

Peng Ning
(As of March 2012)

Department of Computer Science
North Carolina State University
Telephone: (919) 513-4457
Email: pning@ncsu.edu; URL: <http://www.csc.ncsu.edu/faculty/ning>

I. RESEARCH INTEREST

Peng Ning is interested in developing systems and techniques that enhance the security of networks, distributed systems, and applications. His current research is focused on cloud computing security and security of wireless ad-hoc networks.

II. EDUCATION

- Ph.D., Information Technology, 2001, George Mason University, VA
- M.E., Communication and Electronic Systems, 1997, University of Science and Technology of China, China
- B.S., Information Science, 1994, University of Science and Technology of China, China

III. EMPLOYMENT HISTORY

- Technical Director, July 2008 – present, NC State University, Secure Open Systems Initiative (SOSI), NC
- Professor, August 2010 – present, NC State University, Department of Computer Science, NC
- Associate Professor, August 2006 – July 2010, NC State University, Department of Computer Science, NC
- Assistant Professor, August 2001 – July 2006, NC State University, Department of Computer Science, NC

IV. AWARDS

1. NSF Faculty Early CAREER Award, 2005
2. IBM Open Collaboration Faculty Award (a.k.a. IBM Open Collaboration Research (OCR) Award), 2009 (twice), 2010, and 2011.
3. ACM Recognition of Service Awards, 2004, 2007, and 2008
4. Best Paper Award. Wu Zhou, Yajin Zhou, Xuxian Jiang, Peng Ning, "DroidMOSS: Detecting Repackaged Smartphone Applications in Third-Party Android Marketplaces," in *Proceedings of the 2nd ACM Conference on Data and Application Security and Privacy (CODASPY 2012)*, San Antonio, TX, February 2012.
5. Best Paper Award. Qian Wang, Kui Ren, Peng Ning, "Anti-jamming Communication in Cognitive Radio Networks with Unknown Channel Statistics," in *Proceedings of The 19th IEEE International Conference on Network Protocols (ICNP 2011)*, October 2011.
6. Best Paper Award. An Liu, Peng Ning, Huaiyu Dai, Yao Liu, "USD-FH: Jamming-resistant Wireless Communication using Frequency Hopping with Uncoordinated Seed Disclosure," in *Proceedings of 7th IEEE International Conference on Mobile Ad-hoc and Sensor Systems (MASS '10)*, November 2010.
7. Best Paper Award. Wenliang Du, Lei Fang, Peng Ning, "LAD: Localization Anomaly Detection for Wireless Sensor Networks," in *Proceedings of the 19th IEEE International Parallel & Distributed Processing Symposium (IPDPS '05)*, April 2005.
8. Best Paper Award. Peng Ning, Kun Sun, "How to Misuse AODV: A Case Study of Insider Attacks against Mobile Ad-hoc Routing Protocols," in *Proceedings of the 4th Annual IEEE Information Assurance Workshop*, June 2003.

9. Doctoral Completion Fellowship, George Mason University, Summer 2001.
10. Doctoral Fellowship. School of Information Technology and Engineering, George Mason University, 2000 – 2001.
11. Elite Graduate Student Award of Chinese Academy of Sciences (CAS), University of Science & Technology of China, Graduate School at Beijing, 1995.
12. Shenzhen Industrial Technology Award, University of Science & Technology of China, 1993.

V. SELECTED PROFESSIONAL SERVICES

Professional Society

1. Secretary/Treasure, ACM Special Interest Group on Security, Audit, and Control (SIGSAC), 2009 – 2013
2. Member of ACM SIGSAC executive committee, 2009 – 2013

Journal Editorial Board

3. Encyclopedia of Cryptography and Security, 2nd edition, Springer, 2008 – present
4. Journal of Computer Security, IOS Press, 2006 – present
5. ACM Transactions on Sensor Networks, ACM Press, 2007 – present
6. International Journal of Security and Networks, Inderscience, 2008 – 2009
7. Ad Hoc Networks, Elsevier, Elsevier, 2006 – 2009
8. IEE Proceedings Information Security, IEE Publishing, 2005 – 2009
9. Ad Hoc and Sensor Wireless Networks: An International Journal, Old City Publishing, 2004 – 2009

