

# David M. Nicol

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Director, Information Trust Institute  
Franklin W. Woeltge Professor of Elec. & Comp. Eng.  
University of Illinois at Urbana-Champaign  
451 Coordinated Science Laboratory  
1308 West Main Street  
Urbana, IL 61801

[dmnicol@illinois.edu](mailto:dmnicol@illinois.edu)  
voice: (217) 244-1925  
fax: (217) 244-5685

September 6, 2017

## Education

Ph.D.	Computer Science	University of Virginia	1985
M.S.	Computer Science	University of Virginia	1983
B.A.	Mathematics (Phi Beta Kappa)	Carleton College	1979

## Employment

<i>Director, Information Trust Institute</i> January 2011–present.	<i>University of Illinois at Urbana-Champaign</i>
<i>Professor of Electrical and Computer Engineering</i> September 2003–present.	<i>University of Illinois at Urbana-Champaign</i>
<i>Acting Director</i> May 2003–August 2003.	<i>ISTS</i>
<i>Assoc. Director for Research and Development</i> July 2002–May 2003.	<i>ISTS</i>
<i>Professor of Computer Science</i> 1998–2003. Chair: July 2000–July 2002. Sabbatical—Spring 2000: Oxford University Department of Computing .	<i>Dartmouth College</i>
<i>Associate Professor of Computer Science</i> 1996–1998. Vice Chair : July 1999-June 2000.	<i>Dartmouth College</i>
<i>Associate Professor of Computer Science</i> 1992–1996. Sabbatical—Fall 1993 through Spring 1994 : Institute for Computer Application Studies, and Carleton College.	<i>College of William and Mary</i>
<i>Assistant Professor of Computer Science</i> 1987–1992.	<i>College of William and Mary</i>
<i>Staff Scientist</i> 1985–1987.	<i>ICASE, NASA Langley Research Center</i>
<i>Programmer Analyst</i> 1979–1982. Design Lead 1980-1982, CDC Site Representative ABLE System, Zweibruecken AFB West Germany, 1982.	<i>Control Data Corporation</i>

## **Honors and Awards**

Named Franklin W. Woeltge Professor of Electrical and Computer Engineering, 2012.

Best Paper Award, Conference on Principles of Advanced and Distributed Simulation, 2012.

“Reconocimiento Especial”, Tecnológico De Monterrey, (honoring my text-book “Discrete-Event Systems Simulation”), 2010.

Best Paper Award, Malware 2010.

Best Paper Award, Conference on Principles of Advanced and Distributed Simulation, 2008.

ACM SIGSIM Distinguished Contributions Award, inaugural winner, 2007.

Fellow of the ACM, 2006.

Best Paper Award, Conference on Principles of Advanced and Distributed Simulation, 2005.

Best Paper Award, IPSI-2004 Studencia Conference, 2004.

IEEE Fellow, 2003.

Marion and Jason Whiting Fellowship for study at Oxford University, 2000.

Best Paper Award, 9<sup>th</sup> Annual Conference on Parallel and Distributed Simulation, 1995.

Alumni Fellowship Award, given by the William and Mary Society of the Alumni for excellence in teaching, 1992.

Great Performer’s Award (1980), Employee Excellence Award (1982) Control Data Corporation.

## Consulting

- Consultant* *Pacific Northwest National Laboratory*  
Served on external review team evaluating PNNL's program in Asymmetric Resilient Cybersecurity, 2012-2015.
- Consultant* *Los Alamos National Laboratory*  
Served on external review team evaluating LANL's program in Computational Physics and Applied Mathematics, 2010, 2103. Led subgroup on simulation technologies.
- Consultant* *Institut National de Recherche en Informatique et Automatique (INRIA)*  
Assessed proposed multi-year research program on understanding and management of large scale instructure for distributed computing.  
2008.
- Consultant* *Institut National de Recherche en Informatique et Automatique (INRIA)*  
Led team of international experts in assessing 11 INRIA multi-year research programs in high performance computing on distributed Grid networks. 2008.
- Consultant* *Department of Homeland Security*  
Assessment of DHS program in process modeling of coupled critical infrastructures. 2006.
- Consultant* *NASA*  
Assessment of a proposed NASA standard for simulation model development, experimental design, documentation, and reporting. 2006.
- Consultant* *Sandia National Laboratories*  
Aid in design of distributed simulation language and toolset for internal Sandia use, study of distributed simulations of DoE complex enterprise systems, study of utility of fluid based communication models, design of wireless systems in critical infrastructure communications. 1996-2006.
- Consultant* *National Science Foundation*  
Assess research proposals in the areas of high performance computing, performance evaluation, and computer/communication security. 1987-present.
- Consultant* *GRCI Corporation*  
Assist system architect Emmet Beeker in GRCI contract proposal development for high performance analytic military simulations. 2000-2003.
- Developer* *Supercomputing 99, 00, 01, and 02 Conferences*  
Developed, maintained and operated web sites for technical conference and tutorial submission, management, and evaluation. Provide technical assistance for authors, reviewers, and program committee. People I trained for the Supercomputing contract have turned this into a business.
- Consultant* *Universities Space Research Association*  
Assisted USRA in preparation of \$5M/year proposal to NASA for development of a Research Center in Earth Sciences. 1999.
- Science Council* *Center of Excellence in Space Data and Information Science, NASA Goddard Space Center*  
Served on CESDIS technical oversight board, making program recommendations to NASA Goddard. Member 1995-1999. Served as chair, 1998-1999.
- Consultant* *ATT Research*  
Worked with Albert Greenberg and Boris Lubachevsky on problems in parallel simulation of computer and communication networks. 1992-1996.
- Consultant* *IBM Research*  
Worked with Phil Heidelberger on problems in parallel simulation of computer and communication networks. 1992-1996.

