Peter Lawrence Reiher

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Education

B.S. Electrical Engineering, University of Notre Dame, cum laude, 1979
M.S. Computer Science, University of California, Los Angeles, 1983
Thesis: "Recovery in Large Scale Distributed Operating Systems"
Ph.D. Computer Science, University of California, Los Angeles, 1987
Thesis: "Naming Issues in Large Scale Distributed Systems"
Advisor: Dr. Gerald Popek

Employment

Adjunct Professor
Computer Science Department, UCLA, March 1992 to 2021.

Director of several DARPA, NSF, and DHS-sponsored research projects, including the Panoply project, the Dissuade project, the DefCOM project, the Data Tethers project, the RAD project, the D-WARD project, the FLAPPS project, the Conquest project, the SAVE project, the Panda project, Travler project, Ficus project and Truffles project. Also the PI on several industry-sponsored projects funded by Intel, Microsoft, Lockheed Martin, and Hewlett-Packard. These projects, with a total contract value of over $9 million, involve the design, implementation and testing of advanced software components for networks and operating systems. Responsibilities include developing new research directions, writing research proposals, providing research direction for these projects, supervision of over a dozen research and staff personnel, presenting project goals and achievements to funding agencies and other parties, writing technical papers, recruiting students and professional programmers, and producing all reports associated with these research projects. Further responsibilities include supervision of project budgets, creation of new research directions for the group, and providing technical advice on other related projects. Faculty responsibilities include teaching, evaluating graduate admissions and awards and directing the department's computing facilities. Areas of expertise include computer and network security, operating systems, distributed systems, computer networks, and mobile computing.

I am currently (2022) on recall status in this position, performing teaching and research duties similar to those described above.

Member of the Technical Staff
Jet Propulsion Laboratory, November 1987 to March 1992

Chief designer for the Time Warp Operating System, a research project experimenting with optimistic synchronization mechanisms for parallel processing. Responsibilities

included the design of major features of the system, implementation of some of those features, representing the project to the sponsor and other parties, and the general technical direction of the project.

Publications

Books

[3] J. Mirkovic, S. Dietrich, D. Dittrich, and **P. Reiher**, *Internet Denial of Service: Attack and Defense Mechanisms*, Prentice Hall, 2004.

[2] J. Li, **P. Reiher**, and G. Popek, *Disseminating Security Updates at Internet Scale*, Kluwer Academic Publishers, 2003.

[1] M. Yarvis, **P. Reiher**, and G. Popek, *Conductor: Distributed Adaptation for Heterogenous Networks*, Kluwer Academic Publishers, May 2002.

Conference Papers, Journal Papers, and Book Chapters

[141] L. Shi, J. Li, M. Zhang, and **P. Reiher**, "On Capturing DDoS Traffic Footprints on the Internet," IEEE Transactions on Dependable and Secure Computing, Vol. 19, No. 4, 2021.

[140] R. Roy, E. Davis, A. Wang, **P. Reiher**, and S. Diesburg, "An Exploration of Targeted Provenance for Reliability," ACM Symposium on Applied Computing, March 2020.

[139] M. Garip, **P. Reiher**, and M. Gerla, "SHIELDNET: An Adaptive Detection Mechanism against Vehicular Botnets in VANETs," IEEE Vehicular Networking Conference (VNC), December 2019.

[138] M. Garip, **P. Reiher**, and M. Gerla, "RIoT: A Rapid Exploit Delivery Mechanism against IoT Devices Using Vehicular Botnets," Vehicular Technlogy Conference (VTC) 2019, September 2019.

[137] M. Zhang, L. Shi, D. Sisodia, J. Li, and **P. Reiher**, "On Multi-Point, In-Network Filtering of Distributed Denial-of-Service Traffic," 2019 IFIP/IEEE International Symposium on Integrated Network Management (IM 2019), April 2019.

[136] M. Garip, **P. Reiher**, and M. Gerla, "BOTVEILLANCE: A Vehicular Botnet Surveillance Attack against Pseudonymous Systems in VANETs," IFIP Wireless and Mobile Networking Conference, December 2018.

[135] L. Shi, M. Zhang, J. Li, and **P. Reiher**, "PathFinder: Capturing DDoS Traffic Footprints on the Internet," IFIP Networking 2018, May 2018.