Conference Steering Committee

1. ACM Conference on Computer and Communications Security (CCS), 2007 – 2011
2. ACM Symposium on Wireless Security (WiSec), founding member, since 2006
3. ICDCS Workshop on Security and Privacy in Cloud Computing, since 2010

Conference and Workshop Organization

1. Program Chair, 20th Annual Network and Distributed System Security (NDSS) Symposium, 2013
2. Shadow Program Chair, 19th Annual Network and Distributed System Security (NDSS) Symposium, 2012
3. Program Co-Chair, 2010 ICDCS Workshop on Security and Privacy in Cloud Computing
4. Program Committee Vice Chair (Security & Privacy Track), 30th International Conference on Distributed Computing Systems (ICDCS 2010), 2010
5. Program Co-Chair, 14th European Symposium on Research in Computer Security (ESORICS 2009)
6. Program Vice Chair (Security and Privacy Track), 29th and 30th International Conference on Distributed Computing Systems (ICDCS 2009 & 2010)
7. General Chair, 15th ACM Conference on Computer and Communications Security (CCS '08)
8. General Chair, 14th ACM Conference on Computer and Communications Security (CCS '07)
9. Publicity Chair, 2008 ACM Symposium on Wireless Security (WiSec '08)

10. Publicity Co-Chair, the 3rd International Conference on Security and Privacy in Communication Networks (SecureComm '07)
11. Workshop co-Chair, 2007 ARO Planning Workshop on Security of Embedded Systems and Networks (sponsored by ARO)
12. Program Committee Chair, Eighth International Conference on Information and Communications Security (ICICS '06)
13. Workshop co-Chair, 2006 RTAS Workshop on Research Directions for Security and Networking in Critical Real-Time and Embedded Systems
14. Organizing committee member and Treasurer, 2006 ACM Conference on Computer and Communications Security (CCS '06)
15. Program Committee Chair, 2005 ACM Workshop on Security in Ad-Hoc and Sensor Networks (SASN 2005)
16. Organizing committee member and Treasurer, 2005 ACM Conference on Computer and Communications Security (CCS '05)

VI. PUBLICATIONS

Impact Factors:

(March 2012; Microsoft Academic Search <http://academic.research.microsoft.com/>)

- Citations: 4615
- G-Index: 66
- H-Index: 34

Books and Edited Proceedings

1. David Basin, Peng Liu, and Peng Ning (Eds), *Proceedings of the 5th ACM Symposium on Information, Computer and Communications Security (ASIACCS '10)*. The ACM Press. April 13-16, 2010. Beijing, China.
2. Michael Backes, Peng Ning (Eds), *Proceedings of the 14th European Symposium on Research in Computer Security (ESORICS 2009)*. Springer. September 2009.
3. Donggang Liu, Peng Ning. *Security for Wireless Sensor Networks*. Advances in Information Security, Vol. 28. Springer. ISBN: 0387327231. December 2006.
4. Peng Ning, Sihan Qing, Ninghui Li (Eds), *Proceedings of the 2006 International Conference on Information and Communications Security (ICICS 2006)*. December 2006. Raleigh, North Carolina, USA.
5. Peng Ning, Sushil Jajodia, and X. Sean Wang. *Intrusion Detection in Distributed Systems: An Abstraction-Based Approach*. Kluwer Academic Publisher. ISBN: 1-4020-7624-X. October 2003.
6. Vijay Atluri, Pierangela Samarati, Peng Ning, & Wenliang Du (Eds), *Proceedings of the 2005 ACM Workshop on Security of Ad Hoc and Sensor Networks*. November 2005. Alexandria, Virginia, USA.