*Consultant*

*Institute for Computer Applications in Science and Engineering*

Did basic research in control and modeling of high performance computations motivated by problems of interest to NASA, particularly reliability modeling. Developed and managed a visitors program for ICASE in performance and reliability analysis. 1987-1996.

## Research Interests

Analysis of computer and communication systems, particularly with respect to trust metrics and their evaluation; quantitative methods for security evaluation. Modeling and simulation methodologies.

## Funding

PI and co-PI on \$136,798,609 of awarded support since 1988.

### AWARDED

<b>Department of Energy</b> , \$24,500,000, 2015-2020 <i>Cyber Resilient Energy Delivery Consortium</i>	
<b>Department of Homeland Security</b> , \$20,000,000, 2015-2020 <i>Center of Excellence in Resilient Critical Infrastructures</i>	
<b>Intel Corporation</b> , \$63,345, 2014-2014, <i>Security Model for the Intel Chesser Open Analytics Platform</i>	PI
<b>National Security Agency</b> , \$6,404,494, 2014-2017 <i>Science of Security for Systems</i> , co-PI : William Sanders, José Meseguer	PI
<b>National Science Foundation</b> , \$50,000, 2014-2014 <i>I-Corps: Innovation Corps Training for NPView Network Security Leadership</i>	PI
<b>Department of Energy</b> , \$1,100,000, 2013-2016 <i>Software Defined Networking Project</i> , PI: Rakesh Bobba	co-PI
<b>Department of Energy</b> , \$930,000, 2013-2016 <i>Secure Policy Based Configuration Framework</i> , PI: Tim Yardley	co-PI
<b>Army Research Office</b> , \$2,052,597, 2013-2014 <i>Tablet for Science of Security</i> , co-PI : William Sanders, José Meseguer	PI
<b>Office of Naval Research</b> , \$603,742, 2013-2016 <i>Integrating Security in Real Time Embedded Systems</i> , PI: Siban Mohan	co-PI
<b>National Science Foundation</b> , \$5,071,180, 2013-2017 <i>Illinois Cyber Security Scholars Program (ICSSP) Renewal</i> , PI: Roy Campbell	co-PI
<b>Department of Homeland Security</b> , \$750,000, 2012-2014 <i>A Tool for Compliance and Depth of Defense Metrics</i>	PI
<b>National Science Foundation</b> , \$548,720, 2012-2016 <i>Program in Digital Forensics</i> , PI: Roy Campbell	co-PI
<b>Idaho National Laboratories</b> , \$50,000, 2012-2013 <i>Situational Awareness Integration for NetAPT Sophia via IF-MAP</i>	PI
<b>Korean Electronics and Telecommunications Research Institute</b> , \$500,000, 2011-2013 <i>Security for the Smart Grid</i>	PI
<b>National Security Agency</b> , \$964,670, 2011-2012 <i>Tablet for Science of Security</i> , co-PI : William Sanders, José Meseguer	PI
<b>Dept. of Naval Research</b> , \$1,192,650, 2010-2012 <i>Center for Assured Critical Application and Infrastructure Security</i> co-PI : William Sanders	PI

