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EDUCATION

Ph.D. 1978, University of North Carolina at Chapel Hill, Computer Science
M.S. 1964, University of Tennessee at Knoxville, Industrial Management
B.S. 1962, University of Tennessee at Knoxville, Chemistry

ACADEMIC EXPERIENCE

University of North Carolina at Chapel Hill, Department of Computer Science
Research Professor, March 1997 - present
Adjunct Associate Professor, Jan. 1993 - Feb. 1997 (part-time)
Visiting Associate Professor, Jan. 1991 - Dec. 1992 (on assignment from IBM)
Adjunct Associate Professor, July 1989 - Dec. 1990 (on assignment from IBM)

Carnegie Mellon University, Pittsburgh, PA
Assistant Director, Information Technology Center:
Andrew Project, 1983-1986 (on assignment from IBM)

INDUSTRIAL EXPERIENCE

IBM Corporation
Senior Technical Staff Member, 1992-1997
Manager, Experimental Systems, 1987-1989
Manager, Architecture Technology, 1979-1982
Advisory Engineer, 1972-1979
Staff Engineer, 1969-1972
Systems Engineer, 1965-1968

Union Carbide Corporation, Oak Ridge, TN
Scientific Programmer, 1963-1965

PUBLICATIONS

C. Park, F. Hernández-Campos, L. Le, J. S. Marron, J. Park, V. Pipiras, F.D. Smith, R. L. Smith, M. Trovero, and Z. Zhu, “Long Range Dependence Analysis of Internet Traffic”, *Journal of Applied Statistics*, (to appear 2010).

C. Park, F. Hernández-Campos, J. S. Marron, K. Jeffay, and F.D. Smith, “Analysis of Dependence Among Size, Rate, and Duration in Internet Flows”, *Annals of Applied Statistics*, Vol. 4, No. 1, pp. 26-52, May 2010.

J. Terrell, K. Jeffay, F. D. Smith, J. Gogan, J. Keller, “Passive Streaming Inference of TCP Connection Structure for Network Server Management”, *IFIP 1st International Workshop on Traffic Monitoring and Analysis*, May 2009, in Lecture Notes in Computer Science, Vol. 5537, Springer-Verlag, pp. 42-53.

J. Terrell, K. Jeffay, F. D. Smith, J. Gogan, J. Keller, “Exposing Server Performance to Network Managers Through Passive Network Measurements”, *IEEE Internet Network Management Workshop*, October 2008.

