

Curriculum Vitae

Simon S. Lam

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Research Interests: Computer network protocol design, Internet security services, protocol verification, and performance analysis

Education

Washington State University, Pullman, Washington
B.S. in Electrical Engineering (with Distinction), 1969

University of California, Los Angeles
M.S. in Engineering, 1970
Ph.D. in Engineering, 1974

Employment

Department of Computer Science, University of Texas at Austin
Regents Chair in Computer Science, 2001 – present
Professor, 1983 – present
Department Chair, 1992 – 1994
Professorship No. 2 (anonymously endowed), 1992 – 2001
Professorship No. 1 (anonymously endowed), 1988 – 2001
David Bruton Jr. Centennial Professorship, 1985 – 1988
Associate Professor, 1979 – 1983
Assistant Professor, 1977 – 1979

IBM T. J. Watson Research Center, Yorktown Heights, New York
Research Staff Member, June 1974 – August 1977

UCLA, ARPA Network Measurement Center
Postgraduate Research Engineer, June 1971 – March 1974
Postdoctoral Scholar, March 1974 – June 1974

Honors and Awards

Member, National Academy of Engineering (elected 2007) with the citation, “For contributions to computer network protocols and network security services.”

Software System Award (2004), ACM, with the citation, “For inventing secure sockets and prototyping the first secure sockets layer (named SNP - Secure Network Programming) as a high-level abstraction suitable for securing Internet applications” (co-recipient)

SIGCOMM Award (2004), ACM, for lifetime contribution to the field of communication networks with the citation, “in recognition of his vision, breadth, and rigor in contributing to, among other areas: secure network communication, the analysis of network and multiaccess protocols, the analysis of queueing networks, and the design of mechanisms for quality of service”

W. Wallace McDowell Award (2004), IEEE Computer Society, with the citation, “For outstanding fundamental contributions in network protocols and security services”

William R. Bennett Prize (2001) in the field of Communications Networking, IEEE Communications Society (co-recipient)

ACM Fellow (elected 1998)

IEEE Fellow (elected 1985)

Leonard G. Abraham Prize (1975) in the field of Communications Systems, IEEE Communications Society (co-recipient)

Teaching Excellence Award (2007), College of Natural Sciences, UT-Austin

Editor of the Year Award (2002), *Computer Networks*

UCLA Chancellor’s Fellowship, 1969 – 1973

Phi Kappa Phi Fellowship, 1969 – 1970

Outstanding Senior, College of Engineering, Washington State University, 1969

Professional Activities

Editor-in-Chief, *IEEE/ACM Transactions on Networking*, 1995 – 1999;
Editorial Board, 1992 – 2001

Editorial Board, *Computer Networks*, 1999 – 2007.

Editorial Board, *IEEE Transactions on Software Engineering*, 1990 – 1994

Editorial Board, *Performance Evaluation*, 1981 – 1993

Editor for Network Protocols, *IEEE Transactions on Communications*, 1984 – 1990

Editorial Board, *Proceedings of the IEEE*, 1985 – 1989

Co-founder of IEEE International Conference on Network Protocols in 1993

Co-founder of ACM SIGCOMM Conference in 1983

Steering Committee member, IEEE International Conference on Network Protocols, 1993 – 2008;
Advisory Board, 2008 – present

General Chair, IEEE International Conference on Network Protocols, Boston, 1994

Program Chair, ACM SIGCOMM Symposium, Austin, Texas, 1983 (inaugural)

Vice Chair, 8th Texas Conference on Computing Systems, Dallas (1979)

Program Committees

ACM SIGCOMM (2000, 1997, 1996, 1989, 1988, 1984, 1983)

IEEE INFOCOM (1998, 1997, 1996, 1993, 1992, 1984, 1983)

ACM SIGMETRICS (2005, 2000, 1982, 1981)

IEEE International Conference on Network Protocols (2005, 1997); Area Chair (2012); Area Chair (2014)

Fourth IEEE Workshop on the Architecture and Implementation of High Performance Communication Systems, Chalkidiki, Greece (1997)

IEEE Computer Security Foundations Workshop (1994)

TriComm '91, Chapel Hill (1991)