<b>Illinois Dept. of Commerce and Economic Opportunity</b> , \$4,500,000, 2010-2015 <i>Illinois Center for a Smarter Electric Grid (ICSEG)</i> co-PIs : Thomas Overbye, William Sanders, Peter Sauer	co-PI
<b>Rockwell-Collins</b> , \$660,000, 2008-2011 <i>COTS Architecture for Multi-level Security</i> , co-PI : William Sanders	PI
<b>Boeing</b> , \$3,482,351 , 2011-2013 <i>Trusted Software Center</i>	PI
<b>State of Illinois</b> , \$4,500,000 co-PIs : Tom Overbye, William Sanders, Peter Sauer	co-PI <i>Illinois Center for a Smarter Electric Grid</i>
<b>Honeywell</b> , \$570,000, 2010-2014	PI <i>RBAC Driven Least Priviledge Architecture for Control Systems</i>
<b>Air Force</b> , \$83,800, 2009-2010 <i>DURIP : Timing Traffic Analysis Testbed</i> , co-PI : William Sanders, Negar Kiyavash, Todd Coleman	co-PI
<b>NSF</b> , \$1,500,000, 2008-2013, <i>Illinois Cyber Security Scholars Program</i> , co-PI : Roy Campbell	co-PI
<b>EPRI</b> , \$50,000, 2008-2009 <i>Evaluation of Secure Authentication Supplement of the DNP3 Specification</i> , co-PI : William Sanders, Himanshu Khurana	co-PI
<b>I3P/DHS</b> , \$500,000, 2007-2009 <i>Global Policy for Survivable Process Control Networks</i> co-PI : William Sanders	PI
<b>I3P/DHS</b> , \$600,000, 2007-2009 <i>End-to-End Assessment of Identity Management Systems</i> co-PI : William Sanders, Carl Gunter	PI
<b>NSF</b> , \$500,000, 2008-2011 <i>CT-ISG: Traffic Analysis : Attacks, Defenses, and Fundamental Limits</i> , co-PIs : Nikita Borisov, Todd Coleman, Negar Kiyavash	co-PI
<b>Dept. of Energy</b> , \$250,000 2008-2009 <i>Trustworthy Communication Architecture for Converged SCADA Applications</i> , co-PIs : William Sanders, Himanshu Khurana	co-PI
<b>NSF</b> , \$412,000, 2006-2009 <i>Survivable Trust for Critical Infrastructure: Detecting and Preventing Attacks with Vulnerability Signatures</i> , co-PIs : William Sanders, Nikita Borisov	co-PI
<b>NSF</b> , \$7,500,000, 2005-2010 <i>Trustworthy Cyber Infrastructure for the Power Grid</i> , co-PIs : William Sanders, Ravi Iyer, Roy Campbell, Peter Sauer	co-PI
<b>I3P</b> , \$240,000, 2005-2007 <i>Unifying Stakeholders and Security Programs to Address SCADA Vulnerability and Infrastructure Interdependencies</i> co-PI : William Sanders	co-PI
<b>Boeing</b> , \$484,000, 2005-2009 <i>Algorithms for Quantifying Security and Survivability</i> , co-PI : William Sanders	co-PI

<i>David M. Nicol (Funding)</i>	7
<b>NSF</b> , \$360,000, 2002-2005 <i>Survivable Trust for Critical Infrastructure</i> co-PIs : Sean Smith, Chris Hawblitzel	co-PI
<b>Mellon Foundation</b> , \$1,649,977, 2002-2003 <i>Transforming Academic Computing with Public Key Infrastructure</i> PI : Sean Smith Co-PIs : Bob Brentrup, Larry Levine	co-PI
<b>Department of Justice</b> , \$18,000,000, 2002-2003 <i>Institute for Security Technology Studies</i> <i>Institute for Information Infrastructure Protection</i>	PI
<b>Department of Justice</b> , \$15,000,000, 2000-2001 <i>Institute for Security Technology Studies</i> PI Susan Prager, Provost of Dartmouth College Co-PIs : Lewis Duncan, George Cybenko, Joseph Henderson	co-PI
<b>Internet2 and ATT</b> , \$200,000, 2000-2002 <i>Internet2 PKILab</i> Co-PIs : Sean Smith, Larry Levine	co-PI
<b>DARPA</b> , \$1,700,000, 2000-2003 <i>Spatio-Temporal Dynamics of the Global Internet</i>	PI
<b>NSF</b> , \$1,400,000, 1998-2003 <i>Systems Science for Physical Geometric Algorithms</i> NSF Research Infrastructure award Co-PIs : David Kotz, Dan Rockmore, Bruce Donald	PI
<b>NSF</b> , \$224,000, 1998-2001 <i>A Fluid Methodology and Tool for Complex Large-Scale Networks</i>	PI
<b>DARPA</b> , \$3,310,931, 1996-1999 <i>Scalable Self-Organizing Simulations</i> co-PI : Andrew Ogielski	co-PI
<b>NSF</b> , \$1,500,000, 1995-1998 <i>Simulations Of Integrated Communications Systems</i> co-PIs: Andrew Ogielski, Richard Fujimoto, Diane Souvaine	co-PI
<b>NSF</b> , \$125,918 <i>Acquisition of a Parallel Graphics Computer for Inter-disciplinary Research</i>	co-PI
<b>NASA</b> , \$20,000, 1995-1996 <i>Reliability Interface Tool Extension</i>	PI
<b>CACC</b> , \$16,000, 1995-1996 <i>Integrated Modeling</i>	PI
<b>Center for Innovative Technology</b> , \$39,989, 1995 <i>Integrated Environment for performance, reliability, and availability modeling</i>	PI
<b>NASA</b> , \$135,000, 1992-1995 <i>Parallel Algorithms for the Simulation and Analysis of Discrete Time Petri Nets</i>	PI
<b>NSF</b> , \$131,000, 1992-1995 <i>Static and Dynamic Load Balancing of Parallel Discrete-Event Simulations on Distributed Memory Architectures</i>	PI

