CURRICULUM VITAE

Kenneth Leonard Calvert

University of Kentucky
Department of Computer Science
Laboratory for Advanced Networking
University of Kentucky
Lexington, KY 40506-0495
calvert@netlab.uky.edu
http://protocols.netlab.uky.edu/~calvert/
Tel. +1.859.257.6745/Fax +1.859.323.3740

EDUCATIONAL BACKGROUND

Ph.D.	1991	University of Texas at Austin	Computer Sciences
	Thesis: *Protocol Conversion and Quotient Problems*		
	Advisor: Prof. Simon S. Lam		
M.S.	1980	Stanford University	Computer Science
S.B.	1979	M. I. T.	Computer Science and Engineering

EMPLOYMENT HISTORY

2007–present	Chairman, Computer Science Department, University of Kentucky
2007–present	Professor, Computer Science, University of Kentucky
1998–2007	Associate Professor, Computer Science, University of Kentucky
2004–05	Acting President, Lumenware, LLC, Lexington, KY (Sabbatical)
1991–98	Assistant Professor, College of Computing, Georgia Tech
1986–91	Research Assistant, Computer Sciences, University of Texas at Austin
1984–86	Research Fellow, Computer Sciences, University of Texas at Austin
1979–84	Member of Technical Staff, Bell Telephone Laboratories, Holmdel, NJ

AREAS OF EXPERTISE

Design, implementation and analysis of computer network systems and protocols
Formal methods for distributed systems
Network security
Network topology models

CURRENT INTERESTS

Clean-slate design of internet architecture
Generalized routing and forwarding
Home networking architecture
Network topology models
Group security, trust, and security of shared network infrastructure

AWARDS AND HONORS

Best Paper Award, IWAN 2003 Conference	Dec. 2003
Gill Associate Professorship, University of Kentucky	Aug. 2002–2007
Outstanding Computer Science Teacher, University of Kentucky	2000, 2003
Faculty Fellowship Award, Georgia Tech	May 1996
Wm. A. “gus” Baird Teaching Award, Georgia Tech	May 1996

Research and Creative Scholarship

Research Honors and Awards

Best Paper Award, IWAN 2003

Gill Associate Professorship (College of Engineering, University of Kentucky), 2002-2007

Georgia Tech College of Computing 1996 E-Systems Faculty Fellowship Award, for "Home Information Infrastructure Lab"

ACM SIGCOMM '89 Symposium Best Student Paper Award: "Deriving a Protocol Converter: A Top-Down Method"

Note: In the following paper listings, student coauthors are indicated by "*".

Journal Publications

1. S. Chakrabarti*, S. Chandrasekhar*, M. Singhal and K. L. Calvert, "An Efficient and Scalable Quasi-Aggregate Signature Scheme Based on LFSR Sequences", *IEEE Transactions on Parallel and Distributed Systems*, 20(7), July 2009, pp. 1059–1072.
2. Q. Zhang*, K. L. Calvert, "A Peer-Based Recovery Scheme for Group Rekeying in Secure Multicast", *International Journal of Network Security*, 6(1), January 2008, pp. 15–25.
3. L. Poutievski*, K. L. Calvert and J. N. Griffioen, "Routing and Forwarding with Flexible Addressing", *Journal of Communications and Networks*, 9(4), December 2007, pp. 383–393.
4. A. Sehgal*, K. L. Calvert, J. N. Griffioen, "A Flexible Concast-based Grouping Service", *Computer Networks* 50(14), October 2006, pp. 2532–2547.
5. C. S. Dhillon*, M. Bond*, J. N. Griffioen, K. L. Calvert, "Building Layered Active Services", *Computer Networks* 50(14), October 2006, pp. 2475–2487,
6. K. L. Calvert, J. N. Griffioen, S. Venkatraman, "Authenticated Access to Reserved Resources", *International Journal of Network Security*, 3(1), July 2006, pp. 54–64.
7. K. L. Calvert and J. N. Griffioen, "Scalable Network Management using Lightweight Active Services", *Journal of Network and Systems Management*, 14(1), March 2006.
8. K. L. Calvert, J. N. Griffioen, B. Mullins*, S. Natarajan*, L. Poutievski*, A. Sehgal*, and S. Wen*, "Leveraging Emerging Network Services to Scale Multimedia Applications", *Software: Practice and Experience*, volume 33, 2003, pp. 1377–1397.
9. S. Wen*, J. N. Griffioen, and K. L. Calvert, "Building Multicast Services from Unicast Forwarding and Ephemeral State", *Computer Networks* 38(3), February 2002, pp. 327–345.
10. K. L. Calvert, J. N. Griffioen, B. Mullins*, A. Sehgal*, and S. Wen*, "Concast: Design and Implementation of an Active Network Service", *IEEE Journal on Selected Areas in Communications*, 19(3), special issue on Active and Programmable Networks, March 2001, pp. 426–437.

11. R. H. Kravets*, K. L. Calvert, and K. Schwan, "Payoff Adaptation of Communication for Distributed Interactive Applications", *Journal of High-Speed Networks*, 7(1998), pp. 301–317.

12. S. Bhattacharjee*, K. L. Calvert, E. W. Zegura, and J. P. Sterbenz, "Directions in Active Networks", *IEEE Communications Magazine*, 36(10), October 1998, pp. 72–78.

13. R. D. Krupczak*, K. L. Calvert, and M. A. Ammar, "Implementing Communication Protocols in Java", *IEEE Communications Magazine*, 36(10), October 1998, pp. 93–99.

14. S. Bhattacharjee*, K. L. Calvert, and E. W. Zegura, "On Active Networking and End-To-End Arguments", *IEEE Network*, 12(3), May/June 1997, pp. 66–67.