Eleventh IFIP International Conference on Protocol Specification, Testing and Verification, Stockholm (1991)

IFIP International Workshop on Protocols for High-Speed Networks, Palo Alto (1990)

IEEE Region 10 Conference on Computers and Communications, Hong Kong (1990)

ACM Principles of Distributed Computing, Vancouver (1984)

Panelist and contributor, *Research Priorities in Networking and Communications*, Airlie House Workshop reports to NSF Division of Networking and Communications Research and Infrastructure (1994, 1992, 1989)

Advisory Panel, NSF Division of Networking and Communications Research and Infrastructure (1991 – 1992)

NSF Review Panels, chair (October 1997, June 1996), panelist (1999, 1990, 1988)

Advisory Board, Wiley Book Series: Advanced Texts in Computer Networking and Communications, 2008 – 2012

ACM SIGCOMM Award Committee (2005, 2007)

IEEE Koji Kobayashi Award Committee (1991)

External Examiner, Computer Science Department, University of Hong Kong (1990 – 1993)

IEEE Fellows Committee (1987 – 1990)

Postdoctoral Scholar Supervised

Song Han, Research on routing and scheduling design for reliable and deterministic real-time performance in large-scale networks with applications in sensor data collection and analytics, December 2012 - August 2013. (Current position: Assistant Professor of Computer Science and Engineering, University of Connecticut.)

Doctoral Dissertations Supervised

Hongkun Yang,

“Efficient Verification of Packet Networks,” December 2015. (Current position: Software Engineer, Google, Sunnyvale, CA.)

Chen Qian,

“A Scalable, Resilient, and Self-managing Layer-2 Network,” August 2013. (Current position: Assistant Professor of Computer Science, University of Kentucky.)

Dong-Young Lee,

“Protocol Design for Dynamic Delaunay Triangulation,” December 2008. (Current Position: Senior Research Engineer, LG Electronics, Seoul, Korea.)

Yi Li,

“Model-driven Optimization of Multihop Wireless Networks,” August 2008, co-supervised by Yin Zhang. (Current Position: Member of Technical Staff, VMware, California.)

Feng Wang,

“Multi-hop Wireless Network Management: Measurement, Modeling, and Control,” August 2007, co-supervised by Lili Qiu. (Current position: Member of Technical Staff, Meraki Networks, Mountain View, CA.)

Min Sik Kim,

“Building and Maintaining Overlay Networks for Bandwidth-Demanding Applications,” August 2005. (Last known position: Assistant Professor of Computer Science, Washington State University.)

Xincheng Brian Zhang,

“Protocol Design for Scalable and Reliable Group Rekeying,” August 2005. (Current position: Software Engineer, Google, Mountain View, CA.)

Huaiyu Liu,

“A Resilient Routing Infrastructure for Peer-to-Peer Networks,” August 2005. (Current Position: Research Scientist, Wireless Networking Lab, Intel Research.)

Y. Richard Yang,

“Network Congestion Control,” August 2001. (Current position: Professor of Computer Science, Yale University.)

Chung Kei Wong,

“Network Security Services for Flows and Multicasts,” December 1999. (Current position: Software Engineer, Google, Mountain View, CA.)

David K. Y. Yau,

“End System Support for Networking with Quality of Service Guarantees,” July 1997. (Current position: Professor of Information Systems, Singapore University of Technology and Design. Previous position: Associate Professor of Computer Science, Purdue University.)

Geoffrey G. Xie,

“Network Architecture and Algorithms for Multimedia Transport,” August 1996. (Current position: Professor of Computer Science, Naval Postgraduate School, Monterey, CA.)

Thomas Y. C. Woo,

“Authentication and Authorization in Distributed Systems,” August 1994. IEEE Fellow, Bell Labs Fellow. (Current position: Director, Networking Research Laboratory, Bell Laboratories, Alcatel-Lucent Technologies.)

Kenneth L. Calvert,

“Quotient Problems and Protocol Conversion,” May 1991. IEEE Fellow. (Current position: Professor, Department of Computer Science, University of Kentucky. Previous position: Assistant Professor of Computer Science, Georgia Institute of Technology.)

Pradeep Jain,

“Specification of Real-Time Broadcast Networks,” May 1991. (Last known position: Technical staff member, Qualcomm.)