[134] J. Mirkovic, E. Kline, and **P. Reiher**, "RESECT: Self-Learning Traffic Filters for IP Spoofing Defense," ACSAC, December 2017.

[133] M. Garip, P. Kim, **P. Reiher**, and M. Gerla , "INTERLOC: An Interference-Aware RSSI-Based Localization and Sybil Attack Detection Mechanism for Vehicular Ad Hoc Networks," IEEE CCNC Workshop on Security and Cognitive Informatics for Homeland Defense, January 2017.

[132] M. Garip, M. Gerla, and **P. Reiher**, "GHOST: Concealing Vehicular Botnet Communication in the VANET Control Channel," IWCMC 2016, September 2016.

[131] P. Peterson and **P. Reiher**, "Datacomp: Locally Independent Adaptive Compression for Real-World Systems," ICDCS 2016, June 2016.

[130] M. Mitchell, A. Wang, and **P. Reiher**, "Cashtags: Protecting the Input and Display of Sensitive Data," Usenix Security Symposium, August 2015.

[129] M. Mitchell, R. Patidar, M. Saini, P. Singh, A. Wang, and **P. Reiher**, "Mobile Usage Patterns and Privacy Implications," PerMoby'15, March 2015.

[128] **P. Reiher** and M. Gerla, "Securing the Future Autonomous Vehicle: A Cyber-Physical Approach," book chapter in *Securing Cyber Physical Systems*, CRC Press, 2015.

[127] M. Garip, M. Gursoy, M. Gerla, and **P. Reiher**, "Congestion Attacks to Autonomous Cars Using Vehicular Botnets," SENT 2015, February 2015.

[126] M. Garip, M. Gursoy, **P. Reiher**, and M. Gerla, "Scalable Reactive Vehicle-to-Vehicle Congestion Avoidance Mechanism," CCNC VENIT 2015, January 2015.

[125] V. Pournaghshband, S. Hashemzadeh, and **P. Reiher**, "How To Detect Middleboxes: Guidelines on a Methodology," Sixth International Conference on Network and Communications Security, December 2014.

[124] V. Pournaghshband, D. Meyer, M. Holyland, M. Sarrafzadeh, and **P. Reiher**, "Adrasteia: A Smartphone App for Securing Legacy Mobile Medical Devices," IEEE Workshop on Usable Mobile Security, December 2014.

[123] V. Pournaghshband, A. Afanasyev, and **P. Reiher**, "End-to-End Detection of Compression of Traffic Flows by Intermediaries," *IFIP/IEEE Network Operations and Management Systems*, May 2014.

[122] A. Cozzette, K. Lingel, S. Matsumoto, O. Ortlieb, J. Alexander, J. Betser, L. Florer, G. Kuenning, J. Nilles, and **P. Reiher**, "Improving the Security of Android Inter-Component Communication," short paper, *IFIP/IEEE International Symposium on Integrated Network Management*, May 2013.

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[119] A. Fujimoto, P. Peterson, and **P. Reiher**, "Comparing the Power of Full Disk Encryption Alternatives," *2nd Workshop on Energy Consumption and Reliability of Storage Systems*, June 2012.

[118] M. Gray, P. Peterson, and **P. Reiher**, "Scaling Down Off-The-Shelf Data Compression: Backwards-Compatible Fine-Grain Mixing," *ICDCS*, June 2012.

[117] C. Fleming, P. Peterson, E. Kline, and **P. Reiher**, "Data Tethers: Preventing Information Leakage by Enforcing Environmental Data Access Policies," *ICC*, June 2012.

[116] V. Pournaghshband, A. Afanaseyev, L. Kleinrock, and **P. Reiher**, "Controlling Applications by Managing Network Characteristics," *ICC*, June 2012.

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[114] E. Kline, A. Afanasyev, **P. Reiher**, "Shield: DoS Filtering Using Traffic Deflecting," *2nd International Workshop on Security and Trust in the Future Internet (FIST 2011)*, October 2011.

[113] P. Peterson, D. Singh, W. Kaiser, **P. Reiher**, "Investigating Energy and Security Trade-offs in the Classroom With the Atom LEAP Testbed," *4th Workshop on Cyber Security Experimentation and Tes*t, August 2011.

