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RESEARCH INTERESTS

- Survivable Systems, Network Security, Systems Security, Privacy, Forensics

EDUCATION

08/99 Ph.D., Information Technology, George Mason University (GMU), VA
07/96 M.S., Computer Science, University of Science and Technology of China (USTC), China
07/93 B.S., Information Science, University of Science and Technology of China, China

PROFESSIONAL EMPLOYMENT

07/06 - present Associate Professor (with tenure), College of Information Sciences and Technology
Director, Cyber Security Lab
Research Director, Penn State Center for Information Assurance
Dept of Computer Science and Engineering (graduate faculty), College of Engineering
Supply Chain & Information Systems Department (courtesy), Smeal College of Business
Pennsylvania State University

07/02 - 06/06 Assistant Professor, College of Information Sciences and Technology
Director, Cyber Security Lab
Research Director, Center for IA (NSA Certified Center of Excellence in IA Education)
Dept of Computer Science and Engineering (graduate faculty), College of Engineering
Supply Chain & Information Systems Department (courtesy), Smeal College of Business
Pennsylvania State University

08/99 - 06/2002 Assistant Professor, Department of Information Systems
Director, Lab for Information and System Security
UMBC - University of Maryland, Baltimore County

08/96 - 07/1999 Research Assistant, Center for Secure Info Systems, GMU

AWARDS AND HONORS

DOE EARLY CAREER PRINCIPAL INVESTIGATOR AWARD, 2002-2005

Co-lead the effort to have Penn State designated by NSA as a NATIONAL CENTER OF EXCELLENCE IN

INFORMATION ASSURANCE EDUCATION, 2003-06 and 2006-09.

SCHOLARSHIPS AND FELLOWSHIPS

- ⊙ One ACM CCS'03 paper selected for fast track processing by *ACM Transactions on Information and Systems Security*.
- ⊙ One GLOBECOM'05 paper selected for fast track processing by *Wiley International Journal of Security and Networks*.
- ⊙ Outstanding Graduate Research Award, School of Info. Tech. & Engineering, GMU, 2000
- ⊙ Outstanding Graduate Award, Anhui Province, China, 1993
- ⊙ Outstanding Graduate Award, USTC, 1993
- ⊙ ZhangZongZhi Fellowship, USTC, 1993
- ⊙ First Price Scholarship for Best Student, USTC, 1991-92

PUBLICATIONS

MONOGRAPH

- [M1] Peng Liu, Sushil Jajodia, *Trusted Recovery and Defensive Information Warfare*, ISBN 0-7923-7572-6, Kluwer Academic Publishers, 2002.

EDITED BOOKS AND PROCEEDINGS

- [B5] E. Damiani, P. Liu (eds.), *Database and Applications Security XX*, Springer Lecture Notes in Computer Science, LNCS 4127, 2006, ISBN 3-540-36796-9.
- [B4] Peng Liu, Meng Yu (eds.), *Proc. of the First International Workshop on Information Assurance in Distributed Systems*, Springer-Verlag, 2005, To appear
- [B3] Birgit Pfitzmann, Peng Liu (eds.), *Proc. of the Eleventh ACM Conference on Computer and Communications Security*, ACM Press, 2004, ACM ISBN: 1-58113-961-6.
- [B2] P. Liu and P. Pal (Eds.), *Proc. of the First ACM Workshop on Survivable and Self-Regenerative Systems*, ACM Press, 2003, ACM ISBN: 1-58113-784-2/03/0010.
- [B1] Vijay Atluri, Peng Liu (eds.), *Proc. of the Tenth ACM Conference on Computer and Communications Security*, Washington DC, USA, October 28-30, 2003.

BOOK CHAPTERS

- [BC9] H. Wang, P. Liu, "Survivability Evaluation: Modeling Techniques And Measures", in *Handbook of Research on Information Security and Assurance*, Jatinder Gupta and Sushil Sharma (eds.), Idea Group Inc., 2007, in press.
- [BC8] P. Liu, S. Jajodia, M. Yu, "Damage Quarantine and Recovery in Data Processing Systems", in *Handbook of Database Security*, M. Gertz, S. Jajodia, eds., Springer, 2007, in press
- [BC7] Q. Gu, P. Liu, "Denial of Service Attacks", in *The Handbook of Computer Networks*, Hossein Bidgoli et al. (eds.), John Wiley & Sons, 2007, in press.

- [BC6] M. Yu, P. Liu, W. Zang, S. Jajodia, “Trusted Recovery”, in *Security in Decentralized Data Management*, S. Jajodia, T. Yu, eds., Springer-Verlag, 2006, in press.
- [BC5] Q. Gu, P. Liu, C. H. Chu, “Hacking Techniques in Wired Networks”, *The Handbook of Information Security*, Hossein Bidgoli et al. (eds.), John Wiley & Sons, 2005.
- [BC4] P. Liu, M. Yu, J. Jing, “Information Assurance”, *The Handbook of Information Security*, Hossein Bidgoli et al. (eds.), John Wiley & Sons, 2005.
- [BC3] P. Liu, “Architectures for Intrusion Tolerant Database Systems”, in *Foundations of Intrusion Tolerant Systems*, Jaynarayan H. Lala (editor), IEEE Computer Society Press, 2003, 3-13. A previous version appears as C16.
- [BC2] P. Luenam, P. Liu, “The Design of an Adaptive Intrusion Tolerant Database System”, in *Foundations of Intrusion Tolerant Systems*, Jaynarayan H. Lala (editor), IEEE Computer Society Press, 2003, 14-21. A previous version appears as C13.
- [BC1] Paul Ammann, Sushil Jajodia, Peng Liu, “A fault tolerance approach to survivability,” in *Computer Security, Dependability, and Assurance: From Needs to Solutions*, P.Ammann, B. H. Barnes, S. Jajodia, E. H. Sibley, eds., IEEE Computer Society Press, Los Alamitos, 1999, pages 204-212.