Ching-Tarn Hsieh,

“Models and Algorithms for the Design of Store-and-Forward Communication Networks,” December 1986. (Current position: Engineering Director, Information & Communications Laboratories at ITRI, Taiwan and Regional Director of WiMax Forum.)

Ching-Hua Edward Chow,

“A Discipline for the Verification and Modular Construction of Communication Protocols,” December 1985. (Current position: Professor of Computer Science, University of Colorado at Colorado Springs.)

A. Udaya Shankar,

“Analysis of Communication Protocols via Protocol Projections,” December 1982. (Current position: Professor of Computer Science, University of Maryland at College Park.)

Ben L. DiVito,

“Verification of Communications Protocols and Abstract Process Models,” August 1982, co-supervised by Don Good. (Current position: Senior Research Engineer, NASA Langley Research Center, Hampton, Virginia.)

Y. Luke Lien,

“Modeling and Analysis of Flow-controlled Computer Communication Networks,” December 1981. (Last known position: Senior Manager, IBM Research.)

M.A. Theses Supervised

Nishanth Sastry,

“Application Specific Unicast Congestion Control,” December 2001.

Raghuram Bindignavle,

“Secure Network Programming,” December 1994.

Simon Chow,

“A Study of MPEG Compressed Video Traffic on Computer Networks,” August 1994.

Yeu-Chen Hao,

“Simulation of Queueing Network Models and Analysis of Performance Measures,” December 1984.

Research Grants (PI/PD)

Principal Investigator/Project Director, “NeTS: Small: An Efficient Reachability Analysis Method for Large Dynamic Networks and Its Applications,” National Science Foundation CNS-1214239, \$350,000, 9/1/12 to 8/31/16.

Principal Investigator/Project Director, “NECO: Protocol Design for Distributed Delaunay Triangulation and Its Applications,” National Science Foundation CNS-0830939, \$400,000, 9/1/08 to 8/31/12.

Principal Investigator/Project Director, “NeTS-NR: A Novel Technique to Detect Shared Congestion and Applications,” National Science Foundation CNS-0434515, \$350,000, 10/01/04 to 9/30/08.

Principal Investigator/Project Director, “A Foundation for Designing Overlay Network Protocols,” National Science Foundation ANI-0319168, \$350,000, 9/01/03 to 8/31/07.

Principal Investigator/Project Director, “Congestion Controlled Streaming Media for the Internet,” Texas Advanced Research Program 003658-0439-2001, \$200,000 (no overhead), 1/1/02 to 8/31/04

Principal Investigator/Project Director, “Secure Multicast Services and Applications,” National Science Foundation ANI-9977267, \$536,504, 9/15/99 to 8/31/03.

Principal Investigator/Project Director, “Keystone: A Group Key Management Service,” NSA University Research Program MDA904-98-C-A901, \$199,971, 9/10/98 to 9/10/00.

Principal Investigator/Project Director, “Packet Network Architecture and Protocols for Video Services,” National Science Foundation NCR-9506048, \$449,910, 8/15/95 to 8/31/00.

Principal Investigator/Project Director, “Architecture and Protocols for Secure Group Communications,” Texas Advanced Research Program 003658-063, \$100,069 (no overhead), 1/1/98 to 12/31/99

Principal Investigator/Project Director, “Packet Switch Design for Real-Time Delivery of Multimedia,” Texas Advanced Research Program 003658-220, \$154,617 (no overhead), 1/1/96 to 8/31/98 (co-principal investigator: Roy Jenevein).

Principal Investigator/Project Director, “Designing a Distributed Authorization Service,” NSA University Research Program MDA904-94-C-6106, \$199,806, 7/11/94 to 7/31/97.

Principal Investigator/Project Director, “Networking and OS Support for Multimedia,” AT&T Foundation, \$23,000, 10/1/95 to 10/1/97.

Principal Investigator/Project Director, “A Theoretical Foundation for Communication Network Protocols,” National Science Foundation NCR-9004464, \$338,509, 9/1/90 to 8/31/94.

Principal Investigator/Project Director, “A Proof Methodology for Authentication Protocols,” NSA University Research Program MDA 904-93-C-4089, \$119,942, 6/13/93 to 6/30/96.

