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Education

2012   Certificate, National and International Security Policy for Senior Executives, Harvard University
1988   Ph.D., Computer Sciences, Purdue University; three-year Packard Fellowship
1982   B.S, Computer Science, Iowa State University; minors in economics, statistics, math

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Carnegie Mellon University, Pittsburgh, PA USA   **2010-Present**

Chief Scientist for the CERT Division at the Software Engineering Institute

Report to the Director of SEI's CERT Division (www.cert.org). Responsible for working with the Director and SEI leadership to plan, develop and implement research strategies, initiatives, and programs that further the mission of CERT and the SEI as well as developing, conveying and executing innovative ideas for the nation's cybersecurity research agendas. The CERT Division, created in 1988 in response to the Morris worm incident, has grown into a national asset in cyber security with 250 staff supporting the cybersecurity research, development and operational needs of the DoD, DHS, and others.
*   Built and transitioned CERT's Science of Cyber Security (SOCS) research group with 10 FTE.
*   Built and sustain CERT's portfolio of cybersecurity research that is funded (non-line) by the Assistant Secretary of Defense for Research & Engineering (which is SEI's sponsor).
*   Initiate and sustain multi-year cybersecurity research projects with DARPA, IARPA, etc. E.g.:
    *   DARPA program on Anomaly Detection at Multiple Scales (ADAMS), FY11-FY15.
    *   DARPA program on Active Cyber Defense (ACD), FY13-FY15.
*   Congressional Testimony
    *   House Energy and Commerce, Subcommittee on Communications and Technology
    *   (2x) House Homeland Security, Sub. on Cybersecurity, Infrastructure Protection and Security Tech.
    *   House Financial Services, Subcommittee on Financial Institutions and Consumer Credit
*   Leadership in technical communities
    *   Co-organizer, Workshop on Efficient and Scalable Cybersecurity using Algorithms Protected by Electricity (ESCAPE), June 2015, http://dimacs.rutgers.edu/Workshops/ESCAPE.
    *   Chair, IEEE Cybersecruity Initiative, 2014–present, cybersecurity.ieee.org.
    *   General Chair, 2014 IEEE Symposium on Security & Privacy, www.ieee-security.org/TC/SP2014.
    *   Co-founder, Workshop on Learning from Authoritative Security Experiment Results (LASER), www.laser-workshop.org.

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Science Applications International Corp. (SAIC), Arlington, VA USA   **2008-2010**

Chief Scientist, Cyber Security, Science Engineering and Technology Corporation
Report to SET's Senior VP for Information Systems and Security. Responsible for establishing an R&D group in cyber security and operations, with customers such as DARPA, IARPA and INSCOM. Focused on cloud computing, insider threats, anomaly detection, user modeling, and science of cyber security.
SAIC acquired SET in January 2010.
*   Grew cyber-security revenue from $0 to $800K and work from 0 FTE to 3 FTE.
*   Proposed and led SET's Phase I work in DARPA's National Cyber Range (NCR) program; focused on incorporating scientific validity into the testbed's design and operation.

CounterStorm, Inc., New York, NY US   **2003-2008**

Chief Scientist
Reported to the CEO as an individual contributor. Responsible for core algorithms research and data analysis in this venture-funded security startup for network-based detection of cyber threats, malware and other malicious behavior that was based on intellectual property from Columbia U., Prof. Sal Stolfo's group. *Trusted Computer Systems acquired CounterStorm in August 2008.*
- Used multi-spectral statistics and machine-learning techniques to design prototype, validate, and improve a dozen new sensors for reliably detecting network-security anomalies.
- Used abduction-based inference techniques and extensive customer data to design, prototype, validate and improve CounterStorm's incident-identification algorithms.
- Principal Investigator for two DHS-funded SBIR contracts totaling $3.2M: *Real-time Malicious Code Detection in Network Traffic: The PAYL Payload Anomaly Detector*, and *A New Generation of Collaborative Cross-domain Security Technologies: Worminator.*
- General Manager and Facility Security Official (FSO) for CounterStorm Government, Inc. Managed $3M in classified contracts with sustained year-over-year revenue growth.

Lucent Technologies, Inc., Columbus, OH USA   **1997-2003**

Technology and Business Strategist   **2000-2003**
Reported to the VP of Global Strategic Standards in Bell Labs. Responsible for security services research, security policy and standards issues, and corporate-wide security initiatives.
- Designed, prototyped and field-tested parts of three network/telecom security tools for comprehensive network security assessment, detection of intellectual property stolen over networks, and SNMP-vulnerability mitigation.
- Co-led Lucent's team for strategic security & reliability standards. Delivered a company-wide security architecture for operations, administration, management and provisioning (OAM&P) in Lucent's solutions for telecom service providers.
- Contributed to and co-edited ANSI Standard T1.276-2003 as Lucent's co-representative to the Network Security Information Exchange (NSIE) task force of the President's National Security Telecommunications Advisory Council, http://www.dhs.gov/sites/default/files/publications/NSTAC_08_0.pdf.
- Lucent's representative to Focus Group 1B for cyber-security best practices in the Sixth National Reliability and Interoperability Council (www.nric.org/fg/nricvifg.html).
  Chair for the OAM&P subgroup.
- Key technical participant of the Alliance for Network Security (www.t-b.com/ans), which repeatedly convinced the U.S. government to ease encryption export restrictions.
- Chief of Staff for Lucent's internal Architecture Council; reported to the President of Lucent Bell labs, Dr. Jeff Jaffe.