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[110] A. Afanasyev, N. Tilley, **P. Reiher**, L. Kleinrock, "Host-to-Host Congestion Control for TCP," *IEEE Communications Surveys and Tutorials,* Volume 12, No. 3, Fall 2010. IEEE Communications Society Best Tutorial Paper Award, 2012.

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[91] J. Mirkovic, A. Hussain, B. Wilson, S. Fahmy, **P. Reiher**, R. Thomas, W. Yao, and S. Schwab, "Towards User-Centric Metrics for Denial-of-Service Measurement," *Workshop on Experimental Computer Science*, June 2007.

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[16] F. Wieland, **P. Reiher** and D. Jefferson, "Experiences in Parallel Performance Measurement: The Speedup Bias," *Proceedings of the Third Symposium on Experiences with Distributed and Multiprocessor Systems*, March 1992.

[15] F. Wieland, T. Som, J. Wedel, **P. Reiher** and D. Jefferson, "A Critical Path Tool for Parallel Simulation Performance Optimization," *Proceedings of the 25th Hawaiian International Conference on Systems Sciences,* January 1992.

[14] **P. Reiher** and D. Jefferson, "Supercritical Speedup," *Proceedings of the 24th Annual Simulation Symposium,* April 1991.

[13] **P. Reiher**, S. Bellenot and D. Jefferson, "Debugging the Time Warp Operating System and Its Applications," *Proceedings of the Symposium on Experiences with Distributed and Multiprocessor Systems II*, March 1991.

[12] **P. Reiher**, S. Bellenot and D. Jefferson, "Temporal Decomposition of Simulations Under the Time Warp Operating System," *Proceedings of the 1991 Principles of Distributed Simulation Conference,* January 1991.

[11] **P. Reiher**, "Parallel Simulation using the Time Warp Operating System," *Proceedings of the 1990 Winter Simulation Conference*, December 1990.

[10] M. Presley, **P. Reiher** and S. Bellenot, "A Time Warp Implementation of Sharks World," *Proceedings of the 1990 Winter Simulation Conference*, December 1990.

[9] **P. Reiher**, F. Wieland and P. Hontalas, "Providing Determinism in the Time Warp Operating System—Costs, Benefits, and Implications*," Proceedings of the IEEE Workshop on Experimental Distributed Systems*, October 1990.

[8] **P. Reiher** and D. Jefferson, "Virtual Time-Based Dynamic Load Management in the Time Warp Operating System*," Transactions of the Society for Computer Simulation,* Vol. 7, No. 2, June 1990.

[7] **P. Reiher**, R. Fujimoto, S. Bellenot and D. Jefferson, "Cancellation Strategies in Optimistic Execution Systems," *Proceedings of the 1990 Distributed Simulation Conference*, January 1990.

[6] **P. Reiher** and D. Jefferson, "Virtual Time-Based Dynamic Load Management in the Time Warp Operating System," *Proceedings of the 1990 Distributed Simulation Conference*, January 1990.

[5] **P. Reiher**, F. Wieland and D. Jefferson, "Limitation of Optimism in the Time Warp Operating System," *Proceedings of the 1989 Winter Simulation Conference*, December 1989.

[4] P. Hontalas, B. Beckman, M. DiLoreto, L. Blume, **P. Reiher**, J. Ruffles, K. Sturdevant, L. Warren, J. Wedel, F. Wieland, S. Bellenot and D. Jefferson, "Performance of Colliding Pucks Simulation on the Time Warp Operating System," *Society for Computer Simulation, Distributed Simulation Conference*, 1989.

[3] F. Wieland, L. Hawley, A. Feinberg, M. DiLoreto, L. Blume, J. Ruffles, **P. Reiher**, B. Beckman, P. Hontalas, S. Bellenot and D. Jefferson, "Distributed Combat Simulation and Time Warp: The Model and its Performance," *Concurrency: Practice and Experience,* August 1988.

[2] D. Jefferson, B. Beckman, F. Wieland, L. Blume, M. DiLoreto, P. Hontalas, **P. Reiher**, K. Sturdevant, J. Tupman, J. Wedel and H. Younger, "The Status of the Time Warp Operating System," *Proceedings of the Third Hypercube Conference*, Addison-Wesley, 1988.