Principal Investigator/Project Director, “Multimedia Research in UNIX Environment,” Lockheed unrestricted grant, \$23,000, 1993.

Principal Investigator/Project Director, “Authorization in Distributed Systems,” NSA University Research Program MDA 904-92-C-5150, \$119,976, 8/1/92 to 7/31/95.

Principal Investigator/Project Director, “Fundamental Problems in Communication Network Pro-

ocols,” National Science Foundation NCR-8613338, \$333,200, 4/1/87 to 3/31/91.

Principal Investigator/Project Director, “Applying a Theory of Modules and Interfaces to Security Verification,” NSA University Research Program MDA 904-91-C-7046, \$99,981, 6/28/91 to 6/27/94.

Principal Investigator/Project Director, “Verification of Network Protocols for Secure Communication,” Texas Advanced Research Program Project No. 003658-135, \$113,306 (no overhead), 1/1/90 to 8/31/92.

Principal Investigator/Project Director, “Specification and Design of Real-Time Systems and Communications,” Lockheed unrestricted grant, \$20,000, 1990 (co-principal investigator: Al Mok).

Principal Investigator/Project Director, “Performance Analysis of Concurrent Programs,” Texas Advanced Research Program Project No. 1643, \$165,933 (no overhead), 6/1/88 to 8/31/90 (co-principal investigator: Galen Sasaki).

Principal Investigator/Project Director, “Protocols for Communication and Network Resource Allocation,” National Science Foundation ECS-8304734, \$221,701, 6/1/83 to 5/31/87.

Principal Investigator/Project Director, “Resource Allocation for Computer Communication Networks,” National Science Foundation ECS-8004376, \$100,440, 12/1/80 to 5/31/83.

Principal Investigator/Project Director, “Resource Allocation for Computer Communication Networks,” National Science Foundation ENG78-01803, \$84,959, 6/1/78 to 11/30/80.

Research Grants (co-PI)

Co-Principal Investigator (with Zhang and Qiu), “Collaborative Research: NeTS-NBD: Traffic Engineering in an Uncertain World,” National Science Foundation CNS-0627020, \$500,000, 9/1/06 to 8/31/09.

Co-Principal Investigator (with Mok and Lin), “Coordinated Research in Adaptive Network-Centric Computing,” Office of Naval Research N00014-99-1-0402, \$454,000, 3/01/99 to 2/28/02.

(Prior research grants for which I was co-PI are omitted.)

Infrastructure Grants

Co-Principal Investigator (with Fussell, Mok, Porter, and Vin), “CISE Research Infrastructure: System Support for a Hierarchy of Distributed Applications,” National Science Foundation CDA-9624082, \$1.5 million (including UT-Austin matching funds), 1996 – 2001.

Project Director, equipment grant of RS6000 workstations (\$900,000 value), IBM Corporation, 1993.

(Prior infrastructure grants for which I was co-PI are omitted.)

Software Systems Built

1. **Atomic Predicates for Transformers** (2015) and **AP Verifier** (2013), tools for scalable verification of packet network properties based upon our atomic predicates idea (with Hongkun Yang)
2. **COVE** (2014), a tool based upon formal methods for automating the exchange of reachability information in the Internet data plane between networks (with Hongkun Yang)
3. **ROME** (2012), architecture and protocols (host discovery, routing, and multicast) for a scalable and resilient layer-2 network (with Chen Qian)
4. **ACE** (2008), protocols for a dynamic set of p2p nodes to construct and maintain a distributed Delaunay triangulation for greedy routing in a d -dimensional Euclidean space (with Dong-Young Lee)
5. **Silk** (2004), a resilient, scalable routing fabric for p2p networks that use hypercube routing (with Huaiyu Liu).
6. **Keystone** (1999), a scalable group key management service based upon the key tree idea (with Chung K. Wong).
7. **FlowSign** (1999), an efficient digital signature service for packet flows and multicasts (with Chung K. Wong).
8. **SNP** (1993), the *first* secure sockets layer for Internet applications (with Thomas Woo, Raghuram Bindignavle, and Shaowen Su); winner of 2004 ACM Software System Award.
9. **PROSPEC** (1985), one of the earliest tools for interactive protocol specification and verification with a graphical user interface (with Ching-Hua Chow).