15. M. J. Donahoo*, K. L. Calvert, and E. W. Zegura, "Center Selection and Migration for Wide-Area Multicast Routing", *Journal of High-Speed Networks*, 6(2), 1997, pp.141–164.

16. R. J. Clark*, M. A. Ammar, and K. L. Calvert, "Protocol Discovery in Multiprotocol Networks", *Balzer/ACM Mobile Networks and Applications*, 2, 1997, pp.271–284.

17. E. W. Zegura, K. L. Calvert, and M. J. Donahoo*, "A Quantitative Comparison of Graph-based Models for Internet Topology", *IEEE/ACM Transactions on Networking*, 5(6), December 1997, pp.770–783.

18. R. D. Krupczak*, K. L. Calvert, and M. A. Ammar, "Increasing the Portability and Reusability of Protocol Code", *IEEE/ACM Transactions on Networking,* 5(4), August 1997, pp. 445–459.

19. K. L. Calvert, E. W. Zegura, and M. Doar, "Modeling Internet Topology", *IEEE Communications Magazine*, 35(6), June 1997, pp. 160–163.

20. R. V. Clayton* and K. L. Calvert, "Structuring Protocols with Data Streams," *Journal of Electrical and Electronics Engineering, Australia*, 16(1), March 1996, pp. 29–36.

21. K. L. Calvert, "Eliminating Disjunctions of Leads-to Properties," *Information Processing Letters*, 49(4), 24 February 1994, pp. 189–194.

22. K. L. Calvert and S. S. Lam, "Formal Methods for Protocol Conversion," *IEEE Journal on Selected Areas in Communications*, 8(1), January 1990, pp. 127–142.

Journal Papers in Preparation/Submission

S. Chakrabarti*, S. Chandrasekhar*, M. Singhal and K. L. Calvert, "A Novel Technique for Constructing Efficient Proxy Signatures Based on Trapdoor Hash Functions", in revision for resubmission.

Refereed Conference Papers

1. Onur Ascigil*, Song Yuan*, J. N. Griffioen, and K. L. Calvert, "Deconstructing the Network Layer", Proceedings of IEEE International Conference on Computer Communications and Networks (ICCCN), Future Internet Architectures and Protocols Track, St. Thomas, USVI, 4-7 August 2008.

2. K. L. Calvert, R. K. Edwards and R. Grinter, "Moving Toward the Middle: the Case Against the End-to-End Argument in Home Networking", Sixth ACM Workshop on Hot Topics in Networking, Atlanta, 14–15 November 2007.

3. S. Chandresekhar*, M. Singhal, S. Chakrabarti and K. L. Calvert, "Efficient Blind Signatures for Accountability", Proceedings of the 2007 Workshop on Network Protocol Security (IEEE ICNP NPSec), Beijing, 16 October 2007.

4. S. Chakrabarti*, S. Chandrasekhar*, M. Singhal, K. L. Calvert, "Authenticated Feedback in Multicast Applications Using a Novel Multisignature Scheme Based on Cubic LFSR Sequences", *Third IEEE International Symposium on Security in Networks and Distributed Systems*, Niagara Falls, Canada, May 2007.

5. L. Poutievski*, K. L. Calvert, J. N. Griffioen, "Toposemantic Clustering", *IEEE Globecom 2006*, Symposium on Network Internet Services and Enabling Technologies, San Franscisco, November 2006.

6. L. Wang*, J. N. Griffioen, K. L. Calvert, "An Intersection-Based Multipath Routing Scheme", *IEEE Globecom 2006*, Symposium on Network Internet Services and Enabling Technologies, San Franscisco, November 2006.

7. K. L. Calvert, J. N. Griffioen, "On Information Hiding and Network Management", *ACM Workshop on Internet Network Management* (at SIGCOMM 2006), Pisa, Italy, September 2006.

8. M. Muthulakshmi, J. R. Heath, K. L. Calvert, J. N. Griffioen, "A Node-Processor Microarchitecture For Implementation of the ESP Network Service Development Paradigm", *Proceedings of the 2005 International Conference on Information Systems: New Generations*, Las Vegas, April 2005.

9. K. L. Calvert, J. N. Griffioen, B. Mullins*, L. Poutievski*, A. Sehgal*, "Secure, Customizable Many-to-One Communication", *Proceedings of IFIP International Working Conference on Active Networks (IWAN 2004)*, Lawrence, Kansas, October 28–29, 2004.

10. M. Muthulakshmi, J. R. Heath, K. L. Calvert, J. N. Griffioen, "ESP: A Flexible, High-Performance, PLD-Based Network Service", *Proceedings of 2004 IEEE International Conference on Communications—High-Speed Networks Symposium*, Paris, France, June 20–24, 2004.

11. L. Wang*, J. N. Griffioen, K. L. Calvert, S. Shi, "Passive Inference of Path Correlation", *Proceedings of NOSSDAV '04*, Cork, Ireland, June 18–19, 2004.

12. S. Shi, L. Wang*, K. Calvert, and J. N. Griffioen, "A Multipath Routing Service for Immersive Environments", *Proceedings of Workshop on Grids and Advanced Networks 2004 (GAN'04)* (at 4th IEEE/ACM International Symposium on Cluster Computing and the Grid), Chicago, April 2004.

13. L. Poutievski*, K. L. Calvert, J. N. Griffioen, "Speccast", *Proceedings of IEEE INFOCOM 2004*, Hong Kong, March 9–11, 2004.

14. N. Imam*, J. Li*, K. L. Calvert, J. N. Griffioen, "Challenges in Implementing an ESP Service", *Proceedings of the 2003 International Working Conference on Active Networks* (IWAN '03), Kyoto, Japan, December 2003 (**Best Paper Award**).