Book Chapters

7. Chongkyung Kil, Emre Sezer, Peng Ning, "Automated Software Vulnerability Analysis," in *Sushil Jajodia, Peng Liu, Vipin Swarup, Cliff Wang eds. Cyber Situational Awareness*, Springer,

2009.

8. Peng Ning, Dingbang Xu, "Toward Automated Intrusion Alert Analysis," in *S. Huang, D. Du, and D. MacCallum (Eds.), Network Security*, ISBN 978-0-387-73820-8, Springer, 2010.
9. Dingbang Xu, Peng Ning, "Correlation Analysis of Intrusion Alerts," in Roberto Di Pietro, Luigi V. Mancini (Eds), *Recent Advances in Intrusion Detection*, Springer, 2008.
10. Peng Ning, Donggang Liu, Wenliang Du, "Secure and Resilient Location Discovery in Wireless Sensor Networks," in *Cliff Wang, Radha Poovendran, Sumit Roy (Eds), WSN Localization and Time Synchronization*, pages 161-184, Springer, 2006.
11. Kun Sun, Cliff Wang, Peng Ning, "Secure and Resilient Clock Synchronization in Wireless Sensor Networks," in *Cliff Wang, Radha Poovendran, Sumit Roy (Eds), WSN Localization and Time Synchronization*, pages 347-368, Springer, 2006.
12. Wenliang Du, Lei Fang, Peng Ning, "Beaconless Location Discovery in Wireless Sensor Networks in *Cliff Wang, Radha Poovendran, Sumit Roy (Eds), WSN Localization and Time Synchronization*, pages 33-56, Springer, 2006
13. Peng Ning, Sushil Jajodia, "Intrusion Detection Basics," in H. Bidgoli (Ed.) *Handbook of Computer Networks*. John Wiley & Sons. November 2007.
14. Peng Ning, Donggang Liu, "Broadcast authentication and key management for secure sensor networks," in *Ivan Stojmenovic (Ed.), Sensor Networks*, pages 141-172, John Wiley & Sons. ISBN: 13-978-0-471-68472-5. 2005.
15. Peng Ning, Sushil Jajodia, "Intrusion Detection Systems Basics," in H. Bidgoli (Ed.), *Handbook of Information Security*, pages 685-700, John Wiley & Sons. ISBN: 0-471-64833-7. December 2005.
16. Peng Ning, Sushil Jajodia, "Intrusion Detection Techniques," in H. Bidgoli (Ed.), *The Internet Encyclopedia*. John Wiley & Sons. ISBN: 0-471-22201-1. December 2003.

Refereed Journal Publications

17. Kaiqi Xiong, Ronghua Wang, Wenliang Du, Peng Ning, "Containing Bogus Packet Insertion Attacks for Broadcast Authentication in Sensor Networks," To appear in *ACM Transactions on Sensor Networks (TOSN)*, 2012.
18. Liang Xiao, Huaiyu Dai, Peng Ning, "Jamming-Resistant Collaborative Broadcast Using Uncoordinated Frequency Hopping," in *IEEE Transactions on Information Forensics and Security (TIFS)*, Vol. 7, No. 1, February 2012.
19. Mihui Kim, Varagur Karthik Sriram Iyer, Peng Ning, "MrFair: Misbehavior-resistant Fair Scheduling in Wireless Mesh Networks," in *Ad Hoc Networks*, Vol. 10, Issue 3, Pages 299-316. Elsevier. May 2012.
20. Hairong Qi, Xiaorui Wang, Leon M. Tolbert, Fangxing (Fran) Li, Fang Z. Peng, Peng Ning, Massoud Amin, "A Resilient Real-Time System Design for a Secure and Reconfigurable Power Grid," in *IEEE Transactions on Smart Grid*, Vol. 2, No. 3, 2011.
21. Yao Liu, Peng Ning, Mike Reiter, "False Data Injection Attacks against State Estimation in Electric Power Grids" in *ACM Transactions in Information and Systems Security (TISSEC)*, Vol. 14, No. 1, May 2011.
22. Tong Zhou, Romit Roy Choudhury, Peng Ning, Krishnendu Chakrabarty, "P2DAP -- Detecting Sybil Attacks in Vehicular Ad Hoc Networks," in *IEEE Journal on Selected Areas in Communications, Special Issue on Vehicular Communications and Networks*, Vol. 29, No. 3, Pages 582--594, March 2011.

