedia, Video Program, San Francisco, CA, November 1995.

1995 ACM Conference on Organizational Computing Systems, Technical Track, Milpitas, CA, August 1995.

Fifth IEEE Workshop on Hot Topics in Operating Systems, Orcas Island, WA, May 1995.

15th International Conference on Distributed Computing Systems, Distributed Real-Time Systems Track and CSCW track, Vancouver, British Columbia, Canada, May 1995.

Fifth International Workshop on Network and Operating System Support for Digital Audio and Video, Durham, NH, April 1995.

IEEE Workshop on the Role of Real-Time in Multimedia, Research Triangle Park, NC, December 1993.

14th IEEE Real-Time Systems Symposium, Research Triangle Park, NC, December 1993.

13th International Conference on Distributed Computing Systems, Real-Time Issues Track, Pittsburgh, PA, May 1993.

12th IEEE Real-Time Systems Symposium, San Antonio, TX, December 1991.

IEEE Conference on Communication Software: Communications for Distributed Applications and Systems, Chapel Hill, NC, April 1991.

Conference Organizing Committees

Finance Chair, IEEE Real-Time Systems Symposium, Miami, FL, December 2005.

Finance Chair, IEEE Real-Time Systems Symposium, Lisbon, Portugal, December 2004.

Finance Chair, IEEE Real-Time Systems Symposium, Cancun, Mexico, December 2003.

Poster Session Chair, ACM Symposium on Operating System Principles, Bolton Landing, NY, October 2003.

Demonstrations Chair, ACM Conference on Computer-Supported Cooperative Work, Research Triangle Park, NC, November 1994.

Wine Steward, ACM Symposium on Operating System Principles, Asheville, NC, December 1993.

Local Arrangements Chair, 14th IEEE Symposium on Real-Time Systems, Durham, NC, December 1993.

Refereed Publications

Technical Papers

Explicit Topology Management for Continental-Scale Airborne Networks, B. Newton, J. Aikat, K. Jeffay, IEEE INFOCOM Workshop on Wireless Communications and Networking in Extreme Environments, Atlanta, GA, May 2017, pages 72-77.

Scientific Training in the Era of Big Data: A New Pedagogy for Graduate Education, J. Aikat, T. Carsey, K. Fecho, K. Jeffay, A. Krishnamurthy, P.J. Mucha, A. Rajasekar, S. Ahalt, Big Data, Volume 5, Number

1, 2017, pages 12-18.

Geographic Routing in Extreme-Scale Highly-Dynamic Mobile Ad hoc Networks, B. Newton, J. Aikat, K. Jeffay, Proceedings of the 24th IEEE/ACM International Symposium on Modeling, Analysis, and Simulation of Computer and Telecommunication Systems (MASCOTS), London, UK, September 2016, pages 205-210.

Simulating Large-Scale Airborne Networks with ns-3, B. Newton, J. Aikat, K. Jeffay, Proceedings of the 2015 ACM Workshop on ns-3, Barcelona, Spain, May 2015, pages 32-39.

Explicit Topology Control for Airborne Networks, B. Newton, K. Jeffay, J. Aikat, Proceedings of the 22nd IEEE International Conference on Network Protocols, Research Triangle, NC, October 2014, pages 368-373.

The Continued Evolution of Web Traffic, B. Newton, K. Jeffay, J. Aikat, Proceedings of the 21st IEEE/ACM International Symposium on Modeling, Analysis, and Simulation of Computer and Telecommunication Systems (MASCOTS), San Francisco, CA, August 2013, pages 80-89.

Gini in a Bottle: A Case Study of Pareto's Principle in the Wild, A. Blate, K. Jeffay, International Journal of Computer Networks and Communications Security, Vol. 1, No. 1, June 2013, pages 30-39.

Experiment Replication Using ProtoGENI Nodes, D. O'Neill, J. Aikat, K. Jeffay, Proceedings of the Second GENI Research and Educational Experiment Workshop, Salt Lake City, UT, March 2013, pages 9-15.

Towards Traffic Benchmarks for Empirical Networking Research: The Role of Connection Structure in Traffic Workload Modeling, J. Aikat, S. Hasan, K. Jeffay, F.D. Smith, Proceedings of the 20th IEEE/ACM International Symposium on Modeling, Analysis, and Simulation of Computer and Telecommunication Systems (MASCOTS), Arlington, VA, August 2012, pages 78-86.

Generating Realistic Synthetic TCP Application Workloads, J. Aikat, K. Jeffay, F.D. Smith, Proceedings, GENI Infrastructure Workshop, Princeton, NJ, June 2010, 8 pages.

Correlations of Size, Rate, and Duration in TCP Connections: The Case Against, C. Park, F. Hernández-Campos, J.S. Marron, K. Jeffay, F.D. Smith, Annals of Applied Statistics, Volume 4, Number 1, May 2010, pages 26-52.

Passive, Streaming Inference of TCP Connection Structure for Network Server Management, J. Terrell, K. Jeffay, F.D. Smith, J. Gogan, J. Keller, IFIP International Workshop on Traffic Monitoring and Analysis, Aachen, Germany, May 2009, in, Lecture Notes in Computer Science, Volume 5537, Springer, Berlin, Germany, pages 42-53.