15. Q. Zhang*, K. L. Calvert, "On Rekey Policies for Secure Group Applications", *Proceedings of the 2003 IEEE International Conference on Computer Communications and Networks* (ICCCN '03), Dallas, Texas, October 2003, pp. 559–564.

16. B. Mullins*, J. N. Griffioen, K. L. Calvert, "Multicast TCP via Concast Merged Acknowledgements", *Proceedings of the 2003 IEEE International Conference on Computer Communications and Networks* (ICCCN '03), Dallas, Texas, October 2003.

17. K. L. Calvert, J. Eagan*, A. Namjoshi*, S. Merugu*, J. Stasko, E. Zegura, "Extending and Enhancing GT-ITM", *Proceedings of the ACM Workshop on Networking Models, Methodologies and Tools*, (at SIGCOMM 2003), Karlsrühe, Germany, August 2003, pp. 23–27.

18. C. Jaynes, W. B. Seales, K. Calvert, Z. Fei, J. Griffioen, "The Metaverse: A networked collection of inexpensive, self-configuring, immersive environments", *7. Immersive Projection Technologies Workshop*, 9. Eurographics Workshop on Virtual Environments, Zürich, May 2003.

19. A. Sehgal*, K. L. Calvert, J. N. Griffioen, "A Generic Set-Formation Service", *Proceedings of IEEE OPENARCH 2003*, San Francisco, April 2003.

20. M. Bond*, J. N. Griffioen, C. S. Dhillon*, K. L. Calvert, "Designing Service-Specific Execution Environments", *Proceedings of the 2002 International Working Conference on Active Networks* (IWAN '02), Zürich, Switzerland, December 2002, pp. 191–203 (Available as Springer Lecture Notes in Computer Science #2546).

21. A. Sehgal*, K. L. Calvert, J. N. Griffioen, "A Flexible Concast-based Grouping Service", *Proceedings of the 2002 International Working Conference on Active Networks (IWAN '02)* Zürich, Switzerland, December 2002, pp. 216–228 (Available as Springer Lecture Notes in Computer Science #2546).

22. K. L. Calvert, J. N. Griffioen, S. Wen*, "Lightweight Network Support for Scalable End-to-End Services", *Proceedings ACM SIGCOMM 2002*, Pittsburgh, August 2002, pp. 265–278.

23. S. Wen*, J. N. Griffioen, K. L. Calvert, "CALM: Congestion-Aware Layered Multicast", *Proceedings of IEEE OPENARCH 2002*, New York, June 2002, pp. 179–180.

24. K. L. Calvert, S. Venkatraman*, J. N. Griffioen, "FPAC: Fast, Fixed-Cost Authentication for Access to Reserved Resources", *Proceedings of IEEE INFOCOM 2002*, New York, June 2002, pp. 1049–1058.

25. M. Bond*, K. Calvert, J. N. Griffioen, B. Mullins*, S. Natarajan*, L. Poutievski*, A. Sehgal*,S. Venkatraman*, S. Wen*, "ActiveCast: Toward Application-Friendly Active Network Services", *Proceedings of DARPA Active Networks Conference and Exposition*, San Franciso, May 2002.

26. S. Bhattacharjee*, K. Calvert, Y. Chae, S. Merugu, M. Sanders, E. W. Zegura, "CANES: An Execution Environment for Composable Services", *Proceedings of DARPA Active Networks Conference and Exposition*, San Franciso, May 2002.

27. K. L. Calvert, J. N. Griffioen, S. Natarajan*, B. Mullins*, L. Poutievski*, A. Sehgal*, S. Wen*, "Leveraging Emerging Network Services to Scale Multimedia Applications", *Proceedings of IEEE 2001 International Conference on Computer Communications and Networks*, Scottsdale, Arizona, October 2001.

28. M. Sanders, M. Keaton, S. Bhattacharjee*, K. L. Calvert, S. Zabele, E. W. Zegura, "Active Reliable Multicast on CANEs: A Case Study", *Proceedings of IEEE OpenArch 2001*, Anchorage, Alaska, April 2001, pp. 49–60.

29. S. Wen*, J. N. Griffioen, K. L. Calvert, "Building Multicast Services from Unicast Forwarding and Ephemeral State", *Proceedings of IEEE OpenArch 2001*, Anchorage, Alaska, April 2001, pp. 327–345.

30. K. L. Calvert, J. N. Griffioen, A. Sehgal*, S. Wen*, "Building A Programmable Multiplexing Service Using Concast", *Proceedings of the 2000 International Conference on Network Protocols (ICNP '00)*, Osaka, Japan, November 2000, pp. 230–239.

31. S. Merugu*, S. Bhattacharjee, E. W. Zegura, K. L. Calvert, "Bowman: A Node OS for Active Networks", *Proceedings of IEEE INFOCOM 2000*, March 2000, Tel Aviv, Israel, pp. 1127-1136.

32. K. L. Calvert, J. N. Griffioen, A. Sehgal*, S. Wen*, "Concast: Design and Implementation of a New Network Service", *Proceedings of 1999 IEEE International Conference on Network Protocols (ICNP '99)*, Toronto, Canada, November 1999, pp. 335–344.

33. S. Bhattacharjee*, K. L. Calvert, E. W. Zegura, "Reasoning About Active Network Protocols", *Proceedings of 1998 IEEE International Conference on Network Protocols (ICNP '98)*, Austin, Texas, October 14–16, 1998, pp. 31–40.

34. R. H. Kravets*, K. L. Calvert, K. Schwan, "Payoff-based Communication Adaptation based on Network Service Availability", *Proceedings of IEEE International Conference on Multimedia Computing and Systems*, Austin, Texas, June 1998, pp. 33–42.

35. S. Bhattacharjee*, K. L. Calvert, E. W. Zegura, "Self-Organizing Wide-Area Network Caches", *Proceedings of IEEE INFOCOM '98*, San Francisco, April 1998, pp. 600–608.