23. Mihui Kim and Peng Ning, "SeCA: A framework for Secure Channel Assignment in wireless mesh networks," in *Computer Communications*, Volume 34, Issue 4, Pages 567—576, Elsevier, April 2011.
24. Ronghua Wang, Wenliang Du, Xiaogang Liu, Peng Ning, "ShortPK: A Short-Term Public Key Scheme for Broadcast Authentication in Sensor Networks," in *ACM Transactions on Sensor Networks (TOSN)*, Vol. 6, No. 1, pages 1—29, December 2009.
25. Donggang Liu, Peng Ning, An Liu, Cliff Wang, Wenliang Du, "Attack-Resistant Location Estimation in Wireless Sensor Networks," in *ACM Transactions in Information and Systems Security (TISSEC)*, Vol. 11, No. 4, pages 1—39, July 2008.
26. Donggang Liu, Peng Ning, Wenliang Du, "Group-Based Key Pre-Distribution in Wireless Sensor Networks," in *ACM Transactions on Sensor Networks (TOSN)*, Vol. 4, No. 2, pages 11:1—11:30, March 2008.
27. Qing Zhang, Ting Yu, Peng Ning, "A Framework for Identifying Compromised Nodes in Wireless Sensor Networks," in *ACM Transactions in Information and Systems Security (TISSEC)*, Vol. 11, No. 3, Article No. 12, March 2008.
28. Peng Ning, An Liu, Wenliang Du, "Mitigating DoS Attacks against Broadcast Authentication in Wireless Sensor Networks," in *ACM Transactions on Sensor Networks (TOSN)*, Vol. 4, No. 1, January 2008.
29. Sencun Zhu, Sanjeev Setia, Sushil Jajodia, and Peng Ning, "An Interleaved Hop-by-Hop Authentication Scheme for Filtering of Injected False Data in Sensor Networks," in *ACM Transactions on Sensor Networks (TOSN)*, Vol. 3, No. 3, August 2007.
30. Wenliang Du, Lei Fang, Peng Ning, "LAD: Localization Anomaly Detection for Wireless Sensor Networks," in *Journal of Parallel and Distributed Computing, Special Issue on Papers Selected from IPDPS 05*, Vol. 66, No. 7, pages 874-886, July 2006.
31. Kun Sun, Peng Ning, Cliff Wang, "Secure and Resilient Clock Synchronization in Wireless Sensor Networks," in *IEEE Journal on Selected Areas in Communications*, Vol. 24, No. 2, pages 395-408, February 2006.
32. Donggang Liu, Peng Ning, "Improving Key Pre-Distribution with Deployment Knowledge in Static Sensor Networks," in *ACM Transactions on Sensor Networks (TOSN)*, Vol. 1, No. 2, pages 204-239, November 2005.
33. Peng Ning, Kun Sun, "How to Misuse AODV: A Case Study of Insider Attacks against Mobile Ad-hoc Routing Protocols," in *Ad Hoc Networks Journal*, Vol. 3, No. 6, pages 795—819, November 2005.
34. Kun Sun, Peng Ning, Cliff Wang, "Fault-Tolerant Cluster-Wise Clock Synchronization for Wireless Sensor Networks," in *IEEE Transactions on Dependable and Secure Computing (TDSC)*, Vol. 2, No. 3, pages 177–189, July-September 2005.
35. Donggang Liu, Peng Ning, Rongfang Li, "Establishing Pairwise Keys in Distributed Sensor Networks," in *ACM Transactions on Information and System Security (TISSEC)*, Vol. 8, No. 1, pages 41–77, February 2005.
36. Peng Ning, Dingbang Xu, "Hypothesizing and Reasoning about Attacks Missed by Intrusion Detection Systems," *ACM Transactions on Information and System Security (TISSEC)*, Vol. 7, No. 4, pages 591–627, November 2004.
37. Donggang Liu, Peng Ning, "Multi-Level μ TESLA: Broadcast Authentication for Distributed Sensor Networks," in *ACM Transactions in Embedded Computing Systems (TECS)*, Vol. 3, No. 4, pages 800–836, November 2004.