REFEREED JOURNAL ARTICLES

- [J21] Peng Liu, Jie, Li, Sushil Jajodia, Paul Ammann, “Can Follow Concurrency Control”, *IEEE Transactions on Computers*, 2007, accepted, in press.
- [J20] F. Li, B. Luo, P. Liu, D. Lee, P. Mitra, W. Lee, C. Chu, “In-broker Access Control: Towards Efficient End-to-End Performance of Information Brokerage Systems”, *International Journal on Intelligent Control and Systems*, Special Issue on Information Assurance, 2007, accepted, to appear.
- [J19] W. Zang, P. Liu, M. Yu, “How Resilient is the Internet against DDoS attacks? - A Game Theoretic Analysis of Signature-based Rate Limiting”, *International Journal on Intelligent Control and Systems*, Special Issue on Information Assurance, 2007, accepted, to appear.
- [J18] W. Zang, M. Yu, P. Liu, “A Distributed Algorithm for Workflow Recovery”, *International Journal on Intelligent Control and Systems*, 2007, in press.
- [J17] K. Kotapati, P. Liu, T. F. LaPorta, “Dependency Relation based Vulnerability Analysis of 3G Networks: Can It Identify Unforeseen Cascading Attacks?” *Springer Telecommunications Systems Journal*, special issue on “Security, Privacy and Trust for Beyond-3G Networks”, 2007, in press.
- [J16] Q. Gu, Chao-Hsien Chu, Peng Liu, Sencun Zhu, “Slander Resistant Attacker Isolation in Ad Hoc Networks”, *International Journal of Mobile Network Design and Innovation*, Inderscience Publishers, Vol. 1, No. 3, 2006. A previous version appears as C40.
- [J15] Q. Gu, P. Liu, S. Zhu, C. Chu, “Defending against Packet Injection Attacks in Unreliable Ad Hoc Networks”, *Wiley International Journal of Security and Networks*, Inderscience Publishers, Vol. 2, 2007, pages 154-169. A previous version appears as C38.
- [J14] Q. Gu, P. Liu, C. Chu, “Analysis of Area-congestion-based DDoS Attacks in Ad Hoc Networks”, *Elsevier Ad Hoc Networks Journal*, Vol. 5/5, 2007, pages 613-625.

- [J13]] Wang, H., Liu, P. and Li, L. “Evaluating the Survivability of Intrusion Tolerant Database Systems and the Impact of Intrusion Detection Deficiencies”, *International Journal of Information and Computer Security*, Vol. 1, No. 3, 2007, pp. 315-340.
- [J12]] Li, R., Li, J., Liu, P. and Chen, H. H. “On-Demand Public-Key Management for Mobile Ad Hoc Networks”, *Wiley Wireless Communications and Mobile Computing Journal*, No. 6, 2006, pp. 1-12.
- [J11]] P. Liu, J. Jing, “Architectures for Self-healing Databases under Cyber Attacks,” *International Journal of Computer Science and Network Security*, Vol. 6, No. 1B, 2006, 204-216.
- [J10]] Peng Liu, Hai Wang, Lunquan Li, “Real-Time Data Attack Isolation for Commercial Database Applications”, *Elsevier Journal of Network and Computer Applications*, in press.
- [J9]] M. Yu, P. Liu, W. Zang, “Specifying and Using Group-to-Group Communication Services for Intrusion Masking”, *Journal of Computer Security*, Vol. 13, No. 4, pages 623-658.
- [J8]] P. Liu, W. Zang, M. Yu, “Incentive-based Modeling and Inference of Attacker Intent, Objectives, and Strategies”, *ACM Transactions on Information and Systems Security*, Vol. 8, No. 1, 2005, 78-118.
- [J7]] Peng Liu, Amit Chetal, “Trust-Based Secure Info Sharing Between Federal Government Agencies”, *Journal of the American Society for Information Science and Technology*, Vol. 56, No. 3, 2005, pages 283-298
- [J6]] R. Bajjcsy, T. Benzel, M. Bishop, B. Braden, C. Brodley, S. Fahmy, S. Floyd, W. Hardaker, A. Joseph, G. Kesidis, K. Levitt, B. Lindell, **P. Liu**, D. Miller, R. Mundy, C. Neuman, R. Ostrenga, V. Paxson, P. Porras, C. Rosenberg, J. Tygar, S. Sastry, D. Sterne, S.F. Wu, “Cyber Defense Technology Networking and Evaluation”, *Communications of the ACM*, Vol.47, No. 3, 2004, pages 58-61.
- [J5]] P. Liu, J. Jing, P. Luenam, Y. Wang, L. Li, S. Ingsriswang, “The Design and Implementation of a Self-Healing Database System”, *Journal of Intelligent Information Systems*, Vol. 23, No. 3, 2004, 247-269.
- [J4]] P. Ammann, S. Jajodia, P. Liu, “Recovery From Malicious Transactions”, *IEEE Transaction on Knowledge and Data Engineering*, Vol 15, No 5, September 2002, pages 1167-1185. (The authors are ordered alphabetically).
- [J3]] Peng Liu, Peng Ning, Sushil Jajodia, “Avoiding Loss of Fairness Owing to Failures in Fair Data Exchange Systems”, *Decision Support Systems*, Vol. 31, No. 3, 2001, pages 337-350.
- [J2]] P. Liu, P. Ammann, S. Jajodia, “Rewriting Histories: Recovering From Malicious Transactions”, *Distributed and Parallel Databases*, Vol. 8, No. 1, January 2000, pages 7-40.
- [J1]] P. Liu, S. Jajodia, C. D. McCollum, “Intrusion Confinement by Isolation in Information Systems”, *Journal of Computer Security*, Vol. 8, No. 4, 2000, pages 243-279.