36. R. D. Krupczak*, K. L. Calvert, M. A. Ammar, "Implementing Protocols in Java: The Price of Portability", *Proceedings of IEEE INFOCOM '98*, San Francisco, April 1998, pp. 765-773.

37. R. V. Clayton*, K. L. Calvert, "A Reactive Implementation of the Tau Protocol Composition Framework", *Proceedings of IEEE OpenArch '98*, San Francisco, April 1998, pp.101–114.

38. S. Bhattacharjee*, K. L. Calvert, E. W. Zegura, "Active Networking and the End-to-End Argument", *Proceedings 1997 International Conference on Network Protocols (ICNP '97)*, Atlanta, October 1997, pp. 220–228.

39. J. T. Dixon*, K. L. Calvert, "Effective Search Strategies for Application-Independent Speedup in UDP Demultiplexing", *Proceedings of the Sixth International Conference on Computer Communications and Networks (ICCCN)*, Las Vegas, September 1997, pp. 468–474.

40. S. Bhattacharjee*, K. L. Calvert, E. W. Zegura, "An Architecture for Active Networking", *Proceedings of the Seventh IFIP Conference on High Performance Networking*, White Plains, New York, April 1997, 265–279.

41. R. H. Kravets*, K. L. Calvert, P. Krishnan, K. Schwan, "Adaptive Variation of Reliability", *Proceedings of the Seventh IFIP Conference on High Performance Networking*, White Plains, New York, April 1997, pp. 202–216.

42. R. D. Krupczak*, K. L. Calvert, M. A. Ammar, "Protocol Portability Through Module Encapsulation", *Proceedings of 1996 IEEE International Conference on Network Protocols (ICNP '06)*, Columbus, Ohio, October 1996, pp. 56–63.

43. J. T. Dixon*, K. L. Calvert, "Increasing Demultiplexing Efficiency in TCP/IP Network Servers", *Proceedings of the Fifth International Conference on Computer Communications and Networks (ICCCN)*, Rockville, Maryland, October 1996.

44. R. D. Krupczak*, M. A. Ammar, K. L. Calvert, "Multi-subsystem Protocol Architectures: Motivation and Experiences with an Adapter-based Approach", *Proceedings of IEEE INFOCOM '96*, San Franscisco, March 1996, pp. 1149–1156

45. E. W. Zegura, K. L. Calvert, S. Bhattacharjee*, "How to Model an Internetwork", *Proceedings of IEEE INFOCOM '96*, San Franscisco, March 1996, pp. 594–602.

46. R. V. Clayton*, K. L. Calvert, "Structuring Protocols with Data Streams," Workshop on High Performance Protocol Architectures (HIPPARCH '95), Sydney, Australia, December 1995.

47. R. J. Clark*, K. L. Calvert, M. A. Ammar, "Protocol Discovery in Multiprotocol Networks", *Proceedings of the Fourth International Conference on Computer Communications and Networks (ICCCN)*, Las Vegas, September 1995, pp. 361–368.

48. M. J. Donahoo*, E. W. Zegura, K. L. Calvert, "Core Selection Methods for Multicast Routing", *Proceedings of the Fourth International Conference on Computer Communications and Networks (ICCCN)*, Las Vegas, September 1995, pp. 638–642.

49. K. L. Calvert, "Specifying and Verifying Conditional Progress", *Proceedings of the 14th International IFIP Symposium on Protocol Specification, Testing and Verification*, Vancouver, British Columbia, June 1994, pp. 303-318.

50. R. J. Clark*, M. A. Ammar, K. L. Calvert, 'On the Use of Directory Services to Support Multiprotocol Interoperability", *Proceedings of IEEE INFOCOM '94*, Toronto, Canada, June 1994, pp. 784-791.

51. K. L. Calvert, "Beyond Layering: Modularity Considerations for Protocol Architectures", *Proceedings 1993 IEEE International Conference on Network Protocols (ICNP '93)*, San Francisco, October 1993, pp. 90–97.

52. R. J. Clark*, M. A. Ammar, K. L. Calvert, "Multi-Protocol Architectures as a Paradigm for Achieving Inter-Operability", *Proceedings of IEEE INFOCOM '93*, San Francisco, March 1993, pp. 136–143.

53. K. L. Calvert, "Module Composition and Refinement with Applications to Protocol Conversion," *Proceedings of 12th International IFIP Symposium on Protocol Specification, Testing, and Verification*, Orlando, June 1992.

54. K. L. Calvert, S. S. Lam, "Adaptors for Protocol Conversion," *Proceedings of IEEE INFOCOM '90*, San Francisco, June 1990.

55. K. L. Calvert, S. S. Lam, "The Protocol Conversion Problem—Finding a Quotient of Specifications," *Proceedings of the 27th Annual Allerton Conference on Communication, Control, and Computing*, Allerton, Illinois, September 1989.

56. K. L. Calvert and S. S. Lam, "Deriving a Protocol Converter: A Top-Down Method," *Proceedings of ACM SIGCOMM '89 Symposium*, Austin, Texas, September 1989, pp. 247–258 (**Best Student Paper award**).

57. K. L. Calvert and S. S. Lam, "An Exercise in Deriving a Protocol Converter," *Proceedings of ACM SIGCOMM '87 Workshop*, Stowe, Vermont, August 1987, pp. 151–160.

Patents

1. U.S. Patent #7,317,729, *System and Process for Providing Auxiliary Information for a Packet-Switched Network of Shared Nodes Using Dedicated Associative Store*, K. L. Calvert and J. N. Griffioen, granted 8 January 2008.

2. (Pending) *System and method for remote data processing and storage*, W. B. Seales, J. N. Griffioen, and K. L. Calvert, filed 21 January 2004, USPTO.