Conference Keynotes

- “Multi-hop DT: A New Routing Protocol,” Keynote lecture at the IEEE International Conference on Network Protocols, Austin, Texas, October 2012 (the only Keynote in the conference).
- “Back to the Future, Part 4: The Internet,” Keynote speech as SIGCOMM Award winner at the ACM SIGCOMM Conference, Portland, Oregon, August 2004 (the only Keynote in the conference).
- “Understanding Interfaces,” Keynote lecture at the 4th International Conference on Formal Description Techniques, Sydney, Australia, November 1991 (the only Keynote in the conference).

Publications

Dissertation

- *Packet Switching in a Multi-Access Broadcast Channel with Application to Satellite Communication in a Computer Network*, Computer Science Department, University of California at Los Angeles, March 1974 (supervisor: Professor Leonard Kleinrock); published as Technical

Report UCLA-ENG-7429 (ARPA), School of Engineering and Applied Science, UCLA, April 1974, 306 pages.

Book

- *Principles of Communication and Networking Protocols*, IEEE Computer Society Press, 1984. [Editor]

Articles in Books

1. (with Thomas Y. C. Woo) “Authentication for Distributed Systems,” in *Internet Besieged: Countering Cyberspace Scofflaws*, Dorothy Denning and Peter Denning (editors), ACM Press and Addison Wesley, 1998.
2. (with A. U. Shankar) “Refinement and Projection of Relational Specifications,” in *Stepwise Refinement of Distributed Systems*, J. W. de Bakker, W. P. de Roever and G. Rozenberg (editors), Lecture Notes in Computer Science 430, Springer-Verlag, May 1990.
3. (with A. U. Shankar) “Construction of Network Protocols by Stepwise Refinement,” in *Stepwise Refinement of Distributed Systems*, J. W. de Bakker, W. P. de Roever and G. Rozenberg (editors), Lecture Notes in Computer Science 430, Springer-Verlag, May 1990.
4. (with A. U. Shankar) “Time-Dependent Communication Protocols,” in *Principles of Communication and Networking Protocols*, S. S. Lam (ed.), IEEE Computer Society Press, 1984.
5. “Multiple Access Protocols,” chapter in *Computer Communications, Vol. 1: Principles*, W. Chou (ed.), Prentice-Hall, 1982.
6. “Data Link Control Procedures,” chapter in *Computer Communications, Vol. 1: Principles*, W. Chou (ed.), Prentice-Hall, 1982.
7. “Satellite Multi-Access Schemes for Data Traffic,” in *Satellite Communications*, H. L. Van Trees (ed.), IEEE Press, 1979.
8. (with M. Reiser) “Congestion Control of Store-and-Forward Networks by Input Buffer Limits—An Analysis,” in *Advances in Computer Communications and Networks*, W. W. Chu (ed.), Artech House, 1979.
9. (with L. Kleinrock) “Packet-Switching in a Slotted Satellite Channel,” in *Advances in Computer Communications*, W. W. Chu (ed.), Artech House, 1974 (1st ed.), 1976 (2nd ed.).

Journal Articles

1. (with Chen Qian) “Greedy Routing by Network Distance Embedding,” *IEEE/ACM Transactions on Networking*, published as IEEE Early Access Article, 2015, Digital Object Identifier: 10.1109/TNET.2015.2449762.
2. (with Hongkun Yang) “Real-time Verification of Network Properties using Atomic Predicates,” *IEEE/ACM Transactions on Networking*, April 2016, Vol. 24, No. 2, pages 887-900 (first published as IEEE Early Access Article, 2015, Digital Object Identifier: 10.1109/TNET.2015.2398197).