38. Peng Ning, Yun Cui, Douglas Reeves, and Dingbang Xu, "Techniques and Tools for Analyzing Intrusion Alerts," *ACM Transactions on Information and System Security (TISSEC)*, Vol. 7, No. 2, pages 274–318, May 2004.
39. Yingjiu Li, Peng Ning, X. Sean Wang, Sushil Jajodia, "Discovering Calendar-based Temporal Association Rules," *Data and Knowledge Engineering*, Vol. 44, No. 2, pages 193–218, Elsevier Science, February 2003.
40. Peng Ning, Sushil Jajodia, X. Sean Wang, "Design and Implementation of A Decentralized Prototype System for Detecting Distributed Attacks," *Computer Communications, Special Issue on Intrusion Detection Systems*, Vol. 25, No. 15, pages 1374–1391, September 2002.
41. Peng Ning, X. Sean Wang, Sushil Jajodia, "An Algebraic Representation of Calendars," *Annals of Mathematics and Artificial Intelligence*, Vol. 36, No. 12, pages 5–38, Kluwer Academic, September 2002.
42. Peng Ning, Sushil Jajodia, X. Sean Wang, "Abstraction-based Intrusion Detection in Distributed Environments," *ACM Transactions on Information and System Security (TISSEC)*, Vol. 4, No. 4, pages 407–452, November 2001.
43. 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, pages 337–350, Elsevier Science, 2001.
44. Peng Ning, X. Sean Wang, Sushil Jajodia, "Modeling Requests among Cooperating Intrusion Detection Systems," *Computer Communications*, Vol. 23, No. 17, pages 1702–1715, Elsevier Science, 2000.
45. Dengguo Feng, Peng Ning, "The Relationship Among Nonlinear Criteria of S-box," *Journal of China Institute of Communications*, Vol. 19, No. 4, pages 71–75, 1998.
46. Junhui Yang, Peng Ning, "Analysis of a Fast Public Key Cryptosystem," *Cryptography & Information*, Vol. 2, No. 3, pages 1–17, 1996.

Refereed Conference Publications

47. Arun Natarajan, Peng Ning, Yao Liu, Sushil Jajodia, and Steve E. Hutchinson, "NSDMiner: Automated Discovery of Network Service Dependencies," in *Proceedings of IEEE International Conference on Computer Communications (INFOCOM '12)*, Orlando, FL, March 2012.
Acceptance ratio: 18%
48. Yao Liu, and Peng Ning, "BitTrickle: Defending against Broadband and High-power Reactive Jamming Attacks," in *Proceedings of IEEE International Conference on Computer Communications (INFOCOM '12)*, Orlando, FL, March 2012.
Acceptance ratio: 18%
49. Yao Liu, and Peng Ning, "Enhanced Wireless Channel Authentication Using Time-Synched Link Signature," in *Proceedings of IEEE International Conference on Computer Communications (INFOCOM '12)*, Mini-Conference, Orlando, FL, March 2012.
Acceptance ratio: Unknown
50. Attila A. Yavuz, Peng Ning and Mike Reiter, "Efficient, Compromise Resilient and Append-only Cryptographic Schemes for Secure Audit Logging," in *Proceedings of 2012 Financial Cryptography and Data Security (FC 2012)*, February-March 2012.
Acceptance ratio: Unknown
51. Wu Zhou, Yajin Zhou, Xuxian Jiang and Peng Ning, "Detecting Repackaged Smartphone Applications in Third-Party Android Marketplaces," in *Proceedings of 2nd ACM Conference on*

Data and Application Security and Privacy (CODASPY 2012), February 2012. Best paper award.