<i>David M. Nicol (Funding)</i>	8
<b>NASA</b> , \$57,500, 1989-1992 <i>Parallelization of Performance Tools</i>	PI
<b>NASA</b> , \$110,000, 1990-1993 <i>The Reliability Estimation System Testbed</i>	PI
<b>NSF</b> , \$104,000, 1989-1992 <i>Automated Methods for Run-Time Performance Optimization of Sparse and Irregular Numerical Applications</i>	PI
<b>US Army</b> , \$178,000, 1988-1991 <i>Reliable Real-Time Processing of Sensor Data in Embedded Avionics Computing Systems</i> Co-PIs : Steve Park, Phil Kearns	co-PI
<b>NASA</b> , \$105,000, 1990-1992 <i>Writing Software for 2010</i> co-PI: Keith Miller	co-PI
<b>NASA</b> , \$78,745, 1989-1990 <i>Parallelization of ERBE Data Processing</i>	PI
<b>Center for Innovative Technology</b> , \$39,000, 1989-1990 <i>Parallelization of Performability Design Tools</i>	PI
<b>NASA</b> , \$25,000, 1989-1990 <i>Hypercube Equipment Grant</i>	PI
<b>DFL Ltd.</b> , \$25,000, 1988-1989 <i>Mapping Issues in Parallel Simulations</i>	PI

## Publications

### PH.D. DISSERTATION

1. David M. Nicol  
The Automated Partitioning of Simulations for Parallel Execution  
Ph.D. thesis, University of Virginia, August 1985.

### BOOKS

1. Jerry Banks, John Carson, Barry Nelson and David Nicol  
Discrete-Event System Simulation.  
Prentice-Hall, 3<sup>rd</sup> Edition (2000), 4<sup>th</sup> Edition (2005), 5<sup>th</sup> Edition (2009)

## Journal Publications

- [1] Jingwei Huang and David M. Nicol. An anatomy of trust in public key infrastructure. *International Journal of Critical Infrastructure*, 2017. To appear.
- [2] Jeremy Lamps, Vignesh Babu, David M. Nicol, Vladimir Adam, and Rakesh Kumar. Temporal integration of emulation and network simulators on linux multiprocessors. *ACM Trans. Model. Comput. Simul.*, 2017. To appear.
- [3] K.R. Davis, R. Bertier, S. Zonouz, G. Weaver, R.B. Bobba, E. Rogers, P. Sauer, and D.M. Nicol. Cyber-physical security assessment (cypsa) for electric power systems. *The Bridge (IEEE-EKN)*, 112(2):8–19, May 2016.
- [4] Dong Jin and David M. Nicol. Parallel simulation and virtual-machine-based emulation of software-defined networks. *ACM Trans. Model. Comput. Simul.*, 26(1):8:1–8:27, December 2015.
- [5] Dong (Kevin) Jin, Yuhao Zheng, and David M. Nicol. A parallel network simulation and virtual time-based network emulation testbed. *J. Simulation*, 8(3):206–214, 2014.
- [6] Sean Peisert, Jonathan Margulies, David M. Nicol, Himanshu Khurana, and Chris Sawall. Designed-in security for cyber-physical systems. *IEEE Security & Privacy*, 12(5):9–12, 2014.
- [7] Nils Ole Tippenhauer, William G. Temple, An Hoa Vu, Binbin Chen, David M. Nicol, Zbigniew Kalbarczyk, and William H. Sanders. Automatic generation of security argument graphs. *CoRR*, abs/1405.7475, 2014.
- [8] Jingwei Huang and David M. Nicol. Trust mechanisms for cloud computing. *Journal of Cloud Computing*, 2(1):1–9, April 2013.
- [9] Y. Zheng, D.M. Nicol, D. Jin, and N. Tanaka. A virtual time system for virtualization-based network emulations and simulations. *Journal of Simulation*, 6(3):205–213, August 2012.
- [10] David M. Nicol. Hacking the lights out : The computer virus threat to the electrical grid. *Scientific American*, 305(1):70–75, July 2011.
- [11] J. Huang and D.M. Nicol. An approach to formal semantics based calculus of trust. *IEEE Internet Computing*, 14(5):38–46, Sept./Oct. 2010.
- [12] David M. Nicol, Matt Davis, and Tom Overbye. A testbed for power system security evaluation. *International Journal of Information and Computer Security*, 2009.
- [13] David M. Nicol and Nabil Schear. Models of privacy preserving traffic tunneling. *Simulation : Transactions of the Society for Modeling and Simulation International*, 85(9):589–607, 2009.
- [14] Hamed Okhravi and David M. Nicol. Application of trusted network technology to industrial control networks. *International Journal of Critical Infrastructure Protection*, 2009.