Exposing Server Performance to Network Managers Through Passive Network Measurements, J. Terrell, K. Jeffay, F.D. Smith, J. Gogan, J. Keller, IEEE Internet Network Management Workshop 2008, Orlando, FL, October 2008, pages 1-6.

Multi-Resolution Anomaly Detection for the Internet, L. Zhang, Z. Zhu, K. Jeffay, J.S. Marron, F.D. Smith, IEEE Workshop on Network Management, Phoenix, AZ, April 2008, 6 pages.

The Effects of Active Queue Management and Explicit Congestion Notification on Web Performance, L. Le, J. Aikat, K. Jeffay, F.D. Smith, IEEE/ACM Transactions on Networking, Volume 15, Number 6, December 2007, pages 1217-1230.

Co-Scheduling Variable Execution Time Requirement Real-time Tasks and Non-Real-Time Tasks, A. Singh, K. Jeffay, Proceedings of the 19th Euromicro Conference on Real-Time Systems, Pisa, Italy, July 2007, pages 191-200.

Quantifying the Effects of Recent Protocol Improvements to Standards-Track TCP: Impact on Web Performance, M.C. Weigle, K. Jeffay, F.D. Smith, Computer Communications, Volume 29, Number 15, September 2006, pages 2853-2866.

Tmix: A Tool for Generating Realistic TCP Application Workloads in ns-2, M.C. Weigle, P. Adurthi, F. Hernández-Campos, K. Jeffay, F.D. Smith, ACM Computer Communications Review, Volume 36, Number 3, July 2006, pages 67-76.

A Loss and Queuing-Delay Controller for Router Buffer Management, L. Le, K. Jeffay, F.D. Smith, Proceedings of the 26th IEEE International Conference on Distributed Computing Systems, Lisbon, Portugal, July 2006, 10 pages.

Understanding Patterns of TCP Connection Usage with Statistical Clustering, F. Hernández-Campos, A.B. Nobel, F.D. Smith, K. Jeffay, 13th IEEE/ACM International Symposium on Modeling, Analysis, and Simulation of Computer and Telecommunication Systems (MASCOTS), Atlanta, GA, September 2005, pages 35-44.

Delay-Based Early Congestion Detection and Adaptation: Impact on Web Performance, M.C. Weigle, K. Jeffay, F.D. Smith, Computer Communications, Volume 8, Number 8, May 2005, pages 837-850.

Extremal Dependence: Internet Traffic Applications, F. Hernández-Campos, K. Jeffay, C. Park, J.S. Marron, S.I. Resnick, Stochastic Models, Volume 21, Number 1, 2005, pages 1-35.

Generating Realistic TCP Workloads, F. Hernández-Campos, F.D. Smith, K. Jeffay, Proceedings of the Computer Measurement Group's 2004 International Conference, Las Vegas, NV, December 2004, pages 273-284.

Differential Congestion Notification: Taming the Elephants, L. Le, J. Aikat, K. Jeffay, F.D. Smith, Proceedings of the 12th IEEE International Conference on Network Protocols, Berlin, Germany, October 2004, pages 118-128.

Stochastic Models for Generating Synthetic HTTP Source Traffic, J. Cao, W.S. Cleveland, Y. Gao, K. Jeffay, F.D. Smith M.C. Weigle, Proceedings of IEEE INFOCOM 2004, Hong Kong, March 2004, Volume 3, pages 1546-1557.

Variability in TCP Roundtrip Times, J. Aikat, J. Kaur, D. Smith, K. Jeffay, Proceedings of the 2003 ACM SIGCOMM Internet Measurement Conference, Miami Beach, FL, October 2003, pages 279-284.

Tracking the Evolution of Web Traffic: 1995-2003, F. Hernández-Campos, K. Jeffay, F.D. Smith, Proceedings of the 11th IEEE/ACM International Symposium on Modeling, Analysis, and Simulation of Computer and Telecommunication Systems (MASCOTS), Orlando, FL, October 2003, pages 16-25.

The Effects of Active Queue Management on Web Performance, L. Le, J. Aikat, K. Jeffay, F.D. Smith, Proceedings of ACM SIGCOMM 2003, Karlsruhe, Germany, August 2003, pages 265-276.

Managing Latency and Buffer Requirements in Processing Graph Chains, S.M. Goddard, K. Jeffay, The Computer Journal, Volume 44, Number 6, 2001, (special issue on high-assurance systems), pages 486-503.

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Contributor to: *NSF Report on Network Research Testbeds*, B. Braden, M. Gerla, J. Kurose, J. Lepreau, R. Rao, J. Turner, editors, December 2002. A white paper commission by NSF that led to the creation of a $10 million funding program for network research testbeds.

Contributor to: *R&D for the National Information Infrastructure: Technical Challenges*, M.K. Vernon, E.D. Lazowska, S.D. Personick, editors, Interuniveristy Communications Council (EDUCOM), 1994.

Technical Reports

Beyond Window Sharing Hacks: Support for First-Class Window Sharing, J. Menges, K. Jeffay, Report TR97-021, University of North Carolina at Chapel Hill, Department of Computer Science, Chapel Hill, NC, April 1997.