3. (with Chen Qian) “A Scalable and Resilient Layer-2 Network with Ethernet Compatibility,” *IEEE/ACM Transactions on Networking*, Feb. 2016, Vol. 24, No. 1, pages 231-244 (first published as IEEE Early Access Article, 2014, Digital Object Identifier: 10.1109/TNET.2014.2361773).
4. (with Chen Qian) “Geographic Routing in d -dimensional Spaces with Guaranteed Delivery and Low Stretch,” *IEEE/ACM Transactions on Networking*, April 2013, Vol. 21, No. 2, pages 663-677 (first published as IEEE Early Access Article, 2012, Digital Object Identifier: 10.1109/TNET.2012.2214056).
5. (with Y. Mao, F. Wang, L. Qiu, and J. Smith) “S4: Small State and Small Stretch Compact Routing Protocol for Large Static Wireless Networks,” *IEEE/ACM Transactions on Networking*, Vol. 18, No. 3, pages 761-774, June 2010.
6. (with Min Sik Kim, Taekhyun Kim, YongJune Shin, and Edward J. Powers) “A Wavelet-based Approach to Detect Shared Congestion,” *IEEE/ACM Transactions on Networking* Vol. 16, No. 4, pages 763-776, August 2008.
7. (with Feng Wang and Lili Qiu) “Probabilistic Region-based Localization for Wireless Networks,” *ACM SIGMOBILE Mobile Computing and Communications Review (MC2R)*, Special Issue on Localization, January 2007.
8. (with Huaiyu Liu) “Failure Recovery for Structured P2P Networks: Protocol Design and Performance under Churn,” *Computer Networks*, Vol. 50, Issue 16, November 2006, pages 3083-3104.
9. (with Nishanth Sastry) “CYRF: A Theory of Window-based Unicast Congestion Control,” *IEEE/ACM Transactions on Networking*, Vol. 13, No. 2, pages 330-342, April 2005.
10. (with X. Brian Zhang and Dong-Young Lee) “Group Rekeying with Limited Unicast Recovery,” *Computer Networks*, Vol. 44, Issue 6, pages 855-870, April 2004.
11. (with X. Brian Zhang, Dong-Young Lee, and Y. Richard Yang) “Protocol Design for Scalable and Reliable Group Rekeying,” *IEEE/ACM Transactions on Networking*, Vol. 11, No. 6, December 2003.
12. (with Y. Richard Yang and Min S. Kim) “Transient Behaviors of TCP-Friendly Congestion Control Protocols,” *Computer Networks*, Vol. 41, Issue 2, pages 193-210, February 2003.
13. (with Chung Kei Wong and Mohamed G. Gouda) “Secure Group Communications Using Key Graphs,” *IEEE/ACM Transactions on Networking*, Vol. 8, No. 1, Feb. 2000, pages 16-30.
14. (with Chung Kei Wong) “Digital Signatures for Flows and Multicasts,” *IEEE/ACM Transactions on Networking*, Vol. 7, No. 4, August 1999, pages 502-513.
15. (with David K. Y. Yau) “Migrating Sockets—End System Support for Networking with Quality of Service Guarantees,” *IEEE/ACM Transactions on Networking*, Vol. 6, No. 6, pp. 700-716 December 1998.
16. (with Geoffrey G. Xie) “Real-Time Block Transfer Under a Link Sharing Hierarchy,” *IEEE/ACM Transactions on Networking*, Vol. 6, No. 1, pp. 30-41, February 1998.
17. (with Geoffrey G. Xie) “An efficient network architecture motivated by application-level QoS,” *Journal of High Speed Networking*, Vol. 6, No. 3, pp. 165-179, January 1998.
18. (with David K. Y. Yau) “Operating System Techniques for Distributed Multimedia,” *International Journal of Intelligent Systems*, Special Issue on multimedia computing systems, 1998.