[1] **P. Reiher** and G. Popek, "Locus Naming in a Large Scale Environment*," Proceedings of the 1989 Conference on Communications in Distributed Systems*, Springer-Verlag Informatik-Fachberichte 130, 1987.

Patent

[1] An-I Wang, Michael Mitchell, and Peter Reiher, "Obfustication of sensitive human-perceptual output," US patent 10,025,952, issued July 17, 2018.

Professional Activities

Vice-Chair of IEEE ComSoc Communications and Information Security Technical Subcommittee (CSTS), 2005-2007.
UCLA campus representation of the Usenix Association
Member, Association for Computing Machinery, IEEE, Usenix Association
Member of I3P Wireless Network Security Cluster group, 2002
Program committee member: PADS 1993, MDDS 01-05, DISCEX3 02, AMS 00-04, Wetice 03-07, Wolfasi 04, Infocom 05-06, ACM StorageSS Workshop 05, EDBT 06, Monam 06, Globecom 06, 10, 11, ICC 07, ICC 11-12, SAHNS 07,09, 11, Global Internet 07-12, Broadnets 07-08, Chinacom Security 07-08, Q2S Winet 07 and 11, CCNC 08, SECRYPT08-09, MUSIC 08, MUE 08, Wimob 08-12, SecPrivWiMob 08-09, Q2S Winet 08-12, ICDCS 09, CSET 09, CoSec 10, CyberC 10, PDCS 10, DCPerf 11, VTC 11, GC CISS 11-12, GC WN 11-12, Ubicomm 12, Securecom 11-12, ICNC 12-13
Program chair: AMS 02, WSPWN06, Sauce 2008, Sauce 2009, MTEM 2012 (co-chair).
General chair: Symposium on Experiences with Distributed and Multiprocessor Systems, 1993
Reviewer for ACM TOCS, Journal of Computer Security, ACM Wireless Networks Journal, Computer Networks Journal, Computer Journal, Concurrency and Computation – Practice and Experience, IEEE Communications Surveys and Tutorials, ETRI Journal, IEEE Transactions on Systems Man and Cybernetics, International Journal of Wireless and Mobile Communications, ACM MONET, Pattern Analysis and Applications Journal, Journal of Systems and Software, IEEE Transactions on Mobile Computing, IEEE Transactions on Dependability and Computer Security, IEEE Transactions on Computers, VLDB Journal, ACM Design Automation of Electronics Systems, IEEE Communications Letters.
Co-editor, special issue of IEEE JSAC on High Speed Network Security, 2006.
Co-editor of ACM Transactions on Internet Technology, 2007-2015.
NSF proposal review panels (2002-2013)
NSF center review panel (2012)
Technical review of proposals for new Top Level Domain names for ICANN, 2000

Research Interests

Network security (IP spoofing, DDoS defense, botnets, worm defense)
Wireless networks and mobile computing
File systems and optimistic replication
Distributed systems security
Distributed systems
Operating systems
Optimistic concurrency control mechanisms for parallel and distributed systems

Government Contracts and Grants

DrawBridge—Leveraging Software-Defined Networking for DDoS Defense
DHS, Co-Principal Investigator with Jun Li (University of Oregon)
Period of Performance: 2016-2019
Total funding for Peter Reiher: $350,000

TC: Protecting Wireless Medical Devices
NSF, Co-Principal Investigator with Majid Sarrafzadeh
Period of Performance: 2011-2014
Total funding for Peter Reiher: $224,000

CSR: Facets: Exploiting Semantic Equivalence of Files to Improve Storage Systems
NSF, Co-Principal Investigator with An-I Wang (Florida State U.)
Period of Performance: 2011-2015
Total funding for Peter Reiher: $425,000

CSR: Kalipers-Deep Energy Inspection of Operating System Components
NSF, Co-Principal Investigator with William Kaiser
Period of Performance: 2011-2014
Total funding for Peter Reiher: $225,000

CT-ISG: Data Tethers - Preventing Sensitive Data from Loss and Theft
NSF
Period of Performance: 2008-2010
Total funding: $500,000