A Proportional Share Resource Allocation Algorithm For Real-Time, Time-Shared Systems, I. Stoica, H. Abdel-Wahab, K. Jeffay, S.K. Baruah, J.E. Gehrke, C.G. Plaxton, Report TR96-038, University of North Carolina at Chapel Hill, Department of Computer Science, Chapel Hill, NC, September 1996.

Predicting Worst Case Execution Times on a Pipelined RISC Processor, S.J. Bharrat, K. Jeffay, Report TR94-072, University of North Carolina at Chapel Hill, Department of Computer Science, Chapel Hill, NC, April 1994.

The Design, Implementation, and Use of a Sporadic Tasking Model, K. Jeffay, D. Becker, D. Bennett, S. Bharrat, T. Gramling, M. Housel, Report TR94-073, University of North Carolina at Chapel Hill, Department of Computer Science, Chapel Hill, NC, April, 1994.

UNC Collaboratory Project Overview, J.B. Smith, F.D. Smith, P. Calingaert, J.R. Hayes, D. Holland, K. Jeffay, M. Lansman, Report 90-042, University of North Carolina at Chapel Hill, Department of Computer Science, Chapel Hill, NC, November 1990.

An Implementation and Application of the Real-Time Producer/Consumer Paradigm, D. Poirier, K. Jeffay, Report 90-038, University of North Carolina at Chapel Hill, Department of Computer Science, Chapel Hill, NC, October 1990.

The Real-Time Producer/Consumer Paradigm: Towards Verifiable Real-Time Computations, K. Jeffay, Report 89-09-15, University of Washington, Department of Computer Science, Seattle, WA, September 1989, (Ph.D. Dissertation).

On Optimal, Non-Preemptive Scheduling of Periodic and Sporadic Tasks, K. Jeffay, R. Anderson, Report 88-11-06, University of Washington, Department of Computer Science, Seattle, WA, November 1988.

On Optimal, Non-Preemptive Scheduling of Periodic Tasks, K. Jeffay, Report 88-10-03, University of Washington Department of Computer Science, Seattle, WA, October 1988.

Software Engineering of Real-Time Operating Systems, A.C. Shaw, K. Jeffay, Report 88-01-01, University of Washington Department of Computer Science, Seattle, WA, January 1988.

Concurrent Programming with Time, A thesis proposal, K. Jeffay, Report 87-10-03, University of Washington Department of Computer Science, Seattle, WA, October 1987.

A Lace for Ada's Corset, T.P. Baker, K. Jeffay, Report 86-09-06, University of Washington Department

of Computer Science, Seattle, WA, September 1986.

Software Distributions

GENI tmix — A synthetic TCP workload generator for GENI, J. Aikat, D. O'Neil, B. Newton, K. Jeffay, June 2012.

Distributed to the GENI networking research community.

tmix — A synthetic TCP workload generator, F. Hernández Campos, K. Jeffay, F.D. Smith, June 2005.

Distributed to other academic and industry networking research groups via the Web.

UNC VNC — A version of the public domain workspace sharing system VNC to support secure sharing of workspace regions and windows of individual applications. J. Branscomb, L. Fowler, K. Jeffay, August 2004.

Distributed to other research groups and the public via the Web and SourceForge.

thttp 2003 — An HTTP/v1.0 and v1.1 traffic generation program used to simulate the traffic generated by a collection of geographically distributed web browsers and servers. L. Le, A. Van Osdol, F.D. Smith, K. Jeffay, January 2004.

Distributed to other academic and industry networking research groups via the Web.

thttp 2001 — An HTTP/v1.0 and v1.1 traffic generation program used to simulate the traffic generated by a collection of geographically distributed web browsers and servers. F. Hernández Campos, F.D. Smith, K. Jeffay, August 2002.

Distributed to other academic and industry networking research groups via the Web.

Packmime Implementation in ns — An implementation of the Lucent Bell Labs (Bill Cleaveland) HTTP traffic model in ns. M.C. Weigle, K. Jeffay, F.D. Smith, September 2001.

Distributed as part of the Network Simulator (**ns-2**) distribution.

UNC Campus Network Trace Data and Empirical Distributions — A collection of network traces and empirical distributions illustrating the nature of web browsing and the structure of web pages. F. Hernández Campos, K. Jeffay, F.D. Smith, June 2001.

Distributed to other academic and industry networking research groups via the Web.

HTTP Analysis Tools— A set of tools for analyzing http connections. F. Hernández Campos, K. Jeffay, F.D. Smith, June 2001.

Distributed as part of the Network Simulator (**ns-2**) distribution.

thttp — An HTTP traffic generation program used to simulate the traffic generated by a collection of geographically distributed web browsers and servers. M. Christiansen, F.D. Smith, K. Jeffay, January 2000.

Distributed to other academic and industry networking research groups via the Web.

FlowGen — A general purpose, programmable network flow generator. M. Clark, K. Jeffay, F.D. Smith, December 1999.

Distributed to Advanced Networking Systems Inc. for use in performance evaluation studies of Internet 2 and Abilene. Also available via anonymous *ftp* from *http://www.cs.unc.edu/Research/Dirt*.

TruTime Device Drivers for FreeBSD — A set of FreeBSD device drivers for the TruTime GPS boards, A. Moorthy, K. Jeffay, and F.D. Smith, December 1998.

Distributed to Advanced Networking Systems Inc. for use in the IETF Internet Performance Measurement Initiative (IPMI) Surveyor network.