19. (with Geoffrey G. Xie) “Burst Scheduling Networks,” *Performance Evaluation*, Special Issue on ATM Traffic Management, Vol. 31, November 1997, pages 133-157.
20. (with David K. Y. Yau) “Adaptive Rate-Controlled Scheduling for Multimedia Applications,” *IEEE/ACM Transactions on Networking*, Vol. 5, No. 4, August 1997.
21. (with Pawan Goyal and Harrick Vin) “Determining End-to-End Delay Bounds in Heterogeneous Networks,” *ACM/Springer-Verlag Multimedia Systems*, Vol. 5, No. 3, May 1997.
22. (with Geoffrey G. Xie) “Group Priority Scheduling,” *IEEE/ACM Transactions on Networking*, Vol. 5, No. 2, April 1997.
23. (with Simon Chow and David Yau) “A Lossless Smoothing Algorithm for Compressed Video,” *IEEE/ACM Transactions on Networking*, Vol. 4, No. 5, October 1996.
24. (with Geoffrey G. Xie) “Delay Guarantee of Virtual Clock Server,” *IEEE/ACM Transactions on Networking*, Vol. 3, No. 6, December 1995.
25. (with A. U. Shankar) “A Theory of Interfaces and Modules I—Composition Theorem,” *IEEE Transactions on Software Engineering*, Vol. 20, No. 1, January 1994.
26. (with T. Y. C. Woo) “Authorization in Distributed Systems: A New Approach,” *Journal of Computer Security*, 1994.
27. (with A. U. Shankar) “A Stepwise Refinement Heuristic for Protocol Construction,” *ACM TOPLAS*, Vol. 14, No. 3, July 1992.
28. (with T. Y. C. Woo) “Authentication for Distributed Systems,” *Computer*, Vol. 25, No. 1, January 1992, and “Authentication revisited,” *Computer*, Vol. 25, No. 3, March 1992.
29. (with A. U. Shankar) “Specifying Modules to Satisfy Interfaces: A State Transition System Approach,” *Distributed Computing*, Vol. 6, July 1992, pages 39-63.
30. (with P. Jain) “Specification of Real-Time Broadcast Networks,” *IEEE Transactions on Computers*, Vol. 40, No. 4, April 1991.
31. (with A. U. Shankar) “A Relational Notation for State Transition Systems,” *IEEE Transactions on Software Engineering*, Vol. 16, No. 7, July 1990.
32. (with K. L. Calvert) “Formal Methods for Protocol Conversion,” *IEEE Journal on Selected Areas in Communications*, Vol. 8, No. 1, January 1990.
33. (with C. T. Hsieh) “PAM—A Noniterative Approximate Solution Method for Closed Multi-chain Queueing Networks,” *Performance Evaluation*, Vol. 9, No. 2, April 1989.
34. “Protocol Conversion,” *IEEE Transactions on Software Engineering*, Vol. 14, No. 3, March 1988; correction in *IEEE Transactions on Software Engineering*, Vol. 14, No. 9, Sept. 1988, page 1376.
35. (with C. H. Chow) “PROSPEC: An Interactive Programming Environment for Designing and Verifying Communication Protocols,” *IEEE Transactions on Software Engineering*, Vol. 14, No. 3, March 1988.
36. (with C. T. Hsieh) “Two Classes of Performance Bounds for Closed Queueing Networks,” *Performance Evaluation*, Vol. 7, No. 1, February 1987.
37. (with P. Jain) “Modeling and Verification of Real-Time Protocols for Broadcast Networks,” *IEEE Transactions on Software Engineering*, Vol. SE-13, No. 8, August 1987.