NBD: Controlling Applications by Managing Network Characteristics
NSF, Co-Principal Investigator with Leonard Kleinrock
Period of Performance: 2007-2009
Total funding for Peter Reiher: $323,000

Collaborative Research: CT-ISG. Enabling Routers to Detect and Filter Spoofed Traffic
NSF, Co-Principal Investigator with Jelena Mirkovic (ISI)
Period of Performance: 2007-2009
Total Funding for Peter Reiher: $205,000

Benchmarks for Evaluation of DDoS
HSARPA, Co-Principal Investigator with Jelena Mirkovic (U. of Delaware), S. Fahmy (Purdue University), and R. Thomas (Sparta Inc.)
Period of Performance:2005-2007
Total funding for Peter Reiher: $113,000

DefCOM: Distributed Defense Against DDoS Attacks
NSF, Co-Principal Investigator with Jelena Mirkovic (U. of Delaware)
Period of Performance: 2004-2007
Total funding for Peter Reiher: $180,000

Conquest-2: Improving Energy Efficiency and Performance Through a Disk/RAM Hybrid File System
NSF, Co-Principal Investigator with An-I Wang (Florida State University)

Period of Performance :2004-2007
Total funding for Peter Reiher: $182,000

Panoply
NSF, Co-Principal Investigator with Leonard Kleinrock and Gerald Popek
Period of Performance: 2004-2008
Total funding for Peter Reiher: $800,000

Knowledge-Based Inference Techniques to Ensure the Security of Database Content
NSF, Co-Principal Investigator with Wesley Chu
Period of Performance: July 2003 to June 2006
Total Funding for Peter Reiher: $65,085

A Forwarding Layer for Application-Level Peer-to-Peer Services (FLAPPS)
DARPA, Sole Principal Investigator
Period of Performance: January 2002 to January 2004
Total Funding: $252,745

Throttling Distributed Denial of Service Attacks Based on Statistical Analysis of Two-Way Traffic (D-Ward)
DARPA, Sole Principal Investigator
Period of Performance: June 2001 to December 2003
Total Funding: $788,446

Improving Operating systems by Replacing Hard Disks with persistent Solid State Memory (Conquest)
NSF, Sole Principal Investigator
Period of Performance: May 2001 to April 2003
Total Funding: $100,000

File Profiling for Insider Threats
DARPA, Sole Principal Investigator
Period of Performance: November 2000 to February 2002
Total Funding: $94,154

Practical Address Validation for the Internet (SAVE)
NSF, Co-Principal Investigator with Dr. Lixia Zhang
Period of Performance: September 1999 to August 2003
Total Funding: $442,618

Improved Data Accessibility for Mobile Computers Through Predictive Methods (DARWIN)
NSF, Sole Principal Investigator
Period of Performance: August 1998 to July 2001
Total Funding: $251,162

A Middleware Framework for Supporting Application use of Active Networks (PANDA)
DARPA, Sole Principal Investigator

Period of Performance: June 1998 to July 2002
Total funding: $1,663,900

Transparent Virtual Mobile Environment (Travler)
DARPA, Co-Principal Investigator with Dr. Leonard Kleinrock, Dr. Rajive Bagrodia, Dr. Gerald Popek, and Dr. Wesley Chu
Period of Performance: October 1994 to June 1999
Total Funding for Peter Reiher/Gerald Popek: $2,721,370

Industrial Grants and Gifts

Curriculum Development for Intel ATOM in Embedded Security Classes
Intel Corporation, Co-Principal Investigator with Dr. William Kaiser
Period of Performance: 2010-2011
Total Funding: $25,000

An Honors Course in Secure Software Design
Lockheed Martin, Sole Principal Investigator
Period of Performance: 2009-2011
Total Funding: $30,000

Using the IXA to Support Router Security Enhancements
Intel Corporation, Sole Principal Investigator
Period of Performance: May 2003 to Indef.
Total Funding: $25,000

Support of IXP Lab (equipment grant)
Intel Corporation, Co-Principal Investigator with Dr. Mario Gerla
Period of Performance: July 2002 to Indef.
Total Funding: $40,894 in equipment