YARTOS (*Yet Another Real-Time Operating System*) — A real-time operating system kernel for Intel x86 platforms that uses a novel task implementation based on a single, shared run-time stack, an

earliest-deadline-first processor scheduling algorithm developed at UNC, and integrates processor scheduling and inter-process communication. K. Jeffay and D. Stone, January 1996.

Distributed to several universities for use in operating system research and teaching. Also adopted by researchers at IBM's Networking Software Division, RTP, NC, for use in constructing a network protocol evaluation testbed.

XPEL (*The X Protocol Engine Library*) — A C^{++} library for constructing modular X Window System pseudo-servers, J. Menges and K. Jeffay, November 1993.

Distributed on the Internet via anonymous *ftp* from *ftp.cs.unc.edu*.

XTV (*X Terminal View*) — An X Window System pseudo-server that supports window sharing and conferencing across the Internet, H. Abdel-Wahab (Old Dominion University) and K. Jeffay, August 1991.

Distributed by MIT as part of the contributed software portion of the X Window System distribution (release 11, version 5). Last revised January 1993.

Also adopted by the NEC Corporation of Japan as the basis for their *Xprotodist* (X protocol distributor) product.

Patents

Methods, Systems, and Computer Readable Media For Topology Management and Geographic Routing in Mobile Ad-Hoc Networks, U.S. Patent Number 9,832,705, B. Newton, K. Jeffay, J. Aikat, November 2017.

High-Performance Virtualized Applications Platform, U.S. Patent Application No. 421-343. A. Blate, K. Jeffay, May 2014.

Methods, Systems, and Computer Program Products For Network Server Performance Anomaly Detection, U.S. Patent No. 8,938,532, J.S. Terrell. K. Jeffay, F.D. Smith, R. Broadhurst, January 2015.

Method for Understanding the Use of TCP/IP Networks by Users, and Non-Parametric Generation of Synthetic Internet Traffic, U.S. Patent Number 7,447,209, F. Hernández-Campos, K. Jeffay, F.D. Smith, A. Nobel, November 2008.

User Controlled Adaptive Flow Control for Packet Networks, U.S. Patent Number 5,892,754, V. Kompella, F.D. Smith, J.P. Gray, and K. Jeffay, April 1999.

Public Demonstrations

Education Modules for Networking, Cloud Computing and Security in Systems Courses, J. Aikat, K. Jeffay, Demo session at the ACM SIGCSE, Special Interest Group for Computer Science Education, Memphis, TN, March 2016.

Exploring the Internet's Future with GENI (Global Environment for Network Innovations), J. Aikat, K. Jeffay, NSF Higher Education Technology Conference 2013, Morgantown, WV, October 2013.

Your first experiment on GENI: a Hands-on Tutorial, J. Aikat, K. Jeffay, NSF Higher Education Technology Conference 2013, Morgantown, WV, October 2013.

NSF Workshop on GENI in Education (one day), J. Aikat, K. Jeffay, New York University - Polytechnic, NY, October 2013.

Using the GENI Networking Testbed, J. Aikat, K. Jeffay, ACM SIGCSE, Special Interest Group for Computer Science Education, Denver, Colorado, March 2013.

Run your Systems/Networking Experiments using (free) GENI Resources, Lunchtime Table Topics, S. Zolayvar, W. Yau, J. Aikat, K. Jeffay, Grace Hopper Celebration of Women in Computing, Baltimore, Maryland, October 2012.

NSF Workshop on Designing Tools and Curricula for Undergraduate Courses in Distributed Systems, J. Aikat, K. Jeffay, Boston, MA, July 2012.

Introduction to Network Experiments using the GENI CyberInfrastructure, J. Aikat, K. Jeffay, ACM SIGMETRICS/Performance Joint International Conference on Measurement and Modeling of Computer Systems, London, UK, June 2012.

The nanoManipulator "reverse field trip" to Orange County High-School, G. Jones, R. Superfine, R.M. Taylor, M. Whitton, T. Lovelace, R. Parameswaran, K. Jeffay, F.D. Smith, Orange County High School, Hillsboro, NC, November 1999.

The Distributed NanoManipulator Project, R.M. Taylor, K. Jeffay, T. Hudson, M. Clark, an invited demonstration for the Internet 2 Spring 1999 Members Meeting, Washington, DC, April 1999.

A Demonstration of Internet Access to UNC-CH Advanced Microscopy Facilities for Science Education Outreach, K. Jeffay, F.D. Smith, R. Superfine, G. Jones, R.M. Taylor, T. Hudson, M. Clark, Orange County High School, Hillsboro, NC, June 1998.

The Artifact-Based Collaboration (ABC) System, J.B. Smith, K. Jeffay, D. Shackelford, J. Menges, J. Hilgedic, B. Ladd, M. Parris, E. Kupstas, T. Ellis, and T. Hudson, CSCW '94, ACM Conference on Computer-Supported Cooperative Work, RTP, NC, October 1994.

CONCUR: A Window System Supporting Window Sharing, J. Menges and K. Jeffay, CSCW '94, ACM Conference on Computer-Supported Cooperative Work, RTP, NC, October 1994.

Adaptive, Best-Effort Delivery of Live Audio and Video Across Packet-Switched Networks, K. Jeffay, Second MCNC/NSF Packet Video Workshop, Research Triangle Park, NC, December 1992.