Journal Special Issue Edited

Co-Editor: *IEEE Journal on Selected Areas in Communications*, Special Issue on Active and Programmable Networks, Volume 19, Number 3, March 2001.

Conference Proceedings Edited

1. Editor: IEEE Conference on Open Architectures and Network Programming (OPENARCH '99), New York, 26–27 March 1999.
2. Co-Editor: International Conference on Network Protocols (ICNP 2002), Paris, France, 12–15 November 2002.
3. Co-Editor: International Conference on Network Protocols (ICNP 2007), Beijing, China, 16–19 October 2007.

Invited Keynote Presentations

1. "Infrastructure and Self-Organization in Postmodern Internet Architecture", 2007 International Workshop on Self-Organizing Systems, 11-13 September, 2007, The Lake District, England.
2. "Reflections on the Development of Active and Programmable Networks", 2005 IFIP International Working Conference on Active and Programmable Networks (IWAN 2005), November 21–23, 2005, Sophia-Antipolis, France.
3. "Active Networking Architecture: History, Observations and Issues", Presented at the First International Workshop on Active Network Technologies and Applications, Tokyo, Japan, March 25–26, 2002.

Invited Conference Papers

1. "Separating Routing and Forwarding: A Clean-Slate Network Layer Design", K. L. Calvert, J. N. Griffioen, and L. Poutievski*, Proceedings of IEEE Broadnets 2007, Raleigh, NC, September 10–14, 2007.
2. K. L. Calvert, "Active Networking Architecture: History, Observations and Issues", Proceedings of the First International Workshop on Active Network Technologies and Applications, Tokyo, Japan, March 25–26, 2002.
3. K. L. Calvert, J. N. Griffioen, A. Sehgal*, and S. Wen*, "Implementing Concast" *Proceedings of the 37th Allerton Conference on Communications and Control*, Monticello, Illinois, September 22-24, 1999.
4. S. Merugu, S. Bhattacharjee, Y. Chae, M. Sanders, K. L. Calvert, and E. W. Zegura, "Bowman and CANEs: Implementation of an Active Network", *Proceedings of the 37th Allerton Conference on Communications and Control*, Monticello, Illinois, USA, September 22-24, 1999.

Other Publications

1. K. L. Calvert, "Reflections on Network Architecture: An Active Networking Perspective", *ACM SIGCOMM Computer Communication Review*, 36(2), April 2006, pp. 27–30.
2. K. L. Calvert (editor) "Architectural Framework for Active Networks", DARPA Active Networks working group, July 1999.

3. J. M. Smith, K. L. Calvert, S. L. Murphy, H. K. Orman, L. L. Peterson, "Activating Networks: A Progress Report", *IEEE Computer*, 32(4), April 1999.

4. R. J. Clark*, K. L. Calvert, and M. A. Ammar, "Multiprotocol Interoperability In IPng", Internet Engineering Task Force Request for Comments 1683, August 1994.

Software

1. **GT-ITM:** A software package for constructing and analyzing graph models of large Internetworks. It has become the *de facto* standard method of generating large random network topologies for simulations and other experiments. Used at hundreds of institutions worldwide. (Portions of the code were developed in collaboration with Ellen Zegura at Georgia Tech.)
`http://www-static.cc.gatech.edu/fac/Ellen.Zegura/graphs.html`

2. **Odyssey Environment for Active Networking:** A framework for developing and composing active network applications. Includes the **CANEs** Execution Environment, one of five "sanctioned" execution environments in the DARPA Active Networks program (used by researchers at the University of Illinois and the University of Massachusetts), as well as the **Bowman:** user-space NodeOS support platform (used by researchers at the University of Illinois). Developed in collaboration with students and staff at Georgia Tech.
`http://www-static.cc.gatech.edu/projects/canes/software.html`

3. **Concast:** an implementation of the many-to-one network service for the Linux kernel. Developed in collaboration with J. Griffioen, students and staff at the University of Kentucky.
`http://protocols.netlab.uky.edu/%7Eacast/concast_distribution.html`

4. **Ephemeral State Processing:** multiple kernel-space implementations of ESP. Developed in collaboration with J. Griffioen and students at the University of Kentucky.
`http://protocols.netlab.uky.edu/%7Eesp/`

Invited Seminar Presentations

1. 14 April 2009, University of Göttingen, Germany. "Postmodern Routing and Forwarding Architecture".

2. 8 August 2008, NSF FIND Routing Workshop, Tucson, Arizona. "Rethinking Routing and Forwarding".

3. 20 February 2008, CS Seminar, University of California at San Diego, "Rethinking Routing and Forwarding".

4. 1 December 2006, Columbia Institute for Tele-Informatics, Columbia University, "What would one do with a Gigabit per Second?"

5. 2 November 2006, Max Plank Institut for Informatik, Saarbrücken, Germany, "Scalable Network Management Using Ephemeral State"

6. 31 October 2006, Dagstuhl Seminar on Naming and Addressing for Next-Generation Networks, "On What to Name"

7. 17 April 2006, University of Illinois at Urbana-Champaign, Department of Computer Science, "Scalable Network Management Using Ephemeral State"

8. 5 January 2006, Dagstuhl Perspective-Seminar an Autonomic Networking, "On Policies and Building-Block Functions"

9. 21 November 2005, Eurecom, Sophia-Antipolis, France, "Routing Without Addresses"

10. 4 October 2004, Dagstuhl Seminar on Service Management and Self-Organization in IP-based Networks, "Toward a More General Network Layer"

11. 24 January 2003, Duke University, Durham, NC, "Extending the Network Layer: an End-to-End Approach"

12. 4 December 2002, IBM Zürich Laboratory, Switzerland, "Extending the Waist of the Hourglass: An End-to-End Approach" (with J. Griffioen)

13. 15 February 2002, Dagstuhl Seminar on Concepts and Applications of Programmable and Active Networking Technologies, Wadern, Germany, "Scalability Considerations for Programmable Networks"

14. 28 February 2001, Computer Science Colloquium, University of North Carolina at Chapel Hill, "Concast: An Active Internet Service"

15. 18 May 2000, Workshop on Active and Programmable Networks (part of IFIP Networking 2000 Conference), "Toward an Active Internet"

16. 17 November 1998, Bellcore, Morristown, NJ, "Composable Active Network Elements"

17. 25 March 1998, Computer Science Colloquium, University of North Carolina at Chapel Hill, "Composable Active Network Elements"

18. 15 October 1997, Computer Science Colloquium, Kansas State University, Manhattan, Kansas, "What Comes After TCP?"