Using the IXA to Support Router Security Enhancements
Intel Corporation, Sole Principal Investigator
Period of Performance: November 2001 to Indef.
Total Funding: $21,000 cash, $7,400 in equipment and software

Using Automated Planning in e-Speak for Education and Research
Hewlett-Packard Company, Sole Principal Investigator
Period of Performance: May 2000 to Indef.
Total Funding: $46,198 cash, $52,814 in equipment

Supporting Multimedia Transmissions with Active Networks
GTE, Sole Principal Investigator
Period of Performance: April 2000 to December 2001
Total Funding: $16,647

Research on Semantic Clustering

Microsoft Corporation, Sole Principal Investigator
Period of Performance: September 1997 to Indef.
Total Funding: $75,000

Educational Grants

Graduate Assistance in Areas of National Need (GAANN) Fellowship Program
US Department of Education, Sole Principal Investigator
Period of Performance: October 2002 to June 2005
Total Funding: $362,280

Ph.D. Students Advised

Matthew Presley (1992)	The Aerospace Corporation
Geoffrey Kuenning (co-advised with Dr. Popek, 1997)	Professor, Harvey Mudd College
David Ratner (co-advised with Dr. Popek, 1998)	Software.com
Theodore Kim (co-advised with Dr. Popek, 1998)	Oracle
Mark Yarvis (co-advised with Dr. Popek, 2001)	Intel
Jun Li (2001)	Associate Professor, University of Oregon
Alexey Rudenko (2002)	HRL Laboratories
An-I Wang (co-advised with Dr. Popek, 2003)	Associate Professor, Florida State University
Jelena Mirkovic (2003)	Member of Technical Staff, ISI
B. Scott Michel (2004)	Member of Technical Staff, The Aerospace Corporation
Kevin Eustice (2008)	Google, Inc.
Venkata Ramakrishna (2008)	IBM
Nam Nguyen (2009)	University of Science, Ho Chi Minh City
Erik Kline (2012)	Member of Technical Staff, ISI
Charles Fleming (2013)	University of Mississippi
Peter Peterson (2014)	University of Minnesota Duluth
Vahab Pournaghshband (2014)	University of San Francisco
Turker Garip	

Students currently being advised: Kevin Li, Can Rustem

Classes Taught

E 96: Introduction to Engineering Design (2016-2018)
CS 111: Principles of Operating Systems (2013-2019, also taught on-line in 2013-2017)
CS 118: Computer Networks (2016)
CS 188: Secure Design for Embedded Systems (2011)
CS 136: Computer Security (2008-2019)
CS 218: Advanced Computer Networks (2017, also taught on-line in 2019)
CS 236: Advanced Computer Security (2007-2008, also taught for on-line program in 2008-2019)

CS 239: Advanced Operating Systems (1995-1997)
CS 239: Experimental Methodology for Software Systems (1997, 2007)
CS 239: Security in Systems Software (1998, 2000, 2002-2005, 2010)
CS 239: Distributed Operating Systems (1999, 2001)
CS 239: Adaptive Software and Agents for Networks (1999)
CS 239: Active Networks (2000)
HNRS 65: The Impact of the Internet on Society (2000)
CS 239: Advanced Issues in Network Security (2003, 2004)

Average student evaluation ranking for all courses: 8.23 out of 9

Departmental Service

Computer Science Department ABET Accreditation Representative (2015-date)
Handling issues related to accreditation of the UCLA Computer Science Department by ABET, including accreditation review in 2018.
Member of Admissions and Awards Committee (1996-2011)
Chairman of Committee (2002)
Handling choice and assignment of teaching assistants, dealing with the mechanics and any problems related to departmental financial awards, and finding and managing funds to support students from the startup packages of new faculty. As part of this effort, I applied for and obtained the Department of Education GAANN grant mentioned above.
Member of Departmental Computing Facility Committee (1998)
Administrator for Departmental Computing Facility (1999-2011)
Overall supervision of the facility personnel, setting of facility policies, and handling an accounting issue that required changes in our method of charging for facility services.
Participation in Faculty Recruiting (1997-2003)
Presented the cases for 11 faculty candidates. Served as host for 2 faculty candidates. Interviewed many faculty candidates. Consulted on PLS field recommendations on candidates.