REFEREED CONFERENCE AND WORKSHOP PAPERS

- [C60]] Fengjun Li, Bo Luo, Peng Liu, Dongwon Lee, Chao-Hsien Chu, “Automaton Segmentation: A New Approach to Preserve Privacy in XML Information Brokering”, In *Proc. 14th ACM Conf. on Computer and Communication Security (CCS)*, Alexandria, VA, USA, October 2007, accepted (acceptance rate = 18%), in press.
- [C59]] J. Lin, J. Jing, P. Liu, “A Framework for Intrusion Tolerant Certification Authority System Evaluation”, *Proc. IEEE SRDS 2007*, accepted (acceptance rate = 15%), in press.
- [C58]] Y. Jhi, P. Liu, L. Li, Q. Gu, J. Jing, G. Kesidis, “PWC: A Proactive Worm Containment Solution for Enterprise Networks”, *Proc. IEEE SecureComm 2007*, accepted, published.
- [C57]] B. Luo, D. Lee, P. Liu, “Pragmatic XML Access Control Enforcement using Off-the-shelf RDBMS”, *Proc. ESORICS 2007*, accepted, published.
- [C56]] M. Yu, W. Zang, P. Liu, “Database Isolation and Filtering against Data Corruption Attacks”, *Proc. ACSAC 2007*, accepted, in press.
- [C55]] P. Ayyagari, P. Mitra, D. Lee, W. Lee, P. Liu, “Incremental Adaptation of XML Access-Control Views”, *Proc. Second ACM Symposium on Information, Computer and Communications Security (AsiaCCS)*, 2007, acceptance rate = 18%.
- [C54]] L. Li, P. Liu, Y. C. Jhi, G. Kesidis, “Evaluation of Collaborative Worm Containment on DETER Testbed”, In *Proc. DETER Community Workshop on Cyber Security Experimentation*, in association with Usenix Security Symposium, Boston, August 2007.
- [C53]] J. Li, R. Levy, P. Liu, “Intelligent Cyber Security Analysis in Enterprise Networks”, *Proc. AAAI RIDIS Workshop 2007*, position paper, accepted, to appear.
- [C52]] R. Li, J. Li, P. Liu, H. H. Chen, “An Objective Trust Management Framework for Mobile Ad Hoc Networks”, *Proc. IEEE VTC 2007*, to appear.
- [C51]] L. Li, P. Liu, G. Kesidis, “Visual Studio for Network Security Experiment Specification and Data Analysis”, *Proc. ACM VizSEC Workshop 2006* (in association with CCS 06), published.
- [C50]] K. Bai, P. Liu, “Towards Database Firewall: Mining the Damage Spreading Patterns”, *Proc. ACSAC 2006*, published.
- [C49]] H. Wang, P. Liu, “Modeling and Evaluating the Survivability of an Intrusion Tolerant Database System”, *Proc. ESORICS 2006*, published.
- [C48]] X. Wang, C. Pan, P. Liu, S. Zhu, “SigFree: A Signature-free Buffer Overflow Attack Blocker”, *Proc. USENIX Security 2006*, published, acceptance rate = 12%
- [C47]] P. Mitra, C. Pan, P. Liu, “Semantic Access Control for Information Interoperation”, *Proc. ACM SACMAT 2006*, published.
- [C46]] Q. Gu, K. Bai, H. Wang, P. Liu, C. Chu, “Modeling of Pollution in P2P File Sharing Systems,” in *Proc. 2006 IEEE Consumer Communications and Networking Conference*, 8-10 January 2006, Las Vegas, NV
- [C45]] P. Mitra, C. Pan, P. Liu, V. Atluri, “Privacy-preserving Semantic Interoperation and Access Control of Heterogeneous Databases,” *Proc. ACM Symposium on Information, Computer and Communications Security (AsiaCCS)*, 2006, published, acceptance rate = 17%

- [C44]] L. Li, I. Hamadeh, S. Jiwasurat, G. Kesidis, P. Liu, C. Newman, “Emulating Sequential Scanning Worms on the DETER Testbed,” *Proc. IEEE TridentCom 2006*, published.
- [C43]] F. Li, B. Luo, P. Liu, D. Lee, P. Mitra, W. Lee, C. Chu, “In-broker Access Control: Towards Efficient End-to-End Performance of Information Brokerage Systems,” *Proc. IEEE SUTC 2006*, published, acceptance rate = 25%
- [C42]] K. Kotapati, P. Liu, T. F. LaPorta, “CAT A Practical Graph & SDL Based Toolkit for Vulnerability Assessment of 3G Networks,” In *Proc. IFIP SEC 2006*, published, acceptance rate = 24.8%
- [C41]] M. Yu, W. Zang, P. Liu, “Defensive Execution of Transactional Processes against Attacks”, In *Proc. ACSAC '05*, 2005, published, Acceptance rate = 19.6%
- [C40]] Q. Gu, Chao-Hsien Chu, Peng Liu, Sencun Zhu, “Slander Resistant Attacker Isolation in Ad Hot Networks”, *Proc. International Conference on Telecommunication Systems Modeling and Analysis*, November 17-20, 2005, Dallas, TX, 13 pages, published.
- [C39]] Q. Tan, W. Lee, B. Zhang, P. Liu, and D. L. Lee, “Balancing Performance and Confidentiality in Air Index”, In *Proc. ACM CIKM '05*, 2005, published, Acceptance rate = 18%.
- [C38]] Q. Gu, P. Liu, S. Zhu, C. Chu, “Defending against Packet Injection Attacks in Unreliable Ad Hoc Networks”, In *Proc. IEEE GLOBECOM '05*, 2005, published.
- [C37]] P. Mitra, P. Liu, C. Pan, “Privacy Preserving Ontology Matching”, In *Proc. AAI-05 Workshop on Contexts and Ontologies: Theory, Practice and Applications* (short paper), 2005.
- [C36]] B. Luo, D. Lee, W. Lee, P. Liu, “Deep Set Operators for XQuery”, In *Proc. Second International Workshop on XQuery Implementation, Experience and Perspectives (XIME-P 2005)* (short paper), in association with SIGMOD 2005.
- [C35]] Q. Gu, P. Liu, W. Lee, C. Chu, “KTR: An Efficient Key Management Scheme for Air Access Control”, *Proc. IEEE Mobiquitous 2005* (short poster paper), 2005, published.
- [C34]] L. Li, S. Jiwasurat, P. Liu, G. Kesidis, “Emulation of Single Packet UDP Scanning Worms in Large Enterprises”, in *Proc. 19 International Teletraffic Congress (ITC19)*, Springer Lecture Notes in Computer Science (Vol. xx), August, Beijing, China, 2005
- [C33]] K. Bai, H. Wang, P. Liu, “Towards Database Firewalls”, in *Proc. 19th IFIP WG 11.3 Working Conference on Data and Application Security*, 2005.
- [C32]] K. Kotapati, P. Liu., Y. Sun, T. F. LaPorta, “A Taxonomy of Cyber Attacks on 3G Networks”, in *Proc. IEEE Int'l Conf. on Intelligence and Security Informatics* (extended abstract), in *Lecture Notes in Computer Science*, Vol. 3495, Springer-Verlag, 2005.
- [C31]] M. Yu, W. Zang, P. Liu, J. Wang, “The Architecture of An Automatic Distributed Recovery System”, in *Proc. IEEE International Conference on Networking, Sensing and Control*, 2005
- [C30]] R. Li, J. Li, H. Kameda, P. Liu, “Localized Public-key Management for Mobile Ad Hoc Networks”, in *Proc. IEEE Globecom '04*, 2004.