19. 2 September 1997, AT&T Laboratories, Florham Park, New Jersey. "Composable Active Network Elements"

20. 12 December 1996, Intel Architecture Laboratory, Hillsboro, Oregon. "The Home Information Infrastructure Project"

21. 7 August 1996, Computer Science Telecommunications Colloquium, University of Missouri at Kansas City, "Active Networking: Architecture, Applications, and Experiences"

22. 21 October 1994, Math–CS Colloquium, Emory University, Atlanta, Georgia. "Multicasting in Large Internets"

23. 16 Sept 1993, Telecomm Seminar, Clemson University, Clemson, S.C. "Modularity vs. Performance in Protocol Architectures"

24. 21 March 1991, Bell Laboratories Research Colloquium, Murray Hill, New Jersey. "Protocol Conversion and Quotient Problems"

25. 5 March 1991, Computer Science Telecommunications Program, University of Missouri at Kansas City. "Protocol Conversion and Quotient Problems"

Invited Panel Participation

1. "Visions of Networking in 2024", 2004 IEEE International Conference on Network Protocols, Berlin, Germany, October 2004.

2. "Active Networks vs. the End-to-End Argument: Are the Two Compatible?", OPENSIG 2000, Napa, California, October 2000.

3. "Symmetry, Simplicity, and Separation of Concerns in the Internet", *In Pursuit of Simplicity*, a Symposium in honor of Prof. Dr. E. W. Dijkstra on the occasion of his retirement, Austin, Texas, May 2000.

4. "Middleware", NSF Networking PI Meeting, Washington, D.C., January 1999.

5. "Intelligence in the Network", Computer Communications Workshop (IEEE Technical Committee on Computer Communications), Phoenix, Arizona, September 1997.

6. "An Active Networks Forum", Intel Architecture Labs, Hillsboro, Oregon, 1 August 1997.

7. "Interoperability: Beyond Formal Methods?", *14th International IFIP Symposium on Protocol Specification, Testing and Verification*, Vancouver, Canada, June 1994.

8. "Protocol Conversion and Internetworking", *1993 International Conference on Network Protocols*, San Francisco, October 1993.

Funded Research Proposals and Grants (while at Kentucky)

Calvert is PI unless otherwise noted.

1. *NeTS-FIND: Collaborative Research: Postmodern Internetwork Architecture*
   Co-PI: J. Griffioen; Joint project with Universities of Maryland and Kansas
   National Science Foundation — Networking Technology and Systems
   $399,664 (9/1/06–8/31/09)

2. *NeTS-NBD: Collaborative Research: Human-Centered Networking for the Home*
   Joint project with K. Edwards and R. Grinter, Georgia Tech
   National Science Foundation — Networking Technology and Systems
   $186,583 (9/1/06–8/31/09)

3. *Center for Resilient Information Systems*
   U.S. Treasury Department
   Technical PI: J. Griffioen; Co-PIs: Z. Fei, R. Finkel, D. Manivannan, M. Singhal
   $2,700,000 (1/1/06–5/31/07)

4. *Extending Ephemeral State Processing to Support App-level Services*
   Co-PI: J. Griffioen
   Cisco Systems, Inc.
   $85,477 (1/1/05–12/31/05).

5. *NeTS-NR: Generalizing the Network Layer*
   Co-PI: J. Griffioen
   National Science Foundation — Networking Research
   $500,000 (9/1/04–8/31/08).

6. *Enhancing Network Layer Services*
   PI: J. Griffioen
   Kentucky Science and Engineering Foundation R&D Excellence Award
   $86,706 (7/2/04–6/30/06).

7. *Acquisition, Representation, and Remote Visualization of Digital Artifacts*
   PI: W. Seales; Co-PIs: J. Griffioen, C. Jaynes
   National Science Foundation — Information Technology Research
   $1,000,000 (1/1/02–12/31/03).

8. *The Metaverse: A Laboratory for Digital Media Networks*
   PI: J. Griffioen; Co-PIs: C. Jaynes, J. Mazur, B. Seales, Z. Fei, J. McDonough, D. Maloney
   National Science Foundation — Research Infrastructure
   $824,621 + $400,000 University Match, (9/1/2001–8/31/2004).

9. *Enhancing Network Services Using Lightweight Router Processing Modules*
   PI: J. Griffioen
   Intel Corporation
   $104,000 + equipment, (2/1/2001–1/31/2003)

10. *ITR/SII: Collaborative Research in Internet Topology Models*
    Joint project with E. Zegura, Georgia Tech
    National Science Foundation — Information Technology Research
    $112,383, (9/1/00–8/31/03).

11. *Secure Multicast Services and Applications*
    Joint project with S. Lam, University of Texas
    National Science Foundation — Networking Special Projects
    $262,985, three years.

12. *Gigabit Switch Kit*
    National Science Foundation/Washington University
    Hardware value $50,000, July 1999.

13. *UK Laboratory for Advanced Networking*
    PI: J. Griffioen; Co-PIs: D. Friskney, M. Truszczynski
    National Science Foundation/Kentucky EPSCoR agreement
    $1,000,000 (1/1/99–12/31/01).