Grants and Awards

GENI in the classroom: Course Modules for Teaching Networking Concepts, J. Aikat, K. Jeffay, National Science Foundation (GENI Project: Raytheon Corporation), October 2013, 3 years, $178,978.

II-New: Seeing the Future: Ubiquitous Computing in EyeGlasses, J.-M. Frahm, *et al*., National Science Foundation, November 2013, 3 years, $613,623.

GENI Tutorial at ACM SIGCSE, J. Aikat, K, Jeffay, National Science Foundation, grant number CNS 13-32340, March 2013, 1 year, $13,388.

Development of Education and Training Resources for GENI Experimenters, K, Jeffay, J. Aikat, Global Environment for Network Innovations/National Science Foundation, December 2011, 3 years, $388,590.

Exploring Privacy Breaches in Encrypted VoIP Communications, F. Monrose, K, Jeffay, National Science Foundation, grant number CNS 10-17318, August 2010, 3 years, $496,492.

Synthetic Traffic Generation Tools and Resource: A Community Resource for Experimental Networking Research, K, Jeffay, F.D. Smith, UNC, M. Weigle, Old Dominion University, A. Vahdat, University of California San Diego, P. Barford, University of Wisconsin, National Science Foundation, grant number CRI 07-09081, August 2007, 3 years, $799,745.

Modeling and Testing of Application Workloads on Corporate Enterprise Networks, K, Jeffay, F.D. Smith, IBM Global Services Faculty Award, September 2006, 2 years, $70,000 (exempt from indirect

costs).

Tera-pixels: Using High-resolution Pervasive Displays to Transform Collaboration and Teaching, K, Jeffay, A. Lastra, K. Mayer-Patel, L. McMillan, F.D. Smith, National Science Foundation (CISE RI Program), grant number EIA 03-03590, August 2003, 5 years, $962,902.

Extracting and Using Semantic Information in Network Workloads, K, Jeffay, F.D. Smith, IBM Global Services Faculty Award, September 2006, 1 year, $40,000 (exempt from indirect costs).

Modeling and Testing of Application Workloads on Corporate Enterprise Networks, K, Jeffay, F.D. Smith, IBM Global Services Faculty Award, September 2006, 1 year, $40,000 (exempt from indirect costs).

Generation and Validation of Synthetic Internet Traffic, K, Jeffay, F.D. Smith, A.B. Noble, National Science Foundation, grant number ANI 03-23648, September 2003, 3 years, $470,000.

Rate-Based Resource Allocation Methods for Real-Time Embedded Systems, K, Jeffay, F.D. Smith, National Science Foundation, grant number CCR 02-08924, August 2002, 3 years, $179,990.

Empirical Workload Characterizations for Advanced Networks, K. Jeffay, F.D. Smith, Cisco Systems, November 2000, 3 years, $212,500.

Support for Active Queue Management, Distributed XP Programming, and a Teaching Laboratory for Web Services, F.D. Smith, K. Jeffay, J.B. Smith, P.D. Stotts, IBM Shared University Research Grant, August 2002, 1 year, $83,000.

Internet Traffic Measurement and Analysis and A Teaching Laboratory for Enterprise Java Computing, F.D. Smith, K. Jeffay, J.B. Smith, P.D. Stotts, IBM Shared University Research Grant, April 2001, 1 year, $83,000.

An NS Implementation of the HTTP Connection Model, F.D. Smith, K. Jeffay, M. Clark Weigle, Lucent Technologies, April 2001, $10,000.

Multimedia Networking Research in Support of Virtual Field Trips, K. Jeffay, F.D. Smith, R.M. Taylor II, Dell Computer Corporation Strategic Technology and Research (STAR) program, December 2000, 1 year, $25,000.

Rate-based Scheduling Technology for Latency-Sensitive Graphics Applications, J. Anderson, S. Baruah, K. Jeffay, R. Taylor, National Science Foundation, grant number ITR 00-82866, September 2000, 3.5 years, $350,000.

Active Router Queue Management for Congestion Control and Quality-of-Service, K. Jeffay, F.D. Smith, National Science Foundation, grant number ITR 00-82870, September 2000, 3 years, $451,903.

Internet Measurements and Analysis to Support the nanoManipulator and Tele-Immersion, F.D. Smith, K. Jeffay, P. Jones, IBM Shared University Research Grant, September 2000, 1 year, $250,000.

The Performance of Differentiated Services Implementations for Supporting Distributed Virtual Environment Applications, K. Jeffay, North Carolina Network Initiative, September 2000, 1 year, $25,000.

Empirical Application-Workload Characterizations for Advanced Networks, K. Jeffay, F.D. Smith, Sun Microsystems, September 2000, $79,000.

Empirical Application-Workload Characterizations for Advanced Networks, F.D. Smith, K. Jeffay, MCNC, September 2000, 1 year, $50,000.

A Quality-of-Service Network for the nanoManipulator, K. Jeffay, Cabletron Inc. and the North Carolina Network Initiative, September 1999, $25,000.