- [C29]] B. Luo, D. Lee, W. C. Lee, P. Liu, “QFilter: Fine-Grained Run-Time XML Access Controls via NFA-based Query Rewriting”, in *Proc. ACM CIKM 2004*, 2004, pages 543-552. Acceptance rate = 19%.
- [C28]] B. Luo, D. Lee, W. C. Lee, P. Liu, “A Flexible Framework for Architecting XML Access Control Enforcement Mechanisms”, in *Proceedings of the First Workshop on Secure Data Management in a Connected World* (in conjunction with VLDB 04), in *Lecture Notes in Computer Science*, Vol. 3178, Springer-Verlag, August 2004.
- [C27]] Q. Gu, P. Liu, C. Chu, “Tactical Bandwidth Exhaustion in Ad Hoc Networks”, in *Proceedings of the 5th Annual IEEE Information Assurance Workshop* (IA 04) West Point, June 2004.
- [C26]] H. Wang, P. Liu, L. Li, “Evaluating the Impact of Intrusion Detection Deficiencies on the Cost-Effectiveness of Attack Recovery”, in *Proceedings of the 7th Information Security Conference*, *Lecture Notes in Computer Science*, Vol. 3224, Springer-Verlag, September 2004, 146-157.
- [C25]] R. R. Barton, W. J. Hery, P. Liu, “An S-Vector for Web Applications Security Management”, in *Proc. ACM Workshop on Business Security Engineering*, Fairfax VA, Oct. 2003 (short paper).
- [C24]] M. Yu, P. Liu, W. Zang, “Self Healing Workflow Systems under Attacks”, in *Proc. 24th IEEE International Conference on Distributed Computing Systems (ICDCS 04)*, Tokyo, Japan, March 2004, pages 418-425. Acceptance rate = 17.68%
- [C23]] J. Jing, P. Liu, D. G. Feng, J. Xiang, N. Gao, J. Q. Lin, “ARECA: A Highly Attack Resilient Certification Authority”, *Proc. 1st ACM Workshop on Survivable and Self-Regenerative Systems*, Fairfax, VA, Oct 31, 2003, pages 53-63.
- [C22]] P. Liu, W. Zang, “Incentive-Based Modeling and Inference of Attacker Intent, Objectives and Strategies”, *Proc. 10th ACM Conference on Computer and Communications Security*, Washington DC, October 28-30, pages 179-189. Acceptance rate = 13.8%.
- [C21]] M. Yu, P. Liu, W. Zang, “Multi-Version Data Objects Based Attack Recovery of Workflows”, *Proc. 19th Annual Computer Security Applications Conference*, Dec 2003.
- [C20]] Peng Liu, “Engineering a Distributed Intrusion Tolerant Database System Using COT Components”, *Proc. 2003 DARPA Information Survivability Conference and Exposition*, Volume 2, Washington DC, April 2003, pages 284-289.
- [C19]] D. Lee, W. C. Lee, and P. Liu, “Supporting XML Security Models using Relational Databases: A Vision”, *Proc. 2nd International Symposium on XML Databases (XSym 03)*, in conjunction with VLDB 2003, *Lecture Notes in Computer Science (LNCS)*, Michael Rys, Akmal B. Chaudhri (eds.), Springer-Verlag, 2003.
- [C18]] J. Zhang, P. Liu, “Delivering Services with Integrity Guarantees in Survivable Database Systems”, *Proc. 17th IFIP Working Conference on Data and Applications Security*, Estes Park, CO, USA, August 4-6, 2003.
- [C17]] M. Yu, P. Liu, W. Zhang, “Intrusion Masking for Distributed Atomic Operations”, *Proc. 2003 IFIP International Information Security Conference*, May 2003.
- [C16]] P. Liu, “Architectures for Intrusion Tolerant Database Systems”, *Proc. 2002 Annual Computer Security Applications Conference*, Dec 2002, pages 311-320.