- [15] Hamed Okhravi and David M. Nicol. Evaluation of patch management strategies. *International Journal of Computational Intelligence : Theory and Practice*, 3(2):103–111, December 2008.
- [16] David M. Nicol, William H. Sanders, Sankalp Singh, and Mouna Seri. Useable global network access policy for process control systems. *IEEE Security & Privacy*, 6(6):30–36, Nov.-Dec. 2008.
- [17] David M. Nicol. Efficient simulation of internet worms. *ACM Transactions on Modeling and Computer Simulation*, 18(2):5:1–5:32, 2008.
- [18] M. Liljenstam, D.M. Nicol, Y. Yuan, G. Yan, and J. Liu. Rinse: the real-time interactive network simulation environment for network security exercises. *Simulation : Transactions of the Society for Modeling and Simulation International*, 82(1):43–59, Jan. 2006.
- [19] D.M. Nicol G. Yan. High performance simulation of low-resolution network flows. *Simulation : Transactions of the Society for Modeling and Simulation International*, 82(1):21–42, Jan. 2006.
- [20] M. Zhao, S.W. Smith, and D. M. Nicol. The performance impact of BGP security. *IEEE Network*, pages 42–48, November/December 2005.
- [21] David M. Nicol. Modeling and simulation in security evaluation. *IEEE Security and Privacy*, pages 71–74, September/October 2005.
- [22] J. Liu, Y. Yuan, D. Nicol, R. Gray, C. Newport, D. Kotz, and L. Perrone. Empirical validation of wireless models in simulations of ad hoc routing protocols. *Simulation : Transactions of the Society for Modeling and Simulation International*, 81(4):307–323, 2005.
- [23] David M. Nicol, William H. Sanders, and Kishor S. Trivedi. Model-based evaluation: From dependability to security. *IEEE Trans. on Dependability and Security*, 1(1):48–65, 2004.
- [24] David M. Nicol, Sean Smith, and Meiyuan Zhao. Evaluation of efficient security for BGP route announcements using parallel simulation. *Simulation Practice and Theory*, 12(3-4):187–216, 2004.
- [25] David M. Nicol and Guanhua Yan. Discrete-event fluid modeling of tcp background traffic. *ACM TOMACS*, 14(3):211–250, 2004.
- [26] Weizhen Mao and David M. Nicol. On k-ary n-cubes : Theory and applications. *Discrete Applied Mathematics*, 129(1):171–193, 2003.
- [27] David M. Nicol. Utility analysis of network simulators. *International Journal of Simulation : Systems, Science, and Technology*, 2003.
- [28] David Nicol and Jason Liu. Composite synchronization for parallel discrete event simulation. *IEEE Transactions on Parallel and Distributed Systems*, 13(5):433–446, May 2002.
- [29] Heidi Ammerlahn, David Nicol, Michael Goldsby, and Michael Johnson. A geographically distributed enterprise system. *Future Generation Computer Systems*, 17(2):135–146, October 2000.
- [30] Gianfranco Ciardo, David Nicol, and Kishor Trivedi. Simulation of fluid stochastic Petri nets. *IEEE Transactions on Software Engineering*, 25(2):207–217, March/April 1999.
- [31] James Cowie, David Nicol, and Andy Ogielski. Modeling the global internet. *IEEE Computing in Science and Engineering*, 1(1):42–50, Jan.-Feb. 1999.
- [32] Brian Premore and David Nicol. Transformation of ns TCP models to TED. *ACM Performance Evaluation Review*, 25(4):40–48, March 1998.
- [33] Graham Horton, David Nicol, V. Kulkarni, and Kishor Trivedi. Fluid stochastic Petri nets: Theory applications and solution techniques. *European Journal of Operational Research*, 105(1):184–201, February 1998.
- [34] Gianfranco Ciardo, David Nicol, and Josh Gluckman. Distributed state space generation of discrete-state stochastic models. *INFORMS Journal on Computing*, 10(1):82–93, January 1998.