14. *ActiveCast*
    Co-PIs: J. Griffioen, Kentucky; E. Zegura, Georgia Tech
    DARPA
    $1,696,000, (5/28/99–12/31/03).

15. *CANEs: Composable Active Network Elements*
    Joint project with E. Zegura, Georgia Tech
    DARPA
    $950,000 (6/1/97-6/1/00).

16. *A Flexible End-to-End Protocol Framework*
    National Science Foundation
    $182,305, (7/1/97-7/1/00).

TEACHING

Teaching Honors and Awards

1996 **William A. "gus" Baird Faculty Teaching Award**, presented annually to the outstanding teacher in the College of Computing at Georgia Tech

2000 **Department of Computer Science Tau Beta Pi** Oustanding Teacher Award, University of Kentucky

2000 **Department of Computer Science ACM/Upsilon Pi Epsilon Outstanding Teacher Award**, University of Kentucky

2003 **Department of Computer Science Outstanding Teacher Award**, University of Kentucky

2003 Nominated for **Henry Lutes Teaching Award**, College of Engineering, University of Kentucky

Textbooks

TCP/IP Sockets in C: Practical Guide for Programmers, second edition, M. J. Donahoo and K. L. Calvert, Morgan Kaufman, 2009. Supplementary text for networking courses. (First edition published in 2000.)

TCP/IP Sockets in Java: Practical Guide for Programmers, second edition, K. L. Calvert and M. J. Donahoo, Morgan Kaufmann, 2008. (First edition published in 2001.)

TCP/IP Sockets in C#: Practical Guide for Programmers, D. B. Makofske, K. L. Calvert and M. J. Donahoo, Morgan Kaufmann, 2004.

Ph.D. Theses Supervised

1. Robert Krupczak (co-supervised with Prof. M. Ammar)
   Graduation date: September 1997 (Georgia Institute of Technology)
   Thesis title: *Protocol Subsystem Support for Efficient and Flexible Communication Services*
   Employment: self-employed (startup)

2. Richard Clayton
   Graduation date: June 1999 (Georgia Institute of Technology)
   Thesis title: *Structuring and Destructuring Protocols*
   Employment: Adjunct Professor, Computer Science, Monmouth University, New Jersey

3. Robin H. Kravets (co-supervised with Prof. K. Schwan)
   Graduation date: August 1999 (Georgia Institute of Technology)
   Thesis title: *Cooperative Solutions to the Dynamic Management of Communication Resources*
   Employment: Associate Professor, Computer Science, University of Illinois at Urbana-Champaign

4. Samrat Bhattacharjee (co-supervised with Prof. E. Zegura)

Graduation date: August 1999 (Georgia Institute of Technology)
Thesis title: *Active Networks: Architectures, Composition, and Applications*
Employment: Associate Professor, Computer Science,
University of Maryland at College Park

5. Su Wen (co-supervised with Prof. J. Griffioen)
   Graduation date: December 2002
   Thesis Title: *Supporting Group Communication on a Lightweight Programmable Network*
   Employment: Research Scientist, Institute for Infocom Research, Singapore

6. Lili Wang (co-supervised with Prof. J. Griffioen)
   Graduation date: December 2006
   Thesis title: *Improving End-to-End Performance Using Multipath Overlay Services*
   Employment: Juniper Networks

7. Qingyu Zhang
   Graduation date: May 2007 (Defended December 2006)
   Thesis title: *Improving Group Rekeying for Secure Multicast*
   Employment: Citrix

8. Leonid Poutievski (co-supervised with Prof. J. Griffioen)
   Graduation date: December 2007 (Defended November 2007)
   Thesis title: Speccast: Toward a more general network layer
   Employment: Google

9. Amit Sehgal (co-supervised with Prof. J. Griffioen)
   Graduation date: August 2008 (Defended June 2008)
   Thesis title *A Group-Formation Service*
   Employment: Microsoft

10. Saikat Chakrabarti (co-supervised with Prof. M. Singhal)
    Graduation date: August 2008 (Defended July 2008)
    Thesis title: *Efficient and Scalable Security Protocols Based on LFSR Sequences*
    Employment: Siemens

Masters Theses Supervised

1. Najati Imam
   Graduation date: December 2003
   Thesis title: *Implementation of an Ephemeral State Processor on the Intel IXP 1200*

2. Aditya Namjoshi
   Graduation date: December 2006
   Thesis title: *Extending and Enhancing GT-ITM*

Masters Degree Projects Supervised (last 5 years)

Name	Completed	Topic
J. Satapathy	Summer 2004	Open Flow-Based Security Layer
J. Li	Fall 2005	Implementing Ephemeral State Processing Service
B. Mullins	Spring 2007	Multicast TCP via Concast Merged Acknowledgments
T. Gupta	Spring 2008	Universal Remote Application for Nokia N800 Used for Home Networking
S. Ganti	Summer 2009	Statistical Analysis of IP Traffic
S. Malla	Summer 2009	Link-State Routing Simulation

Ph.D. Committee Member

Student	Department	Institution	Defended
Rida Bazzi	Computing	Georgia Tech	1994
Russell Clark	Computing	Georgia Tech	1995
M. Jeffrey Donahoo	Computing	Georgia Tech	1998
Shengbing Jiang	Electrical Engineering	Univ. Kentucky	2000
Chris Diaz	Computer Science	Univ. Kentucky	2002
Amila Fernando	Computer Science	Univ. Sydney, Australia	2002
Darren Williams	Computer Science	Univ. Sydney, Australia	2002
Indrias Berhane	Statistics	Univ. Kentucky	2004
Osama Rawashdeh	Electrical Engineering	Univ. Kentucky	2005
Andrew Mertz	Computer Science	Univ. Kentucky	2005
Timothy Mattox	Electrical Engineering	Univ. Kentucky	2006
Mengkun Yang	Computer Science	Univ. Kentucky	2006
Bryan Crawley	Computer Science	Univ. Kentucky	2006
Wei Zhang	Mathematics	Univ. Kentucky	2007
Sylvain Martin	Computer Science	Univ. de Liège	2007
Santosh Chandrasekhar	Computer Science	Univ. Kentucky	