- [C15]] P. Liu, S. Jajodia, P. Ammann, J. Li, “Can-Follow Concurrency Control”, *Proc. IASTED International Conference on Networks, Parallel and Distributed Processing, and Applications*, Oct 2002.
- [C14]] P. Liu, Y. Wang, “The Design and Implementation of a Multiphase Database Damage Confinement System”, *Proc. 16th IFIP Working Conf. on Data and Applications Security*, July 2002.
- [C13]] P. Luenam, P. Liu, “The Design of an Adaptive Intrusion Tolerant Database System”, *Proc. IEEE Workshop on Intrusion Tolerant Systems*, June 2002.
- [C12]] P. Liu, “DAIS: A Real-Time Data Attack Isolation System for Commercial Database Applications”, *Proc. 17th Annual Computer Security Applications Conference*, New Orleans, Dec 2001, pages 219-229.
- [C11]] Peng Liu, Xu Hao, “Efficient Damage Assessment and Repair in Resilient Distributed Database Systems”. *Proc. 15th IFIP WG11.3 Working Conference on Database and Application Security*, July 15-18, Ontario, Canada.
- [C10]] P. Luenam, P. Liu, “ODAM: An On-the-fly Damage Assessment and Repair System for Commercial Database Applications”. *Proc. 15th IFIP WG11.3 Working Conference on Database and Application Security*, July 15-18, Ontario, Canada.
- [C9]] P. Liu, S. Jajodia, “Multi-Phase Damage Confinement in Database Systems for Intrusion Tolerance”, *Proc. 14th IEEE Computer Security Foundations Workshop*, Nova Scotia, Canada, June 2001, pages 191-205.
- [C8]] Peng Liu, Peng Ning, Sushil Jajodia, “Avoiding Loss of Fairness Owing to Process Crashes in Fair Data Exchange Protocols”, *Proc. 2000 International Conference on Dependable Systems and Networks (FTCS-30 and DCCA-8)*, Workshop on Dependability Despite Malicious Faults, New York City, June 2000, pages 631-640.
- [C7]] Peng Liu, Sushil Jajodia and Catherine D. McCollum, “Intrusion confinement by isolation in information systems”, *Proc. 13th IFIP WG 11.3 Working Conf. On Database Security*, Seattle, WA, July 1999.
- [C6]] P. Liu, P. Ammann, S. Jajodia, “Incorporating Transaction Semantics to Reduce Reprocessing Overhead in Replicated Mobile Data Applications”, *ICDCS’99, Proc. 19th IEEE International Conference on Distributed Computing Systems*, Austin, TX, June 1999, pages 414-423.
- [C5]] Sushil Jajodia, Peng Liu, Paul Amman, “A Fault Tolerance Approach to Survivability”, In *Proceedings of the Information Systems Technology Symposium: Protecting NATO Information Systems in the 21st Century*, RTO/NATO, Hull, Canada, October 1999, pages 20-1 to 20-7.
- [C4]] S. Jajodia, P. Liu, C. D. McCollum, “Application-Level Isolation to Cope with Malicious Database Users”, *ACSAC’98, Proc. 14th Annual Computer Security Applications Conf.*, Phoenix, AZ, December 1998, pages 73-82.
- [C3]] Jiwu Jing, Yinxia Dai, Peng Liu, “Secure X.25 Packet Exchange Networks”, *Proc. 11th Chinese Annual Conference on Computer Security*, Dan Dong, China, June 1995.
- [C2]] Jiwu Jing, Peng Liu, “Security Threats to Networked Management Information Systems”, *Proc. 11th Chinese Annual Conference on Computer Security*, Dan Dong, China, June 1995.

[C1] Peng Liu, Yinxia Dai, Shuwang Lu, “Secure Multimedia Data Communication”, *Proc. 2nd Chinese Annual Conference on Multimedia*, Hangzhou, China, 1993.

OTHER REVIEWED PUBLICATIONS

[O10] L. Li, G. Kesidis, P. Liu, “Scanning Worm Emulation on the DETER Testbed” (3 page short paper), *Proc. 2006 DETER Community Workshop*, Arlington, VA, June 2006

[O9] L. Li, P. Liu, G. Kesidis, “Scanning An Integrated Experiment Specification and Visualization Tool for Testbed Emulation” (3 page short paper), *Proc. 2006 DETER Community Workshop*, Arlington, VA, June 2006

[O8] P. Liu, Book Review, “Information Security: A Strategic Approach”, Vincent Leveque, IEEE Computer Society & Wiley Interscience, ISBN 0471736120, Elsevier Information Processing & Management Journal, 2006, in press

[O7] P. Liu, “Emerging Technologies in Information Assurance”, *DoD IA Newsletter*, summer volume, 2005.

[O6] Peng Liu, “ITDB: An Attack Self-Healing Database System Prototype”, Demo Abstract, *Proc. 2003 DARPA Information Survivability Conference and Exposition*, Volume 2, Washington DC, April 2003, pages 131-133.

[O5] Peng Liu, “Trusted Recovery from Malicious Attacks”, PhD Dissertation, George Mason University, 1999.

[O4] Peng Liu, “SDB2: A Secure Client-Server Database System Prototype”, *MS Thesis*, University of Science and Technology of China, 1996.

[O3] Jiwu Jing, Peng Liu, “IsData - A Secure Networked Management Information System Architecture” (in Chinese), *IDG Computer World Newspaper*, 1995. Invited paper.

[O2] Jiwu Jing, Peng Liu, “Threats of Viruses to Networked Management Information Systems” (in Chinese), *IDG Computer World Newspaper*, 1995. Invited paper.

[O1] Peng Liu, “Using Artificial Neural Network Techniques to Build an Information Management and Decision Support Expert System”, *BS Thesis*, University of Science and Technology of China, June 1993.