Interactive Graphics for Molecular Studies and Microscopy — Supplement for Collaborative Science, F.P. Brooks, D. Erie (Chemistry), K. Jeffay, J. Samulski (Gene Therapy), F.D. Smith, D. Sonnenwald (Information and Library Science), R. Superfine (Physics and Astronomy), R. Taylor, National Institute of Health, October 1998, 4 years, $1,902,544.

Computing Power for Collaborative Science, S.R. Aylward, G. Bishop, D.W. Brenner, E. Bullitt, E.L. Chaney, V.L. Chi, B.J. Dempsey, N. England, A.G. Gash, D. Fritsch, H. Fuchs, B. Hemminger, J. Hermans, K. Jeffay, K. Keller, A. Lastra, M. Lin, D. Manocha, L.S. Nyland, S.M. Pizer, J.W. Poulton, J.F. Prins, J. Rosenman, F.D. Smith, R. Superfine, R.M. Taylor, S. Tell, G. Tracton, A. Tropsha, S. Washburn, G. Welch, Intel Corporation, August 1998, 3 years, $2,858,747. PI on *Multimedia Networking* and *A Distributed Teaching Laboratory for Networking and Internet Technologies* sections (F.D. Smith, B.J. Dempsey, Co-PIs), $557,669.

Empirical Application-Workload Characterizations for Advanced Networks, F.D. Smith, K. Jeffay, North Carolina Network Initiative, September 1998, $40,000.

Congestion control for high-speed networks, F.D. Smith, K. Jeffay, IBM Corporation, 1998, $20,000.

A Communications Middleware For Immersive Distributed Virtual Environments, K. Jeffay, North Carolina Network Initiative, 1998, $15,000.

Technology for Real-Time Services in Protocol Stack Implementations, K. Jeffay, IBM Corporation, 1997, $80,000.

Internet Access to UNC-CH Advanced Microscopy Facilities for Science Education Outreach, K. Jeffay, R. Superfine (Physics and Astronomy), G. Jones (Education), University of North Carolina at Chapel Hill Instructional Technology Award, 1997, $29,750.

Support for the Real-Time Technology and Applications Symposium, K. Jeffay, Office of Naval Research, 1997, $7,000.

Research Experience For Undergraduates supplement to *Object Sharing Technology For Real-Time Systems*, J. Anderson, K. Jeffay, National Science Foundation, 1996, $10,000.

Infrastructure for Research in Collaborative Systems, S.F. Weiss, J.B. Smith, K. Jeffay, P. Dewan, P. D. Stotts, D.K. Smith, F.D. Smith, W. Oliver (U.S. Armed Forces Institute of Pathology), National Science Foundation, grant number CDA-9624662, August 1996, 5 years, $1,260,830.

Collaboration Bus: An Infrastructure for Supporting Interoperating Collaborative Systems, P. Dewan, K. Jeffay, H. Abdel-Wahab (Old Dominion University), P. D. Stotts, L. Nyland, J.B. Smith, J. Mchugh (Portland State University), J. Menges (Hewlett Packard), Advanced Research Projects Agency, grant number 96-06580 (High Performance Distributed Services Technology), 1996, $973,334.

Object Sharing Technology For Real-Time Systems, J. Anderson, K. Jeffay, National Science Foundation, grant number CCR 95-10156, 1996, $209,442.

Flexible Shared Windows, P. Dewan, K. Jeffay, National Science Foundation, grant number IRIS 95-08514, 1995, $343,811.

An ATM Testbed For Multimedia Networking and Computer-Supported Cooperative Work, K. Jeffay, IBM Corporation, 1995, $400,000.

An Examination of Flow and Congestion Control Mechanisms for Media Transmission in Collaborative

Systems, K. Jeffay, IBM Corporation, 1995, $125,242.

Software Infrastructure for the Rapid Development of Interactive and Collaborative Educational Simulations, J.F. Prins, K. Jeffay, P.D. Stotts, L.S. Nyland, Advanced Research Projects Agency, grant number 95-36871 (Computer Aided Education and Training Initiative), 1995, $200,000.

A Proposal For Network Routers, K. Jeffay, IBM Corporation, Research Triangle Park, NC, 1994, $40,000.

System Support For Video Teleconferencing Across Local Area Networks, K. Jeffay, Intel Corporation, 1993, $253,385.

The Integration and Use of Digital Audio and Video in Desktop Computing Environments, K. Jeffay, IBM Corporation, 1993, $100,000.

Construction of a UNC-Tektronix MBONE Link, K. Jeffay, Tektronix Corporation, 1993, $10,000.

An Empirical Determination of the Limits of Human Perception of Properties of Digital Audio and Video Streams, K. Jeffay, University of North Carolina Research Council, 1993, $2,000.

Processor and Resource Allocation Problems in Hard-Real-Time Systems: Theory and Practice, K. Jeffay, National Science Foundation, RIA Award, 1991, $59,400.

Accommodating Continuous Media in a Local Area Network: An exercise in distributed real-time computing, K. Jeffay, University of North Carolina Junior Faculty Development Award, 1990, $3,000.

Building and Using a Collaboratory: A Foundation for Supporting and Studying Group Collaborations, J.B. Smith, F.D. Smith, P. Calingaert, K. Jeffay, J.R. Hayes, D. Holland, M. Lansman, National Science Foundation, grant number ICI-9015443, 1990, $946,000.