Courses Taught (last three years)

Term	Course	Title	# Students
Spring 2005	CS 275	Discrete Mathematics	29
Fall 2006	CS 571	Computer Networks	25
Spring 2007	CS 471G	Computer Networks & Distributed OSs	15
Fall 2007	CS 671	Advanced Computer Networks	8
Spring 2008	CS 375	Logic and Theory of Comp.	21
Fall 2008	CS 499	Senior Design	16
Fall 2008	CS 100	Intro to CS Professions	85
Fall 2009	CS 100	Intro to CS Professions	130
Fall 2009	CS 585	Cybercrime: Legal Issues and Investigative Procedures	10

Curriculum Development

Systems Area Curriculum. Redesign of systems courses in Department of Computer Science at U.K., 1998–99.

Computer Engineering Program Committee. Development of curriculum proposal for a Computer Engineering program at the University of Kentucky, 1999-2000.
New courses developed include: **Formal Methods for Communicating Systems** (gradu-

ate), **Computer Network Protocols** (upper-division undergraduate lab course), **Network Security** (graduate), **Advanced Computer Networks** (graduate), **Network Algorithmics** (graduate), **Cybercrime: Legal Issues and Investigative Procedures** (co-developed with Dr. Thomas Johnson).

Other Academic and Teaching Activities

1. NSF-sponsored Symposium "Teaching Formal Methods to Undergraduates", Southwestern University, Georgetown Texas, 3–6 June 1993. Presentation: "What Every Undergraduate Should Know About the Curry-Howard Isomorphism".

2. Programming Team Coach for ACM Programming Contest at Georgia Tech, 1995, 1997, 1998. Team advanced to World Championships in 1995.

3. Module on Networking, taught to Rogers Scholars (high school students from Eastern Kentucky) Summer 2000.

Professional Activities and Service

Professional Societies

Senior Member, Institute of Electrical and Electronics Engineers, also Computer and Communications Societies. **Vice-Chair** of IEEE Computer Society Technical Committee on Computer Communications, 2004-2007.

Member, Association for Computing Machinery, also Special Interest Group on Computer Communications (SIGCOMM)

Editorial and Reviewer Work for Technical Journals and Publishers

Associate Editor for *IEEE/ACM Transactions on Networking*, 1999–2005. (This is the top journal in my field. According to CiteSeer, it has the fourth-highest impact rating among CS journals.)

Referee for (not an exhaustive list):
IEEE/ACM Transactions on Networking
IEEE Transactions on Communications
Information Processing Letters
ACM Transactions on Programming Languages and Systems
IEEE Transactions on Software Engineering
Computer Networks and ISDN Systems
ACM SIGCOMM Conference
IEEE INFOCOM Conference

Conference Committee Activities

Steering Committee Member, International Conference on Network Protocols, 2004–present.

General Co-Chair, IEEE International Conference on Network Protocols, 1997, Atlanta, Georgia

Technical Program Chair, IEEE Conference on Open Architectures and Network Programming, 1999 (OpenArch '99)

Technical Program Co-Chair, IEEE International Conference on Network Protocols 2002, 2007

General Co-Chair, IEEE International Conference on Network Protocols 2003

Technical Program Co-Chair, 2004 IFIP International Working Conference on Active Networks (IWAN '04)

Technical Program Committee Member:

ACM SIGCOMM Conference	2004
IEEE International Conf. on Network Protocols	'94, '97–'04, '06
IEEE Infocom	'98, '01–'03, '06
Int'l Conf. on Distributed Computing Systems	'98, '00, '02, '03, '06
IEEE Int'l Conf. on Computer Comm. & Networks	'96, '97
IEEE OpenArch	'99, '00–'02
IFIP Int'l Working Conf. on Active Networks	'02–'06
IEEE Globecomm, various symposia	'06

Tutorial Presentations

Active Networks (half-day tutorial) at International Conference on Network Protocols, Osaka, Japan, November 2000.

Conference Sessions Chaired

"Multicasting", *1994 IEEE International Conference on Network Protocols*, Boston, October 1994.

"Active Networks", *IEEE Infocom '98*, San Francisco, April 1998.

"Security and Verification", *1998 IEEE International Conference on Network Protocols*, Austin, October 1998.

"Pervasive Computing", *OPENSIG 2000*, Napa, California, October 2000.

"Topology Modeling", *INFOCOM 2002*, New York, June 2002.

"Network Geometry and Design", *SIGCOMM 2004*, Portland, Oregon, August 2004.

Consulting and Advisory Work

GTE Mobile Communications Corporation, Atlanta, Georgia, October 1994.

AT&T Bell Laboratories, Holmdel, NJ, Summer 1995.

DVT, Norcross, Georgia, 1996–98.

EG Technologies, Atlanta, GA, technical advisory board, 2001.

Research Project Reviewer

National Science Foundation—Communications and Networking Systems (multiple panels).

Swiss National Science Foundation, external proposal review.

Government of Hong Kong, external grant proposal review.

Campus Service

Committee Service (selected)

University Faculty Senate (Elected from College of Engineering)	2005–2008
Computer Security and Resource Allocation Task Force	2002–present
Computer Engineering Program Proposal	1999-2000

Faculty Advisor for the Student Chapter of the Association for Computing Machinery (Georgia Tech College of Computing), 1992–1998.