SELECTED RESEARCH GRANTS

- *NSF-TC*: Peng Liu (PI), Sushil Jajodia (Co-PI), Meng Yu (Co-PI), “Collaborative Research: Transparent Damage Quarantine and Recovery in Transactional Applications and Web Services”, 2007-2008.
- *AFOSR*: Peng Liu (sole PI), “MURI: Autonomic Recovery of Enterprise-Wide Systems After Attack or Failure with Forward Correction”, Air Force Office of Scientific Research (AFOSR), \$1,160,000 (05/2007 - 04/2012; part of a larger project with GMU and Columbia University).
- *ARO STTR*: Jason Li (PI), Peng Liu (Co-PI), et al. “Practical Efficient Graphical Models for Cyber Security Analysis in Enterprise Networks”, 2007-2009. The total budget is \$750,000.

- *TTC*: Peng Liu (PI), Sencun Zhu (Co-PI), Tom DiClemente (Co-PI), “Toolkits for Blocking Remote Code Execution Attacks”, 2007-2008.
- *ARO*: Sencun Zhu (PI), Guohong Cao (Co-PI), Peng Liu (Co-PI), “Distributed Self-healing Mechanisms for Securing Sensor Networks”, 2005-2008.
- *NSF/DHS*: George Kesidis (PI), Peng Liu (Co-PI), David Miller (Co-PI), “Collaborative Research: EMIST: Testing and Benchmarking Methodologies for Future Network Security Mechanisms”, 2003-2007. The total budget is about \$2,300,000.
- *DOE CAREER Award*: Peng Liu, “A Game Theoretic Approach for Cyber Attack Prediction”. 2002 - 2005.
- *NSF-TC*: Peng Liu (Sole PI), “QoIA-Aware Attack Resilient Database Systems”. 2002 - 2006.
- *DARPA*: Peng Liu (Sole PI), “Engineering a Distributed Intrusion Tolerant Database System Using COTS Components”. 2000 - 2002.

INVENTIONS AND PATENTS

- P. Liu, S. Zhu, X. Wang, C. Pan, “SigFree - A Signature-free Buffer Overflow Attack Blocker;” Final Patent Application Filing, filed with the U.S. Patent and Trademark Office on 2007.
- P. Liu, Y-C. Jhi, L. Li, “PWC: A Proactive Worm Containment Solution for Enterprises”, Provisional Patent Application Filing, filed with the U.S. Patent and Trademark Office on 2007.
- P. Liu, S. Zhu, X. Wang, C. Pan, “SigFree - A Signature-free Buffer Overflow Attack Blocker;” Provisional Patent Application Filing, PSU Inv. Disc. No. 2005-3146, Legal Reference No. PSU-19418/36, filed with the U.S. Patent and Trademark Office on Jan 31, 2006.
- P. Liu, S. Jajodia, “Intrusion Tolerant Database Systems”, Provisional Patent Application Filing, UMBC, Nov 2001.

RESEARCH SOFTWARE DEVELOPED

- *ESVT - Internet Security Experiments Specification and Visualization Toolkit*, Version 2.0 (around 45,000 lines of C++ code), 2005, Penn State University
- *SigFree - A Signature-Free Buffer Overflow Attack Blocker*, 2005, Penn State University
- *SHDB - Self-Healing Database System under Cyber Attacks*, around 35,000 lines of multi-threaded C++ code, 2004, Penn State University
- *SACE - A Semantic Access Control System Across Heterogeneous Information Sources*, Version 1.0, 2004, Penn State University
- *QFilter - A NFA-based XML Access Control Toolkit*, Version 1.0, 2004, Penn State University
- *ITDB - An Intrusion Tolerant Database System*, Version 3.0 (around 25,000 lines of multi-threaded C++ code), 2002, Baltimore, UMBC

PRESS COVERAGE

- (Feb, 07) The proactive worm containment technology developed by Peng Liu and his students was reported about 80 times by both national media (e.g., The Association Press, USA Today, Washington Post, Fox News, BusinessWeek, Forbes, MSNBC, ABC Money, PC World) and international media (e.g., Times Online), under such titles as “Penn State Researchers ID Worms by Speed”.
- (Apr 27, 06) “New software protects confidentiality of data while enabling access and sharing” (Penn State news office research headlines), <http://www.live.psu.edu/story/17533>
- (Summer 2005) “IATAC Spotlight on Subject Matter Expert (SME) – Dr. Peng Liu”, DoD IA Newsletter, Vol. 8, No. 1, Summer 2005, <http://iac.dtic.mil/iatac>
- (Mar 31, 05) “New Protocol Can Defuse Turf Wars Over Information Sharing Among Federal Agencies” (Penn State news office research headlines), <http://live.psu.edu/story/11259>
- (Jan 12, 05) “Penn State’s QFilter puts security in XML database queries” (NewsForge), <http://programming.newsforge.com/print.pl?sid=05/01/06/188254>
- (Dec 21, 04) “GSN: Deter Fills Security Testing Void” (Government Security News), <http://www.isi.edu/deter/news/8.html>
- (Nov 11, 04) “New software developed by Penn State improves database security”, <http://live.psu.edu/story/8954>
- (Sept 04) “Net Internet-Security Software to be Demonstrated in Washington DC”, <http://ist.psu.edu/news/CurrentNewsDisplay.cfm?HeadlineID=1412>
- (Dec 2002) “Software System Heals Itself”, (Technology Research News, Nov/Dec 2002 Issue), http://www.trnmag.com/Stories/2002/112702/Software_system_heals_itself_112702.html
- (Nov 2002) New ‘Self-Healing’ Database Tool Stands Up to Hackers (NEWFACTOR.com story), <http://www.newsfactor.com/perl/story/19848.html>
- (Nov 2002) “Self-healing Databases” (GEEK.com news), <http://www.geek.com/news/geeknews/2002Nov/gee20021101017090.htm>
- (Oct 2002) “Software Heals Systems While They Work” (CNET.com & ZDNET.com story), <http://news.com.com/2100-1001-964109.html>
- (Oct 2002) “Databases Can Heal Themselves On-The-Fly” (Penn State news office research headlines), <http://www.psu.edu/ur/2002/selfhealingdatabase.html>

STUDENTS SUPERVISED

POSTGRADUATE-SCHOLAR SPONSOR

- Jiwu Jing, A visiting professor from the University of Science and Technology of China, Sep 2000 to Jan 2001, and April 03 to Dec 03.
- Meng Yu, A post-doc scholar from Nanjing University, China, from Jan 02 to Nov 04. Current employment: Assistant Professor (tenure-track), Monmouth University, NJ.
- Wanyu Zang, A visiting scholar from Nanjing University, China, from Sep 02 to June 04.