- L. Zhang, Z. Zhu, K. Jeffay, J. S. Marron, and F. D. Smith, "Multi-Resolution Anomaly Detection for the Internet", *IEEE Workshop on Automated Network Management*, April 2008, 6 pages.
- L. Le, J. Aikat, K. Jeffay, and F.D. Smith, "The Effects of Active Queue Management and Explicit Congestion Notification on Web Performance", *IEEE/ACM Transactions on Networking*, Vol 15, No. 6, December 2007, pp 1217-1230.
- S. Rewaskar, J. Kaur, and F.D. Smith, "A Performance Study of Loss Detection/Recovery in Real-world TCP Implementations", *Proceedings of IEEE ICNP 2007*, October 2007, pp. 256-265.
- F. Hernández-Campos, K. Jeffay, F. D. Smith, "Modeling and Generating TCP Application Workloads" (invited paper) *Proceedings of IEEE Broadnets 2007*, September 2007.
- M.C. Weigle, K. Jeffay, and F.D. Smith, "Quantifying the Effects of Recent Protocol Improvements to TCP: Impact on Web Performance", *Computer Communications*, Vol 29, No 15, September 2006, pp. 2853-2866.
- S. Rewaskar, J. Kaur, and F.D. Smith, "A passive state-machine approach for accurate analysis of TCP out-of-sequence segments", *ACM SIGCOMM Computer Communication Review*, Vol. 36, No. 3, July 2006, pp. 51-64.
- M. C. Weigle, P. Adurthi, F. Hernández-Campos, K. Jeffay, F. D. Smith, "Tmix: a tool for generating realistic TCP application workloads in ns-2", *ACM SIGCOMM Computer Communication Review*, Vol. 36, No. 3, July 2006, pp. 65-76.
- L. Le, K. Jeffay, and F.D. Smith, "A Loss and Queuing-Delay Controller for Router Buffer Management", *Proceedings of IEEE ICDCS 2006*, July 2006.
- F. Hernández-Campos, A. B. Nobel, F. D. Smith, and K. Jeffay, "Understanding Patterns of TCP Connection Usage with Statistical Clustering", *Proceedings of MASCOTS 2005*, October 2005, pp. 35-44.
- C. Park, F. Hernández-Campos, J. S. Marron, and F.D. Smith, "Long-Range Dependence in a Changing Internet Traffic Mix," *Computer Networks*, Vol. 48, No. 3, June 2005, pp. 401-422.
- M. C. Weigle, K. Jeffay, and F.D. Smith, "Delay-Based Early Congestion Detection and Adaptation: Impact on Web Performance," *Computer Communications*, Vol. 28, No. 8, May 2005, pp. 837-850.
- F. Hernández-Campos, J. S. Marron, G. Samorodnitsky and F. D. Smith, "Variable Heavy-Tails in Internet Traffic", *Performance Evaluation*, vol. 58, no.2-3, November 2004, pp. 261-284.
- L. Le, J. Aikat, K. Jeffay, and F.D. Smith, "Differential Congestion Notification: Taming the Elephants," *Proceedings of IEEE ICNP*, October 2004, pp. 118-128.
- J. Cao, W.S. Cleveland, Y. Gao, K. Jeffay, F.D. Smith, and M.C. Weigle, "Stochastic Models for Generating Synthetic HTTP Source Traffic," *Proceedings of INFOCOM 2004*, pp. 1546-1557
- A. Budhiraja, F. Hernández-Campos, V.G. Kulkarni, and F. D. Smith, " Stochastic Differential Equation for TCP Window Size: Analysis and Experimental Validation", *Probability in the Engineering and Informational Sciences*, vol. 18, no. 1, January 2004, pp. 111-140.
- J. S. Marron, F. Hernandez-Campos, and F.D. Smith, "A SiZer Analysis of IP Flow Start Times", in Institute of Mathematical Statistics Lecture Notes-Monograph Series, Volume 44, J. Rojo and V. Perez-Abreu (Eds), 2004, pp. 87-105.

Jan Hannig, J.S. Marron, Gennady Samorodnitsky and F.D. Smith, "Log-Normal Durations Can Give Long Range Dependence", in Institute of Mathematical Statistics Lecture Notes-Monograph Series, Volume 42, M. Moore, S. Froda and C. L'eger, (Eds), 2004, pp. 333-345.

J. Aikat, J. Kaur, F. D. Smith, and K. Jeffay, "Variability in TCP Round-trip Times," in *Proceedings of the ACM SIGCOMM Internet Measurement Conference*, Miami, FL, October 2003, pp. 279-284.

F. Hernández-Campos, Kevin Jeffay and F. D. Smith, "Tracking the Evolution of Web Traffic: 1995-2003", *Proceedings of ACM/IEEE MASCOTS 2003*, October 2003, pp 16-25.

M.C. Weigle, K. Jeffay, and F.D. Smith, "Quantifying the Effects of Recent Protocol Improvements to Standards-Track TCP", *Proceedings of ACM/IEEE MASCOTS 2003*, October 2003, pp 226-229.

L. Le, J. Aikat, K. Jeffay, and F.D. Smith, "The Effects of Active Queue Management on Web Performance", *Proceedings of ACM SIGCOMM 2003*, pp. 265-276.

F. Hernández-Campos, A. B. Nobel, F. D. Smith, and K. Jeffay, "Statistical Clustering of Internet Communication Patterns", *Proceedings of the 35th Symposium on the Interface of Computing Science and Statistics, Computing Science and Statistics, Vol. 35*, July 2003.