Acceptance ratio: 14%

52. Ahmed Azab, Peng Ning, Xiaolan Zhang, "SICE: A Hardware-Level Strongly Isolated Computing Environment for x86 Multi-core Platforms," in *Proceedings of 18th ACM Conference on Computer and Communications Security (CCS '11)*, October 2011.

Acceptance ratio: 14%

53. Qian Wang, Kui Ren, Peng Ning, "Anti-jamming Communication in Cognitive Radio Networks with Unknown Channel Statistics," in *Proceedings of The 19th IEEE International Conference on Network Protocols (ICNP 2011)*, October 2011.

Acceptance ratio: 16.4%

54. Liang Xiao, Huaiyu Dai, Peng Ning. "Jamming-Resistant Collaborative Broadcast In Wireless Networks, Part I: Singlehop Networks," in *Proceedings of GLOBECOM 2011*, December 2011.

Acceptance ratio: unknown

55. Liang Xiao, Huaiyu Dai, Peng Ning. "Jamming-Resistant Collaborative Broadcast In Wireless Networks, Part II: Multihop Networks," in *Proceedings of GLOBECOM 2011*, December 2011.

Acceptance ratio: unknown

56. Minh Tran, Mark Etheridge, Tyler Bletsch, Xuxian Jiang, Vincent Freeh, Peng Ning, "On the Expressiveness of Return-into-libc Attacks," in *Proceedings of the 14th International Symposium on Recent Advances in Intrusion Detection (RAID 2011)*, September 2011.

Acceptance ratio: 23%

57. Wu Zhou, Peng Ning, Xiaolan Zhang, Glenn Ammons, Vasanth Bala, Ruowen Wang, "Always Up-to-date -- Scalable Offline Patching of VM Images in a Compute Cloud," in *Proceedings of 26th Annual Computer Security Applications Conference (ACSAC 2010)*, December 2010.

Acceptance ratio: 17.2%

58. An Liu, Peng Ning, Huaiyu Dai, Yao Liu, Cliff Wang, "Defending DSSS-based Broadcast Communication against Insider Jammers via Delayed Seed-Disclosure," in *Proceedings of 26th Annual Computer Security Applications Conference (ACSAC 2010)*, December 2010.

Acceptance ratio: 17.2%

59. Chengzhi. Li, Huaiyu Dai, Liang Xiao and Peng Ning, "Analysis and Optimization on Jamming-resistant Collaborative Broadcast in Large-Scale Networks," in *2010 Asilomar Conference on Signals, Systems, and Computers*, Pacific Grove, CA, November 2010.

Invited paper

60. An Liu, Peng Ning, Huaiyu Dai, Yao Liu, "USD-FH: Jamming-resistant Wireless Communication using Frequency Hopping with Uncoordinated Seed Disclosure," in *Proceedings of 7th IEEE International Conference on Mobile Ad-hoc and Sensor Systems (MASS '10)*, November 2010. **(Best Paper Award)**

Acceptance ratio: 27.6%

61. Ahmed M. Azab, Peng Ning, Zhi Wang, Xuxian Jiang, Xiaolan Zhang, Nathan C. Skalsky, "HyperSentry: Enabling Stealthy In-context Measurement of Hypervisor Integrity," in *Proceedings of the 17th ACM Conference on Computer and Communications Security (CCS 2010)*, October 2010, Chicago, IL, USA.

Acceptance ratio: 17.2%

62. Yao Liu, Peng Ning, Huaiyu Dai, "Authenticating Primary Users' Signals in Cognitive Radio Networks via Integrated Cryptographic and Wireless Link Signatures," in *Proceedings of 2010 IEEE Symposium on Security and Privacy (Oakland '10)*, Oakland, CA, May 2010.