PHD GRADUATES

- Qijun Gu (with Chao-Hsien Chu), College of IST, Penn State, Defended his thesis in June 21, 2005
 - Thesis: “A Study of Selected Security Issues in Wireless Networks”
 - First employment: Assistant Professor (tenure-track), Texas State University
- Pramote Luenam (with Anthony F. Norcio), Dept. of Information Systems, UMBC, Defended his thesis in May, 2007

- Hai Wang, College of IST, Penn State, Defended his thesis in July, 2007

PHD IN PROGRESS

- Kameswari Kotapati (With Tom La Porta), CSE, Penn State, Since 2003
- Lunquan Li, IST Penn State, Since 2004
- Yoon-Chan Jhi (with George Kesidis), CSE, Penn State, Since 2003
- Kun Bai, IST, Penn State, Since 2004
- Fengjun Li (with Chao-Hsien Chu), IST, Penn State, Since 2005
- Robert Cole (with Chao-Hsien Chu), IST, Penn State, Since 2004
- Xi Xiong, CSE, Penn State, Since 2007
- Shengzhi Zhang, CSE, Penn State, Since 2007

UNIVERSITY SERVICES

SELECTED UNIVERSITY COMMITTEES

11/05-07/06	University wide Security and Risk Analysis Major Development Committee, Penn State
09/05-05/06	Chair, IST Faculty Recruiting Committee, Penn State
10/04-05/05	Chair, IST Faculty Recruiting Committee (IA track), Penn State
09/07-05/08	Faculty Promotion & Tenure Committee, College of IST, Penn State
07/06-now	PSU TCP/IP Anonymization Committee (university wide), Penn State
09/04-08/05	IST Graduate Advisory Committee, Penn State

PROFESSIONAL SERVICES

MEMBERSHIP IN HONORARY AND PROFESSIONAL SOCIETIES

IEEE, ACM, IFIP WG 11.3

PROFESSIONAL ACTIVITIES: JOURNAL EDITORSHIPS

- Editorial Board, *Elsevier Computer Standards & Interfaces Journal*, since 2006.
- Associate Editor, *Wiley Security and Communication Networks Journal*, since 2007
- Editorial Board, *International Journal of Computer Systems, Networking, and Communications*, Hindawi Publishing Corporation, since 2007
- Editorial Board, *International Journal of Data Analysis Techniques and Strategies*, Inderscience Publishers, since 2007
- Editorial Review Board, *International Journal of Information Systems in the Service Sector*, IGI Publishers, since 2007

PROFESSIONAL ACTIVITIES: CHAIRING

- Program Co-Chair, IEEE Securecomm 2008

- Program Co-Chair, 20th IFIP WG 11.3 Working Conference on Data and Application Security, France 2006
- Founding PC Co-Chair, 1st ACM Workshop on Survivable and Self-Regenerative Systems, Washington D.C., Oct 2003
- PC Co-Chair, First International Workshop on Information Assurance in Distributed Systems (IADS-05)
- Proceeding Chair, 10th ACM Int'l Conference on Computer and Communications Security, Washington DC, 2003.
- Proceedings Chair, 11th ACM Int'l Conf. on Computer and Communications Security, 2004
- Publicity Chair, IEEE Securecomm 2006
- Panel Chair, IEEE Securecomm 2005
- Session Chair, ACM CCS 2007
- Session Chair, Session on Flexible Access Control, 20th IFIP WG 11.3 Working Conference on Data and Application Security, France, August 2006
- Session Chair, ACM AsiaCCS 2006
- Session Chair, ACSAC 2005
- Session Chair, ACSAC 2005
- Session Chair, 11th ACM Int'l Conference on Computer and Communications Security, 2004, Session on Access Control
- Session Chair, ACSAC 2004, Session on Audit Analysis
- Session Chair, 10th ACM Int'l Conference on Computer and Communications Security, Washington DC, 2003, Session on Intrusion Detection.

PROFESSIONAL ACTIVITIES: PROGRAM COMMITTEES

1. ACM CCS 2008
2. IEEE INFOCOM 2008
3. IEEE ICDE 2008
4. IFIP SEC 2008
5. IFIP DBSEC 2008
6. ACM CCS 2007
7. IEEE INFOCOM 2007
8. ACM AsiaCCS 2007
9. ACSAC 2007
10. IEEE Securecomm 2007
11. IEEE GLOBECOM 2007
12. WISE 2007
13. USENIX DETER Workshop 2007
14. AAAI RIDIS Workshop 2007
15. PC Member, ACM CCS 2006
16. PC Member, ACSAC 2006
17. PC Member, IEEE ICC 2006 – Network Security and Information Assurance Symposium
18. PC Member, IEEE Globecom 2006 Network Security Systems
19. IEEE CHINACOM 2006
20. PC Member, ACM Symposium on Information, Computer and Communications Security (AsiaCCS '06)
21. PC Member, IEEE Securecomm 2006