Enhanced program of research and teaching in communications software and distributed systems, K. Jeffay, IBM Corporation, 1989, $429,000.

The Design and Construction of Predictable Real-Time Systems, K. Jeffay, Digital Faculty Program Award, Digital Equipment Corporation, 1989, $180,000.

Invited Presentations

Keynote Addresses

Network Neutrality Considered Harmful,

PearlHacks, University of North Carolina at Chapel Hill, Chapel Hill, NC, March 2014.

Carolina Science Café, University of North Carolina at Chapel Hill, Chapel Hill, NC, May 2015.

Network Neutrality Considered Harmful, Revisiting the Quality-of-Service Morass

ACM International Workshop on Network and Operating System Support for Digital Audio and Video, Newport, RI, May 2006.

Rate-Based Resource Allocation Methods for Multimedia Computing

SPIE Multimedia Computing and Networking 2003, Santa Clara, CA, January 2003.

Network Support For Distributed Virtual Environments: The Tele-nanoManipulator

NCNI Advanced Networking Symposium, Research Triangle Park, NC, May 1999.

The Internet 2 Spring Members Meeting (presented jointly with R.M. Taylor),

Washington, DC, April 1999.

Network Support For Distributed, Immersive, Virtual Environments

Workshop on Automated Control of Distributed Instrumentation, Beckman Institute for Advanced Science and Technology, University of Illinois at Urbana-Champaign, Urbana, IL, April 1999.

The Future of Networking: The Networking Revolution Has Yet to Begin

North Carolina Governor's Board of Science and Technology Retreat, Banner Elk, NC, September 1998.

Distinguished Lectures

The Synthetic Traffic Generation Problem: The least sexy problem in computer networking

University of Minnesota, Minneapolis, MN, January 2008.

The Effect of Active Queue Management on Web Performance: The Good, the Bad, and the Ugly

University of Nebraska, Lincoln, NE, November 2003.
University of Pennsylvania, April 2004.

The Evolution of Quality-of-Service on the Internet

Mälardalen University, Sweden, February 2001.

Colloquia

Efficient Topology Management and Geographic Routing in High-Capacity Continental- Scale Airborne Networks

University of Virginia, November 2017.

The Evolution of Quality-of-Service on the Internet

IEEE Computer Society Seattle Chapter, Seattle, WA, September 2005.

Modeling and Generating TCP Application Workloads

Georgia Institute of Technology, Atlanta, GA, September 2005.
Microsoft Research, Redmond, WA, September 2005.
Worcester Polytechnic Institute, Worcester, MA, July 2005.
Cisco Systems, RTP, NC, May 2005 (presently jointly with F. Hernandez-Campos and F.D. Smith).

A Rate-Based Execution Abstraction For Embedded Real-Time Systems

University of Pennsylvania, April 2004.

How "Real" Can Synthetic Network Traffic Be?

University of Virginia, March 2004.

Non-Parametric Approach to Generation and Validation of Synthetic Network Traffic

Columbia University, New York, NY, January 2004.

Is Explicit Congestion Notification (ECN) Worthwhile?

Cisco Systems, San Jose, CA, October 2003.
Intel Architecture Labs, Hillsboro, OR, October 2003.

Tuning RED for Web Traffic: RED Considered Harmful?

Sprint Advanced Technology Research Laboratories, San Francisco, CA, March 2000.
University of Illinois at Urbana-Champaign, Urbana, IL, March 2000.

Internet Traffic: Measurement & Generation

Ganymede Software, Research Triangle Park, NC, June 1999. (Presented jointly with F.D. Smith.)

Lightweight Active Router-Queue Management for Multimedia Networking

University of Toronto, October 2000.
HP Laboratories, Palo Alto, CA, January 1999.
Sprint Advanced Technology Research Laboratories, San Francisco, CA, January 1999.

A Better-Than-Best-Effort Service For UDP: Lightweight Active Router-Queue Management for Multimedia Networking

University of Virginia, January 1999.

Congestion Control Mechanisms for Real-Time Communications on the Internet

IBM Networking Systems, Research Triangle Park, NC, November 1998.

A Better Than Best-Effort Forwarding Service For UDP

Microsoft Research, Redmond, WA, March 1998.
IBM Networking Systems, Research Triangle Park, NC, March 1998.

Multimedia Networking Research at UNC Chapel Hill

IBM Networking Systems, Research Triangle Park, NC, February 1998.
Lucent Technologies, Bell Laboratories, Holmdel, NJ, June 1997.

Design Principles for Distributed, Interactive, Virtual Laboratories

Mitsubishi Electric Research Laboratory, Cambridge, MA, January 1998.
Lucent Technologies, Bell Laboratories, Holmdel, NJ, June 1997.

The Performance of Two-Dimensional Media Scaling for Internet Videoconferencing

Mitsubishi Electric Research Laboratory, Cambridge, MA, January 1998.
Carnegie Mellon University, Pittsburgh, PA, March 1997.

Some Approaches to Enabling Real-Time Computation on Desktop Operating Systems

Honeywell Technology Center, Minneapolis, MN, October 1996.

Two-Dimensional Scaling Techniques for Adaptive, Rate-Based Transmission Control of Live Audio and Video Streams

Oregon State University, Corvallis, OR, May 1996.