38. (with A. U. Shankar) “Time-Dependent Distributed Systems: Proving Safety, Liveness, and Real-Time Properties,” *Distributed Computing*, Vol. 2, 1987.
39. (with C. H. Chow, M. G. Gouda) “A Discipline for Constructing Multiphase Communication Protocols,” *ACM Transactions on Computer Systems*, Vol. 3, No. 4, November 1985.
40. (with A. U. Shankar) “Protocol Verification via Projections,” *IEEE Transactions on Software Engineering*, Vol. SE-10, No. 4, July 1984.
41. (with A. U. Shankar) “An HDLC Protocol Specification and its Verification Using Image Protocols,” *ACM Transactions on Computer Systems*, Vol. 1, No. 4, pp. 331–368, November 1983.
42. “A Simple Derivation of the MVA and LBANC Algorithms from the Convolution Algorithm,” *IEEE Trans. on Computers*, Vol. C-32, No. 11, November 1983.
43. (with Y. L. Lien) “A Tree Convolution Algorithm for the Solution of Queueing Networks,” *Comm. ACM*, Vol. 26, No. 3, March 1983.
44. (with J. W. Wong) “Queueing Network Models of Packet Switching Networks, Part 2: Networks with Population Size Constraints,” *Performance Evaluation*, Vol. 2, No. 3, 1982.
45. (with J. W. Wong) “Queueing Network Models of Packet Switching Networks, Part 1: Open Networks,” *Performance Evaluation*, Vol. 2, No. 1, 1982.
46. “Dynamic Scaling and Growth Behavior of Queueing Network Normalization Constants,” *Journal of the ACM*, Vol. 29, No. 2, April 1982.
47. (with Y. L. Lien) “Congestion Control of Packet Communication Networks by Input Buffer Limits—A Simulation Study,” *IEEE Trans. on Computers*, Vol. C-30, No. 10, October 1981.
48. (with A. U. Shankar) “A Derivation of Response Time Distributions for a Multi-Class Feedback Queueing System,” *Performance Evaluation*, Vol. 1, No. 1, 1981.
49. “Packet Broadcast Networks—A Performance Analysis of the R-ALOHA Protocol,” *IEEE Trans. on Computers*, Vol. C-29, July 1980.
50. “A Carrier Sense Multiple Access Protocol for Local Networks,” *Computer Networks*, Vol. 4, No. 1, January 1980.
51. “Satellite Packet Communication—Multiple Access Protocols and Performance,” *IEEE Trans. on Commun.*, Vol. COM-27, October 1979.
52. (with M. Reiser) “Congestion Control of Store-and-Forward Networks by Input Buffer Limits—An Analysis,” *IEEE Trans. on Commun.*, Vol. COM-27, January 1979.
53. “A New Measure for Characterizing Data Traffic,” *IEEE Trans. on Commun.*, Vol. COM-26, January 1978.
54. “Delay Analysis of a Time Division Multiple Access (TDMA) Channel,” *IEEE Trans. on Commun.*, Vol. COM-25, December 1977.
55. “An Extension of Moore’s Result for Closed Queueing Networks,” *IBM Journal of Research and Development*, Vol. 21, July 1977.
56. “Queueing Networks with Population Size Constraints,” *IBM Journal of Research and Development*, Vol. 21, July 1977.

57. (with P. J. Schweitzer) "Buffer Overflow in a Store-and-Forward Network Node," *IBM Journal of Research and Development*, Vol. 20, November 1976.
58. "Store-and-Forward Buffer Requirements in a Packet Switching Network," *IEEE Trans. on Commun.*, Vol. COM-24, April 1976.
59. (with L. Kleinrock) "Packet-Switching in a Multi-Access Broadcast Channel: Dynamic Control Procedures," *IEEE Trans. on Commun.*, Vol. COM-23, September 1975.
60. (with L. Kleinrock) "Packet-Switching in a Multi-Access Broadcast Channel: Performance Evaluation," *IEEE Trans. on Commun.*, Vol. COM-23, April 1975.

Conference Articles

1. (with Huazhe Wang, Chen Qian, Ye Yu, and Hongkun Yang) "Practical Network-wide Packet Behavior Identification by AP Classifier," *Proceedings ACM CoNext 2015*, Heidelberg, Germany, December 2015.
2. (with Hongkun Yang) "Collaborative Verification of Forward and Reverse Reachability in the Internet Data Plane," *Proceedings of IEEE ICNP 2014*, Raleigh, NC, October 2014.
3. (with Hongkun Yang) "Real-time Verification of Network Properties Using Atomic Predicates," *Proceedings of IEEE ICNP 2013*, Gttingen, Germany, October 2013.
4. (with Chen Qian) "ROME: Routing On Metropolitan-scale Ethernet," *Proceedings of IEEE ICNP 2012*, Austin, Texas, October 2012.
5. (with Chen Qian) "Greedy Distance Vector Routing," *Proceedings of 31st IEEE ICDCS*, Minneapolis, Minnesota, June 2011.
6. (with Chen Qian) "Geographic Routing in d -dimensional Spaces with Guaranteed Delivery and Low Stretch," *Proceedings of ACM SIGMETRICS 2011*, San Jose, CA, June 2011.
7. (with Song Han, Tianji Li, Chen Qian, Douglas Leith, and Aloysius K. Mok) "HartFi: An Energy-Efficient Localization System," *Proceedings of ACM SIGCOMM Workshop on Energy and IT: from Green Networking to Smarter Systems*, August 2011.
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