22. PC member, The Eighth International Conference on Information and Communications Security (ICICS '06)
23. PC member, ACM STC Workshop (in association with CCS 06), 2006
24. PC member, IEEE Workshop on IA, 2006
25. PC Member, WISE 2005
26. PC Member, The First International Workshop on Network Security (WoNS 2005), in conjunction with IEEE LCN 2005.
27. PC Member, IPIP TC-11 Conference on Security Management, Integrity, and Internal Control in Information Systems, 2005
28. PC Member, WWW 2005, 14th International World Wide Web Conference
29. PC Member, ESORICS 2005, European Symposium on Research in Computer Security
30. PC Member, IEEE GLOBECOM 2005
31. PC Member, MCCIS 2005
32. PC Member, ACSAC 2005, Annual Computer Security Applications Conference
33. PC Member, IEEE Securecomm 2005
34. PC Member, IFIP DBSEC 2005, 19th IFIP WG11.3 Working Conference on Data and Application Security.
35. PC Member, IEEE ICPADS 2005, The 11th IEEE International Conference on Parallel and Distributed Systems
36. PC Member, 2005 Int'l Workshop on Security in Parallel and Distributed Systems (SDCS)
37. PC Member, NGWPS 2005
38. PC Member, CRIS Workshop on Critical Information Infrastructures, 2005
39. PC Member, ESORICS 2004, European Symposium on Research in Computer Security
40. PC Member, ACSAC 2004, Annual Computer Security Applications Conference
41. PC Member, 2004 Int'l Workshop on Security in Parallel and Distributed Systems (SDCS)
42. PC member, 18th IFIP WG11.3 Working Conference on Data and Application Security, 2004.
43. PC Member, 19th IFIP International Information Security Conference, France, May 2004
44. PC Member, 13th International World Wide Web Conference (WWW'04), New York City, May 2004
45. PC member, 18th IFIP Int'l Information Security Conference, Athens, Greece, May 2003
46. PC member, 10th ACM Int'l Conference on Computer and Communications Security, Washington DC, 2003.
47. PC member, 17th IFIP WG11.3 Working Conference on Data and Applications Security, Colorado, USA, 2003.
48. PC member, 9th ACM Int'l Conference on Computer and Communications Security, Washington DC, 2002.
49. PC member, 18th IFIP Int'l Information Security Conference, May 2003.
50. PC member, IASTED Int'l Conference on Networks, Parallel and Distributed Processing, and Applications, Japan, July 2002.
51. PC member, ACM International Conference on Computer and Communication Security (ACM CCS2001), Philadelphia, PA, Nov 2001.
52. PC member, International Conference on Conceptual Modeling (ER2001), Tokyo, Japan, 2001.

PROFESSIONAL ACTIVITIES: OTHER

- (Nov 2007) Co-Organizer, ARO Workshop on Cyber Situational Awareness, Fairfax, VA

- Reviewer, Two Sweden VINNOVA proposals
- Member, DOE Panel, 2005
- Member, NSF CISE Panels, 2001, 2002, 2003, 2004, 2006 (3 panels), 2007
- Leader of DETER/EMIST ESVT Tool Development, 2003-2007
- DARPA OASIS Program Peer-Review Team Mentor, 2003.
- Member, NSF CAREER Panel, 2001
- Invited Proposal Reviewer, French aciSI Research Program on Computer Security and Dependability, 2004
- Invited SBIR Proposal Reviewer, Department of Energy, 2004, 2005, 2006
- (March 05) Liu attended the NSF-Dept of Treasury Workshop on Resilient Financial Information Systems by invitation.

SELECTED TALKS, LECTURES, AND DEMOS

- Invited Speaker, “Attack Aware Integrity Control in Databases”, IFIP TC-11 WG 11.1 & WG 11.5 Joint Working Conference on Security Management, Integrity, and Internal Control in Information Systems, George Mason University, Fairfax, Virginia, December 1-2, 2005
- Invited Talk, “Defending against Internet Worm Attacks”, School of Information, University of Pittsburgh, Pittsburgh, Feb 2005.
- Invited Talk, “Self Healing Databases under Cyber Attacks”, Department of Computer Science and CERICS, Purdue University, Feb 2005
- Invited Talk, “Defending against Internet Worm Attacks”, Department of Computer and Information Science, University of Delaware, Nov 2004
- Invited Presentation, “Defending Military Enterprise Networks Against Worm-Based Attacks - The Self Healing Aspect”, DARPA Dynamic Quarantine Program Industry Day, April 2003.
- Talk, “An Incentive-Based Framework for Information Assurance Measuring”, DARPA IAM & SRS Workshop, Oct 2002.
- Invited Talk, “Intrusion Tolerant Database Systems and QoIA Management”, National Science Foundation, July 2002.
- Demo, “ITDB - An Intrusion Tolerant Database System Prototype” (Version 3.0), DARPA OASIS PI Meeting, Hilton Head Island, SC, March 2002.
- Invited Talk, “Intrusion Tolerant Database Systems”, Center for Information Management, Integration and Connectivity, Rutgers University, Nov 2001.
- Demo, “ITDB - An Intrusion Tolerant Database System Prototype” (Version 2.0), DARPA OASIS PI Meeting, Sante Fe, NM, July 2001.
- Talk, “Engineering a Distributed Intrusion Tolerant Database System using COTS Components” (Phase III), on DARPA OASIS PI Meeting, Sante Fe, NM, July 2001.
- Demo, “ITDB - An Intrusion Tolerant Database System Prototype” (Version 1.0), DARPA Information Survivability Conference and Exposition, Anaheim, CA, June 2001.
- Invited Keynote Speaker, “Intrusion Detection - A 20 Year Practice”, UNCC Security Symposium, Charlotte, NC, Dec 2000
- Talk, “Engineering a Distributed Intrusion Tolerant Database System using COTS Components” (Phase I), DARPA IA&S Joint Summer PI Meeting, Honolulu, HI, July 2000.