F. Hernández-Campos, J. S. Marron, G. Samorodnitsky and F. D. Smith, "Variable Heavy-Tail Durations in Internet Traffic, Part I: Understanding Heavy Tails", *Proceedings of ACM/IEEE MASCOTS 2002*, October, 2002, pp 43-52.

F. Hernández-Campos, J. S. Marron, G. Samorodnitsky and F. D. Smith, "Variable Heavy-Tail Durations in Internet Traffic, Part II: Theoretical Implications", *Proceedings of the 40th Allerton Conference on Communications, Control and Computing*, October, 2002.

J. S. Marron, F. Hernández-Campos, and F. D. Smith, "Mice and Elephants Visualization of Network Traffic", *Proceedings of 15th Conference on Computational Statistics*, August, 2002.

F.D. Smith, F. Hernandez, K. Jeffay, and D. Ott, "What TCP/IP Protocol Headers Can Tell Us About the Web", *Proceedings of ACM SIGMETRICS 2001/Performance 2001*, Cambridge MA, June 2001, pp. 245-256.

M. Christiansen, K. Jeffay, D. Ott, and F.D. Smith, "Tuning RED for Web Traffic," *IEEE/ACM Transactions on Networking*, Vol. 9, No. 3, June 2001, pp. 249-264. An abbreviated version appeared in *Proceedings of ACM SIGCOMM 2000*, August 2000, pp. 139-150.

M. Parris, K. Jeffay, and F.D. Smith, "Lightweight Active Router-Queue Management for Multimedia Networking," *Proceedings, Multimedia Computing and Networking 1999*, SPIE Proceedings Series, Volume 3654, San Jose, CA, January 1999, pp. 162-174.

K. Jeffay, F.D. Smith, A. Moorthy, and J.H. Anderson, "Proportional Share Scheduling of Operating System Services for Real-Time Applications," *Proceedings of the 19th IEEE Real-Time Systems Symposium*, Madrid, Spain, December 1998, pp. 480-491.

M. Parris, K. Jeffay, F.D. Smith, and J. Borgersen, "A Better-Than-Best-Effort Service for Continuous Media UDP Flows," *Proceedings of the Eighth International Workshop on Network and Operating System Support for Digital Audio and Video*, Cambridge, UK, July 1998, pp. 193-197.

K. Jeffay, M. Parris, F.D. Smith, and T.M. Talley, "A Router-Based Congestion Control Scheme For Real-Time Continuous Media," *Proceedings of the Sixth International Workshop on Network and Operating System Support for Digital Audio and Video*, Zushi, Japan, April 1996.