General Manager, Lumeta Venture   **1999-2000**
Reported to a general partner in Lucent's New Ventures Group. Hired ten direct reports, and was responsible for commercializing two network security technologies including work by firewall expert, Bill Cheswick.
- In six months, closed four revenue-generating contracts to beta-test a new service based on an application service provider (ASP) delivery model.
- Received term sheets from four venture capitalists for investments of $1-8MM. An investment for $5MM closed in 2000, and the venture became a separate legal entity in September, 2000, www.lumeta.com.

Engineering Manager, Ascend Communications, Inc.   **1997-1999**
Reported to the VP of Engineering for the $200M Enterprise Network Business Unit. Responsible for fifteen direct reports, security software development, Dublin (Ohio) facility, and the business unit's security technologies and related business issues. Products covered included: embedded firewall, client firewall configurator, embedded IPSEC VPN, VPN client, client VPN configurator, and RADIUS server. *Lucent acquired Ascend in June 1999.*
- Transitioned the Dublin development group from working on eight security products to one.
- Led R&D for carrier-class VPN+firewall concentrator – idea to beta testing in 12 months.
- Technical expert in re-designing the export-licensing procedures for Ascend's products in conjunction with representing Ascend's support for encryption-export-control relief at the Alliance for Network Security (www.t-b.com/ans).

Spanning Tree Technologies, Inc., Ames, IA USA   **1994-1997**

Chief Scientist, Milkyway Networks Corp.,
Reported to VP of Engineering in a publicly held Canadian developer of network security products. Responsible for cross-product R&D, strategic technical opportunities and external technical representations.
- Integrated NetProbe with Milkyway's other products.
- Improved performance ten-fold in the firewall product with innovative measurements.
- Discovered and published new data on traffic profiles at corporate Internet gateways.

President & Founder for Spanning Tree   **1994-1996**
Founded Spanning Tree in Ames, Iowa, to sell software and services for enterprise computer security and fraud detection. Competed against Internet Security Systems (ISS).
- Acquired, enhanced, and marketed the NetProbe network vulnerability assessment tool.
- *Milkyway Networks acquired Spanning Tree in August 1996.*

Indiana University, Bloomington, Indiana USA   **1988-1995**

Visiting Technical Staff Member, Los Alamos National Laboratory   **1993-1994**
Reported to the head of the Computer Research and Applications Group at this U.S. Department of Energy (DOE) laboratory. Responsible for providing project leadership and securing external project funding from the DOE, other federal agencies and industry in areas such as fraud detection, anomaly detection and security.
- Co-author of a $1.5M DOE project for intranet infrastructure and applications.
- Creator of a graph-based algorithm to detect tax fraud used by the IRS.

Assistant Professor, Computer Science
Responsible for establishing, managing and funding a research program as well as teaching and service. a
- Awarded grants totaling $800,000 from the National Science Foundation for the design and analysis of algorithms using both theoretical and empirical techniques.
- With colleagues from SUNY Stony Brook, Bellcore, and Rensselaer Polytechnic Institute and $350K in team funding from the NSF via DIAMCS, developed a new research and applications-development software tool for concepts and algorithms in discrete mathematics, dimacs.rutgers.edu/~berryj/LINK.html.
- Authored research papers and proceedings, and organized three national research workshops. Topics covered include graph algorithms, parallel algorithms, algorithm visualization, empirical analysis, and software systems for algorithm design and analysis.

Journal Publications

Berry, J., Dean, N., Goldberg, M. K., Shannon, G. E., and Skiena, S. 2000. LINK: a system for graph computation. *Softw. Pract. Exper.* 30, 11 (Sep. 2000), 1285-1302. DOI=http://dx.doi.org/10.1002/1097-024X(200009)30:11<1285::AID-SPE340>3.3.CO;2-N

Silverman, K. S., Brenner, M. R., Shannon, G. E. Toward a vision for network and service management. *Bell Labs Technical Journal*. 5,4 (Jan. 2000), 21-30. DOI=http://dx.doi.org/10.1002/bltj.2248

Bradford, P. G., Rawlins, G. J., and Shannon, G. E. 1998. Efficient Matrix Chain Ordering in Polylog Time. *SIAM J. Comput.* 27, 2 (Apr. 1998), 466-490. DOI=http://dx.doi.org/10.1137/S0097539794270698

Kao, M. and Shannon, G. E. 1993. Linear-processor NC algorithms for planar directed graphs II: directed spanning trees. *SIAM J. Comput.* 22, 3 (Jun. 1993), 460-481. DOI=http://dx.doi.org/10.1137/0222033