- [35] Tom Cormen and David Nicol. Performing out-of-core FFTs on parallel disk systems. *Parallel Computing*, 24(1):5–20, January 1998.
- [36] Tom Cormen and David Nicol. Out-of-core FFTs with parallel disks. *ACM Performance Evaluation Review*, 25(3):3–12, December 1997.
- [37] Scott Leutenegger and David Nicol. Efficient bulk-loading of gridfiles. *IEEE Transactions on Knowledge and Data Engineering*, 9(3):410–420, May/June 1997.
- [38] Shahid Bokhari and David Nicol. Balancing contention and synchronization on the Intel Paragon. *IEEE Concurrency*, 5(2):74–84, April-June 1997.
- [39] David Nicol and Gianfranco Ciardo. Automated parallelization of discrete state-space generation. *Journal of Parallel and Distributed Computing*, 47:153–167, 47 1997.
- [40] Phillip Dickens, David Nicol, and Philip Heidelberger. Parallelized direct execution simulation of message passing programs. *IEEE Transactions on Parallel and Distributed Systems*, 7(10):1090–1105, October 1996.
- [41] Phillip Dickens, David Nicol, Paul Reynolds, and Mark Duva. Analytic comparison of bounded time warp and yawns. *ACM Transactions on Modeling and Computer Simulation*, 6(4):297–320, October 1996.
- [42] David Nicol and Philip Heidelberger. Parallel execution for serial simulators. *ACM Transactions on Modeling and Computer Simulation*, 6(3):210–242, July 1996.
- [43] David Nicol and Weizhen Mao. On bottleneck partitioning of  $k$ -ary  $n$ -cubes. *Parallel Processing Letters*, 6(6):389–399, June 1996.
- [44] David Nicol, Rahul Simha, and Don Towsley. Static assignment of complex tasks using stochastic majorization. *IEEE Transactions on Computers*, 45(6):730–741, June 1996.
- [45] David Nicol. Conference program management using the internet. *IEEE Computer*, 29(3):112–113, March 1996.
- [46] Weizhen Mao and David Nicol. Isomorphic routing on torodial meshes. *ORSA Journal on Computing*, 8(1):63–73, Winter 1996.
- [47] David Nicol and Philip Heidelberger. A comparative study of parallel algorithms for simulating continuous time Markov chains. *ACM Transactions on Modeling and Computer Simulation*, 5(4):326–354, October 1995.
- [48] David Nicol. Automated parallel simulation of timed Petri-nets. *Journal of Parallel and Distributed Computing*, 29(1):60–74, August 1995.
- [49] David Nicol and Dan Palumbo. Reliability analysis of complex models using SURE bounds. *IEEE Transactions on Reliability*, 44(1):46–53, March 1995.
- [50] Gianfranco Ciardo, David Nicol, and Larry Leemis. On the minimum of a set of independent geometrically distributed random variables. *Statistics and Probability Letters*, 23:313–326, 1995.
- [51] David Nicol. Non-committal barrier synchronization. *Parallel Computing*, 21:529–549, 1995.
- [52] David Nicol, Dan Palumbo, and Michael Ulrey. Integrating reliability analysis with a performance tool. *Communications in Reliability Maintainability and Supportability*, 1995.
- [53] David Nicol and Richard Fujimoto. Parallel simulation today. *Annals of Operations Research*, 53:249–286, December 1994.
- [54] David Nicol. Rectilinear partitioning of irregular data parallel computations. *Journal of Parallel and Distributed Computing*, 23(2):119–134, November 1994.
- [55] David Nicol, Albert Greenberg, and Boris Lubachevsky. Massively parallel algorithms for trace-driven cache simulations. *IEEE Transactions on Parallel and Distributed Systems*, 5(8):849–859, August 1994.