- K. Jeffay, D.L. Stone, and F.D. Smith, "Transport and Display Mechanisms for Multimedia Conferencing Across Packet-Switched Networks," *Computer Networks and ISDN Systems*, Vol. 26, No. 10 (July 1994), pp. 1281-1304. Republished in B. Furht and M. Milenkovic (Eds), *A Guided Tour of Multimedia Systems and Applications*, IEEE Computer Society Press, Los Alamitos, CA, 1995, pp. 439-461.
- D. Stotts, J.B. Smith, P. Dewan, K. Jeffay, F.D. Smith, D. Smith, S. Weiss, J. Coggins, and W. Oliver, "A Patterned Injury Digital Library for Collaborative Forensic Medicine," *Proceedings of Digital Libraries'94, The First Annual Conference on the Theory and Practice of Digital Libraries*, College Station, TX, June 1994.
- K. Jeffay, D. L. Stone, T. Talley, and F.D. Smith, "Adaptive, Best-Effort Delivery of Audio and Video Data Across Packet-Switched Networks", *Proceedings of the Third International Workshop on Network and Operating Systems Support for Digital Audio and Video*, published in V. Rangan (Ed.), *Lecture Notes in Computer Science*, Vol. 712, pp. 3-14, Springer-Verlag, Heidelberg, 1993.
- D. L. Shackelford, J.B. Smith, and F.D. Smith, "The Architecture and Implementation of a Distributed Hypermedia Storage System," *Proceedings of ACM Hypertext 93*, Seattle, WA, November 1993, pp. 1-14. Republished in G.M. Olson, T.W. Malone, and J.B. Smith (Eds), *Coordination Theory and Collaboration Technology*, Lawrence Erlbaum Associates, Publishers, Mahwah, NJ, 2001, pp. 391-408.
- K. Jeffay, J.K. Lin, J. Menges, F.D. Smith, and J.B. Smith, "Architecture of the Artifact Based Collaboration System Matrix," *Proceedings of CSCW92, 1992 ACM Conference on Computer Supported Cooperative Work*, Toronto, Canada, November 1992, pp. 195-202.
- K. Jeffay, D.L. Stone, F.D. Smith, "Kernel Support for Live Digital Audio and Video," *Computer Communications*, Volume 15, Number 6, July/August 1992, pages 388-395.
- K. Jeffay, D.L. Stone, and F.D. Smith, "Kernel Support for Live Digital Audio and Video," *Proceedings of the Second International Workshop on Network and Operating System Support for Digital Audio and Video*, published in R.G. Hertzwich (Ed.), *Lecture Notes in Computer Science*, Vol. 614, Springer-Verlag, Heidelberg, 1992.
- J.B. Smith, and F.D. Smith, "ABC: A Hypermedia System for Artifact-Based Collaboration," *Proceedings of ACM Hypertext 91*, San Antonio, TX, December 1991, pp. 179-192.
- J.B. Smith, F.D. Smith, P. Calingaert, J.R. Hayes, D. Holland, K. Jeffay, M. Lansman, "UNC Collaboratory Project Overview," *Proceedings of the 1991 Symposium on Command and Control Research*, National Defense University, Washington, D.C., June 1991, pages 341-391.
- K. Jeffay and F.D. Smith, "System Design for Workstation-Based Conferencing with Digital Audio and Video," *Proceedings TriComm 91: IEEE Conference on Communications Software*, Chapel Hill, NC, April 1991, pp. 169-177.
- K. Jeffay and F.D. Smith, "Designing a Workstation-Based Conferencing System Using the Real-Time Producer/Consumer Paradigm," *Proceedings of the First International Workshop on Network and Operating System Support for Digital Audio and Video*, Berkeley, CA, November 1990, pages 40-55.
- J. Morris, M. Satyanarayanan, M.H. Conner, J.H. Howard, D.S.H. Rosenthal, and F.D. Smith, "Andrew: A Distributed Personal Computing Environment," *Communications of the ACM*, Vol. 29, No. 3, March 1986, pp. 184-201.
- F.D. Smith and C.H. West, "Technologies for Network Architecture and Implementation," *IBM Journal of Research and Development*, 27(1) January 1983, pp. 68-78.

F.D. Smith, and C.H. West, "Architecture Validation and Implementation Testing," *Proceedings of IEEE Conference on Large Scale Systems*, Virginia Beach VA, October 1982.

D.P. Pozefsky and F.D. Smith, "A Meta-Implementation for Systems Network Architecture," *IEEE Transactions on Communications*, COM-30(6) June 1982, pp. 1348-1355.

D.P. Pozefsky and F.D. Smith, "The SNA Meta-Implementation: Language and Applications," *Proceedings of the International Conference on Communications – ICC'81*, June, 1981, Vol. 1, 9.2.1-9.2.5.

F.D. Smith and J. Wilder, *IBM 8100 Information System Principles of Operation*, IBM Corporation publication GA23-0031, April 1979.

D. Rose and F.D. Smith, "Real-Time Event Tracing System," *IBM Corporation Technical Disclosure Bulletin*, Vol. 17, No. 5, October 1974.