Berman, F. and Shannon, G. E. 1993. Representing graph families with edge grammars. *Inf. Sci.* 70, 3 (Jun. 1993), 241-269. DOI= http://dx.doi.org/10.1016/0020-0255(93)90080-6

Goldberg, A. V., Plotkin, S. A., and Shannon, G. E. 1988. Parallel symmetry-breaking in sparse graphs. *SIAM J. Discret. Math.* 1, 4 (Oct. 1988), 434-446. DOI= http://dx.doi.org/10.1137/0401044

Shannon, G. E. 1988. A linear-processor algorithm for depth-first search in planar graphs. *Inf. Process. Lett.* 29, 3 (Oct. 1988), 119-123. DOI= http://dx.doi.org/10.1016/0020-0190(88)90048-8

Other Publications

Berry, J., Dean, N., Goldberg, M. K., Shannon, G. E., and Skiena, S. 1997. Graph Drawing and Manipulation with LINK. In *Proceedings of the 5th international Symposium on Graph Drawing* (September 18 - 20, 1997). G. D. Battista, Ed. Lecture Notes In Computer Science, vol. 1353. Springer-Verlag, London, 425-437.

J.Berry, N. Dean, P. Fasel, M. Golberg, E. Johnson, J. MacCuish, G. Shannon and S. Skiena. "LINK: A Combinatorics and Graph Theory Workbench, for Applications and Research", DIMACS Technical Report 95-15 and Los Alamos Laboratory Unclassified Report 95-1982, 1995.

J. MacCuish, S. Mniszewski, G. Shannon, and B. Yantis. "Digital Village". *Los Alamos Science*, 22, p. 150-155, 1994.

G. Shannon, J. MacCuish and E. Johnson. "A case study in algorithm animation: Maximum flow algorithms", in *Network Flows and Matching: First DIMACS Implementation Challenge*. Editors: David S. Johnson, Catherine C. McGeoch. DIMACS Series in Discrete Mathematics and Theoretical Computer Science, Vol. 12, American Mathematical Society, 1993.

Dean, N. and Shannon, G. E., editors. *Computational Support for Discrete Mathematics: DIMACS Workshop March 12-14, 1992*. DIMACS Series in Discrete Mathematics and Theoretical Computer Science, Vol. 12, American Mathematical Society, 1993. ISBN 0821866052.

Wan, F., Shannon, G. E. Using Separators Instead of Dynamic Programming in Approximation Algorithms for Planar Graphs. *Proceedings of the International Conference on Parallel Processing*, Austin, Texas, USA, August 1991, Vol.3: Algorithms and Applications. 298-299.

Shannon, G. E. 1989. Optimal on-line load balancing. In *Proceedings of the First Annual ACM Symposium on Parallel Algorithms and Architectures* (Santa Fe, New Mexico, United States, June 18 - 21, 1989). F. T. Leighton, Ed. SPAA '89. ACM, New York, NY, 235-245. DOI=http://doi.acm.org/10.1145/72935.72960

Shannon, G. E. 1988 *Designing Efficient Parallel Algorithms: Techniques and Applications*. Doctoral Thesis. UMI Order Number: AAI8900729. Purdue University.

Congressional Testimony

March 28th, 2012

Testimony before House Energy and Commerce Committee, Subcommittee on Communications and Technology, "Cybersecurity: Threats to Communications Networks and Public-Sector Responses"
http://energycommerce.house.gov/hearing/cybersecurity-threats-communications-networks-and-public-sector-responses

http://www.gpo.gov/fdsys/pkg/CHRG-112hhrg78432/pdf/CHRG-112hhrg78432.pdf

December 6th, 2011

Testimony before House Homeland Security Committee, Subcommittee on Cybersecurity, Infrastructure Protection and Security Technologies, "Hearing on Draft Legislative Proposal on Cybersecurity"
http://homeland.house.gov/hearing/subcommittee-hearing-hearing-draft-legislative-proposal-cybersecurity

http://www.gpo.gov/fdsys/pkg/CHRG-112hhrg74646/pdf/CHRG-112hhrg74646.pdf

September 14th, 2011

Testimony before House Financial Services Committee, Subcommittee on Financial Institutions and Consumer Credit, "Cybersecurity: Threats to the Financial Sector"
http://financialservices.house.gov/Calendar/EventSingle.aspx?EventID=258792

http://www.gpo.gov/fdsys/pkg/CHRG-112hhrg72601/pdf/CHRG-112hhrg72601.pdf

June 24th, 2011

Testimony before House Homeland Security Committee, Subcommittee on Cybersecurity, Infrastructure Protection and Security Technologies, "Examining the Homeland Security Impact of the Obama Administration's Cybersecurity Proposals"
http://homeland.house.gov/hearing/subcommittee-hearing-examining-homeland-security-impact-obamaadministrations-cybersecurity

http://www.gpo.gov/fdsys/pkg/CHRG-112hhrg72253/pdf/CHRG-112hhrg72253.pdf