- [56] Alok Choudhary, Bhagirath Harahari, David Nicol, and Rahul Simha. Assignment of processors for pipeline computations. *IEEE Transactions on Parallel and Distributed Systems*, 5(4):439–445, April 1994.
- [57] Bruno Gaujal, Albert Greenberg, and David Nicol. A sweep algorithm for massively parallel simulation of circuit-switched networks. *Journal of Parallel and Distributed Computing*, 18(4):484–500, August 1993.
- [58] Philip Heidelberger and David Nicol. Conservative parallel simulation of Markov chains using uniformization. *IEEE Transactions on Parallel and Distributed Systems*, 4(8):906–921, August 1993.
- [59] David Nicol and Philip Heidelberger. Optimistic parallel simulation of Markov chains using uniformization. *Journal of Parallel and Distributed Computing*, 18(4):395–410, August 1993.
- [60] David Nicol. The cost of conservative synchronization in parallel discrete-event simulations. *Journal of the ACM*, 40(2):304–333, April 1993.
- [61] David Nicol. Conservative parallel simulation of priority class queueing networks. *IEEE Transactions on Parallel and Distributed Systems*, 3(3):294–303, May 1992.
- [62] Keith Miller, L. Morell, David Nicol, Richard Noonan, Steve Park, Branson Murrill, and Jeff Voas. Estimating the probability of failure when testing reveals no failures. *IEEE Transactions on Software Engineering*, 18(1):33–42, January 1992.
- [63] David Nicol. Inflated speedups in parallel simulations via `malloc()`. *International Journal on Simulation*, 2:413–426, 1992.
- [64] David Nicol and David O'Hallaron. Improved algorithms for mapping pipelined and parallel algorithms. *IEEE Transactions on Computers*, 40(3):295–306, March 1991.
- [65] Rex Kincaid, David Nicol, Dana Richards, and Doug Shier. A multi-stage linear array assignment problem. *Operations Research*, 38(6):993–1005, Nov.-Dec. 1990.
- [66] David Nicol and Joel Saltz. An analysis of scatter decomposition. *IEEE Transactions on Computers*, 39(11):1337–1345, November 1990.
- [67] David Nicol and Jr. Paul Reynolds. Optimal dynamic remapping of data parallel computations. *IEEE Transactions on Computers*, 39(2):206–219, February 1990.
- [68] David Nicol. Parallelization of sparse dynamic programming problems. *ORSA Journal on Computing*, 2(2):162–173, Spring 1990.
- [69] David Nicol. Performance bounds on self-initiating parallel discrete event simulations. *ACM Transactions on Modeling and Computer Simulation*, 1(1):24–50, 1990.
- [70] David Nicol. Optimal partitioning of random programs across two processors. *IEEE Transactions on Software Engineering*, 15(2):134–141, February 1989.
- [71] David Nicol, Joel Saltz, and James Townsend. Delay point schedules for irregular parallel computations. *International Journal on Parallel Programming*, 18(1):69–90, February 1989.
- [72] David Nicol and Joel Saltz. Dynamic remapping of parallel computations with varying resource demands. *IEEE Transactions on Computers*, 37(9):1073–1087, September 1988.
- [73] David Nicol and Frank Willard. Problem size, parallel architecture, and optimal speedup. *Journal of Parallel and Distributed Computing*, 5:404–420, August 1988.
- [74] David Nicol. Expected performance of m-solution backtracking. *SIAM Journal on Computing*, 17(1):114–127, February 1988.
- [75] Joel Saltz, Vijay Naik, and David Nicol. Reduction of the effects of the communication delays in scientific algorithms on message passing mimd architectures. *SIAM Journal on Scientific and Statistical Computing*, 8(1), January 1987.

## Patents

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## Conference Publications

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## Book Chapters

- [244] D. Bergman and D. M. Nicol. *A Testbed for Evaluation of Power Grid Cyber-Infrastructure*. CRC Press, June 2012.
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## Public Domain Software

I have over the years developed several pieces of software which I have placed in the public domain.

1. **DaSSF**  
The Dartmouth implementation of the Scalable Simulation Framework. A high performance parallel simulation kernel with C++ API, highly portable. It is in active use in DoE laboratories, industry (e.g. Motorola), and academic research projects. It is most commonly used to model communication and computer systems.
2. **SSFNet**  
SSFNet is a public domain body of software for the modeling and simulation of computer systems, using the SSF Java API. My research team has contributed significantly to the software at this site.
3. **WIMPE**  
In 1996, in conjunction with my role as Program Chair of the ACM Sigmetrics conference I developed what I believe was the first web-based system for paper submission and reviewing management. I parameterized this system to be configurable for other conferences, called it Web Interface for Managing Programs Electronically (WIMPE), and made it available for use by others. It passed through six revisions in the period 1996-2003, and was used by several hundred conferences and workshops. A colleague took WIMPE and used it to launch a conference management custom software development company, Linklings ([linklings.com](http://linklings.com)).
4. **RITE**  
The Reliability Interface Tool Extension (RITE) is a program written to support path-based analysis of complex hardware systems. It is designed to be integrated with a system design tool such as BoNES Designer and ADEPT (it has been integrated with both of these). RITE provides a master-slave interface to the system modeling tool, where RITE is master. It queries the system modeling tool for information about the model, information that allows RITE to construct path-based Markovian analysis of the probability of failure.
5. **NON-COMMITTAL SYNCHRONIZATION BARRIER**  
This is code that implements an algorithm I developed of a barrier synchronization, with the twist that a process can change its mind and back out of the barrier in response to receipt of a new message. It is tricky coding, and so I make available source code that is parameterized to work with different message passing libraries. While developed in the early 1990's, this code still gets a few downloads a month by sources other than bots.