UNITED STATES PATENTS

F. Hernández-Campos, K. Jeffay, F.D. Smith, A. Nobel, "Methods, Systems, and Computer Program Products for Modeling and Simulating Application-Level Traffic Characteristics in a Network Based on Transport and Network Layer Header Information", US 74447209, November 4, 2008.

V.P. Kompella, J.P. Gray, F.D. Smith, and K. Jeffay, "User Controlled Adaptive Flow Control for Packet Networks," US5892754, April 6, 1999.

EXTERNAL RESEARCH FUNDING

F. D. Smith, IBM Faculty Award, October 2007, \$15,000.

Collaborative Research: CRI:CRD Synthetic Traffic Generation Tools and Resources: A Community Resource for Experimental Networking Research K. Jeffay, F.D. Smith, M.C. Weigle, A. Vahdat, P. Barford, National Science Foundation, Award 0709081, August 2007, 3 years, \$799,923 (UNC-\$473,580, ODU-\$201,974, UCSD-\$65,800, U. Wisc.-\$58,569)

F. D. Smith, IBM Faculty Award, October 2006, \$30,000.

Generation and Validation of Synthetic Internet Traffic, K. Jeffay, A. Nobel, F.D. Smith, National Science Foundation, Award ANI-0323648, September 2003, 4 years, \$470,000.

RI: Tera-pixels: Using High-resolution Pervasive Displays to Transform Collaboration and Teaching, K. Jeffay, A. Lastra, K. Mayer-Patel, L. McMillan, and F.D. Smith, National Science Foundation, Award EIA-0303590, September 2003, 5 years, \$962,902.

Rate-Based Resource Allocation Methods for Real-Time Embedded Systems, K. Jeffay, S. Goddard, and F. D. Smith, National Science Foundation, Award 0208924, September 2002, 2 years, \$179,990.

Empirical Workload Characterization for Advanced Networks, K. Jeffay and F. D. Smith, Cisco Corporation University Research grants, 2001, 2002, and 2003, \$212,512.

F.D. Smith and J.B. Smith, IBM Corporation Shared University Research grants, 2001 and 2002, \$166,000 (equipment).

Multimedia Networking Research in Support of Virtual Field Trips, K. Jeffay, R. Taylor, and F.D. Smith, Dell Corporation STAR program, 2001, \$25,000.

Active Queue Management for Scalable Network Services: Theory and Internet Practice, K. Jeffay and F.D. Smith, National Science Foundation, Award ITR-0082870, September 2000, 3 years, \$499,849.

F.D. Smith and K. Jeffay, IBM Corporation Shared University Research grant, 2000, \$83,000 (equipment).

K. Jeffay and F.D. Smith, North Carolina Networking Initiative grants, 1998 and 1999, \$40,000.

F.D. Smith, IBM Corporation University Partnership Program grants, 1997 and 1998, \$60,000.

Interactive Graphics for Molecular Studies and Microscopy — Supplement for Collaborative Science, F.P. Brooks, D. Erie, K. Jeffay, J. Samulski, F.D. Smith, D. Sonnenwald, R. Superfine, and 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. {*Multimedia Networking and A Distributed Teaching Laboratory for Networking and Internet Technologies* projects, K. Jeffay, F.D. Smith and B.J. Dempsey, \$557,669 (equipment).}

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, National Science Foundation, grant number CDA-9624662, August 1996, 5 years, \$1,260,830.

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 IRI-9015443, 1990, 3 years, \$946,000 + \$50,000 supplement.

PROFESSIONAL ACTIVITIES

Referee for ACM SIGCOMM, ACM IMC, IEEE INFOCOM Conferences (2000 – 2010)

Conference Co-Chair, CSCW'94: 1994 ACM Conference on Computer-Supported Cooperative Work, October 1994.

Program Chair, TriComm'91: IEEE Conference on Communications Software, 1991.

PUBLIC ACTIVITIES

Orange County, NC, Government Information Technology Committee, 1997-2003.

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