A Router-Based Congestion Control Scheme For Real-Time Continuous Media

Intel Architecture Development Laboratory, Hillsboro, OR, May 1996.
NetEdge Inc., Research Triangle Park, NC, March 1996.
North Carolina State University, Raleigh, NC, March 1996.

A Hybrid Reservation-Based/Best-Effort Transmission Scheme For Real-Time Transmission of Multimedia Data

Intel Research Council, Hillsboro, OR, November 1995.

Operating System Support For Multimedia Computing

IBM Networking Systems, Research Triangle Park, NC, July 1995.

Network Support For Multimedia Computing

IBM Networking Systems, Research Triangle Park, NC, July 1995.

A Rate-Based Execution Abstraction For Multimedia Computing

Tektronix Computer Research Laboratory, Beaverton, OR, May 1996.

INRIA, Rocquencourt, France, December 1995.

AT&T Bell Laboratories, Murray Hill, NJ, July 1995.

A Theory of Rate-Based Scheduling

Carnegie Mellon University, Pittsburgh, PA, August 1994.

Demonstration of Videoconferencing Over Packet-Switched Internetworks

Global Lecture Hall of the U.S.-Russian Electronic Distance Education System/TELE-TEACHING '93, Trondheim, Norway (via satellite from Chapel Hill), August 1993.

Transport and Display Mechanisms For Multimedia Conferencing Across Packet-Switched Networks

York University, York, England, November 1993.

Purdue University, West Lafayette, IN, February 1993.

Intel Architecture Development Laboratory, Hillsboro, OR, February 1993.

Oregon Graduate Institute, Beaverton, OR, February 1993.

Second MCNC/NSF Packet Video Workshop, Research Triangle Park, NC, December 1992.

Carnegie Mellon University, Pittsburgh, PA, November 1992.

Multimedia and Conferencing Research at UNC-CH

IBM Multimedia Networking, Research Triangle Park, NC, September 1992.

System Support for Synchronous Collaboration

North Carolina Artificial Intelligence and Advanced Computing Symposium, Raleigh, NC, March 1992.

Software Architectures for Predictable Real-Time Computer Systems

Carnegie Mellon University, Pittsburgh, PA, March 1992.

Operating System Requirements for Digital Audio and Video

MCNC/NSF Packet Video Videoconferencing Workshop, Research Triangle Park, NC, December 1991.

Some Experiments With Live Digital Audio and Video on a Local-Area Network

IBM European Networking Center, Heidelberg, Germany, November 1991.

Network and Operating System Support for Digital Audio and Video

Duke University, Durham, NC, November 1994.
Carnegie Mellon University, Pittsburgh, PA, April 1994.
Intel Corporation, Hillsboro, OR, December 1993.
IBM Networking Systems, Research Triangle Park, NC, June 1992.
IBM TJ Watson Research Center, Yorktown Heights, NY, March 1992.
University of Washington, Seattle, WA, February 1992.
Old Dominion University, Norfolk, VA, October 1991.

Systems Research in the UNC Collaboration Project

Intel Architecture Development Laboratory, Hillsboro, OR, May 1992.
University of Colorado, Boulder, CO, March 1991.

Some Deterministic Resource Allocation Problems in Real-Time Computer Systems

Research Triangle Institute, Research Triangle Park, NC, June 1990.
University of North Carolina at Chapel Hill, Department of Operations Research, Chapel Hill, NC, October 1989.

The Real-Time Producer/Consumer Paradigm: Towards Verifiable Real-Time Computations

Carnegie-Mellon University, Pittsburgh, March 1991.
Duke University, Durham, NC, June 1990.
Technical University of Denmark, Lyngby, Denmark, September 1989.
University of California at Davis, Davis, CA, April 1989.
University of Minnesota, Minneapolis, MN, April 1989.
Purdue University, West Lafayette, IN, April 1989.
University of North Carolina at Chapel Hill, Chapel Hill, NC, April 1989.
University of British Columbia, Vancouver, BC, Canada, April 1989.
Rice University, Houston, TX, March 1989.
University of Arizona, Tucson, AZ, March 1989.
Oregon Graduate Center, Beaverton, OR, March 1989.
Tektronix Computer Research Laboratory, Beaverton, OR, March 1989.
University of Colorado, Boulder, CO, March 1989.
IBM TJ Watson Research Center, Yorktown Heights, NY, March 1989.
IBM Systems Integration Division, Owego, NY, March 1989.
New York University, New York, NY, March 1989.
Bell Communications Research, Morristown, NJ, March 1989.

Concurrent Programming With Time

Olivetti Research Center, Menlo Park, CA, December 1987.
IBM TJ Watson Research Center, Yorktown Heights, NY, September 1987.
Columbia University, New York, NY, September 1987.

Short Courses

Trends in Congestion Control and Quality-of-Service: Active queue management on the Internet of the future

Mälardalen University, Sweden, February 2001.

Rate-Based Execution Models For Real-Time Multimedia Computing

Scuola Superiore Santa Anna, Pisa, Italy, September 1997.

Tutorials *Issues in Multimedia Delivery Over Today's Internet*
IEEE International Conference on Multimedia Computing Systems, Austin, TX, June 1998.

Systems Issues in the Design and Realization of Desktop Videoconferencing Systems,
Second ACM International Conference on Multimedia, San Francisco, CA, October 1994.

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