## Keynote Addresses

### KEYNOTE ADDRESSES

- 2012: *Exploiting Uncertainty and Error to Accelerate Simulations*, SIMULTECH 2012, Rome, Italy
- 2012: *Questioning Temporal Fidelity in View of Uncertainty Quantification*, 2012 Conference on Principles of Advanced and Distributed Simulation.
- 2011: *Wrestling With Reality – Integrating New Security Solutions into Existing Control Systems*, 4<sup>th</sup> International Symposium on Resilient Control Systems, August 2011.
- 2011: *Towards Connectivity Metrics for Cyber-Security*, 2011 CACR Higher Education Cyber-Security Summit, April 2011.
- 2010: *Securing the Perimeter : Challenges in Enforcing Global Access Control*, 6<sup>th</sup> Annual Cyber Security and Information Intelligence Workshop, Oak Ridge National Labs, April 2010.
- 2009: *Melding Power Devices, Electrical Simulation, and Computer Simulation (A Testbed for Power System Security Evaluation)*, SIMUTools'09 (2<sup>nd</sup> International Conference on Simulation Tools and Techniques).
- 2005: *Models and Analysis of Active Worm Defense*, International Workshop on Mathematical Methods, Models and Architectures for Computer Networks Security, St. Petersburg, Russia.
- 2003: *Multiscale Modeling and Simulation of Worm Effects on the Internet Routing Infrastructure*, Performance Tools 2003 Conference, Urbana, IL.
- 2003: *Network Security Research using High Performance Simulation*, 7<sup>th</sup> Workshop on Distributed Supercomputing (SOS7), Durango, CO.
- 1999: *Simulation : The 3<sup>rd</sup> Leg of Science*, CESDIS Workshop on Simulation, NASA Goddard Research Center, Greenbelt, MD.
- 1997: *Parallel Simulation : So Who Cares?*, 1997 Conference on Parallel and Distributed Simulation. Lockenhaus, Austria.
- 1997: *Parallel Simulation : Past, Present, Future*, Annual Simulation Symposium, Atlanta, GA.

## Professional Activities

### SERVICE ACTIVITIES

**ACM Distinguished Lecturer**, 2006-present.

### EDITORIAL ACTIVITIES

**Editor-in-Chief**, *ACM Transactions on Computer Modeling and Simulation*, 1997-2003.

**Area Editor**, *ACM Transactions on Computer Modeling and Simulation*, 1996-1997.

**Associate Editor**, *ACM Transactions on Computer Modeling and Simulation*, 1990-1996.

**Associate Editor**, *ORSA Journal on Computing*, 1990-1997.

### ADVISORY ACTIVITIES

**Executive Committee**, Winter Simulation Conference, 2009-present, chair 2016.

**Steering Committee**, *IEEE International Symposium on Modeling, Analysis, and Simulation of Computer and Telecommunication Systems (MASCOTS)*, 2010-2016.

**Steering Committee**, Workshop on Principles of Advanced and Distributed Simulation, 2005-2009.

**Science Council**, Center of Excellence in Space Data and Information Science, 1995-1999, Chair 1998-1999.

**CMG Computer Science Advisory Committee**, 1994-1995, Chair 1995.

**Executive Committee**, Virginia/ICASE/Langley Program in High Performance Computing and Communication, 1995-1996.

**Steering Committee**, Workshop on Parallel and Distributed Simulation, 1992-1994.

### CONFERENCE ORGANIZATION

**General Chair**, Winter Simulation Conference 2006.

**General Chair**, Workshop on Principles of Advanced and Distributed Simulation, 2005.

**Program Chair**, 2001 MASCOTS conference.

**Program Chair**, 1996 ACM Sigmetrics Conference.

**Tools Chair**, 1995 Petri Net and Performance Modeling Conference.

**Tutorial Chair**, 1994 ACM Sigmetrics Conference.

**Publicity/Exhibits Chair**, 1992 ORSA Conference on the Interface of Operations Research and Computer Science.

**General Chair**, 1990 Workshop on Parallel and Distributed Simulation.

**Program Chair**, 1989 Workshop on Parallel and Distributed Simulation.

**Program Committee**, PADS (1992-2002), Winter Simulation Conference (1989, 1991), ACM Sigmetrics (1991-1993, 1998-1999, 2002), MASCOTS (2002), Communication Networks and Distributed Systems Modeling Conference (2002), International Performance, Computing and Communications Conference (2002). There are surely others. I've lost count.

PROFESSIONAL MEMBERSHIPS

IEEE, Fellow.

ACM, Fellow.

INFORMS, member.

IFIPS Working Group 7.3 (for performance evaluation).