Acceptance ratio: 11.0%

63. Yao Liu, Peng Ning, Huaiyu Dai, An Liu, "Randomized Differential DSSS: Jamming-Resistant Wireless Broadcast Communication," in *Proceedings of IEEE INFOCOM 2010*, March 2010, San Diego, CA, USA.

Acceptance ratio: 17.5%

64. Ahmed M. Azab, Peng Ning, Emre C. Sezer, and Xiaolan Zhang, "HIMA: A Hypervisor-Based Integrity Measurement Agent," in *Proceedings of the 25th Annual Computer Security Applications Conference (ACSAC '09)*, December 2009, Honolulu, Hawaii, USA.

Acceptance ratio: 19.6%

65. Attila Yavuz and Peng Ning, "BAF: An Efficient Publicly Verifiable Secure Audit Logging Scheme for Distributed Systems," in *Proceedings of the 25th Annual Computer Security Applications Conference (ACSAC '09)*, December 2009, Honolulu, Hawaii, USA.

Acceptance ratio: 19.6%

66. Yao Liu, Peng Ning, Michael Reiter, "False Data Injection Attacks against State Estimation in Electric Power Grids," in *Proceedings of the 16th ACM Conference on Computer and Communications Security (CCS '09)*, November 2009.

Acceptance ratio: 18.4%

67. Zhi Wang, Xuxian Jiang, Weidong Cui, Peng Ning, "Countering Kernel Rootkits with Lightweight Hook Protection," in *Proceedings of the 16th ACM Conference on Computer and Communications Security (CCS '09)*, November 2009.

Acceptance ratio: 18.4%

68. Attila Yavuz and Peng Ning, "Hash-Based Sequential Aggregate and Forward Secure Signature for Unattended Wireless Sensor Networks," in *Proceedings of the Sixth Annual International Conference on Mobile and Ubiquitous Systems: Computing, Networking and Services (MobiQuitous 2009)*, July 2009.

Acceptance ratio: 22%

69. Chongkyung Kil, Emre Can Sezer, Ahmed Azab, Peng Ning, Xiaolan Zhang, "Remote Attestation to Dynamic System Properties: Towards Providing Complete System Integrity Evidence," in *Proceedings of the 39th Annual IEEE/IFIP International Conference on Dependable Systems and Networks (DSN 2009)*, Lisbon, Portugal, June-July 2009.

Acceptance ratio: 20.9%

70. Young-Hyun Oh, Peng Ning, Yao Liu, Michael Reiter, "Authenticated Data Compression in Delay Tolerant Wireless Sensor Networks," in *Proceedings of the 6th International Conference on Networked Sensing Systems (INSS '09)*, June 2009.

Acceptance ratio: 29.1%

71. An Liu, Peng Ning, Cliff Wang, "Lightweight Remote Image Management for Secure Code Dissemination in Wireless Sensor Networks," in *IEEE INFOCOM 2009*, April 2009.

Acceptance ratio: 19.7%

72. Kun Sun, An Liu, Roger Xu, Peng Ning, Douglas Maughan, "Securing Network Access in Wireless Sensor Networks," in *Proceedings of 2nd ACM Conference on Wireless Network Security (WiSec '09)*, pages 261—268, March 2009.

Acceptance ratio: 26%

73. An Liu, Peng Ning, "TinyECC: A Configurable Library for Elliptic Curve Cryptography in Wireless Sensor Networks," in *Proceedings of the 7th International Conference on Information Processing in Sensor Networks (IPSN 2008), SPOTS Track*, April 2008.

Acceptance ratio: 26.5% (SPOTS track)

74. Sangwon Hyun, Peng Ning, An Liu, Wenliang Du, "Seluge: Secure and DoS-Resistant Code Dissemination in Wireless Sensor Networks," in *Proceedings of the 7th International Conference on Information Processing in Sensor Networks (IPSN 2008), IP Track*, April 2008.

Acceptance ratio: 23.8% (IP track)

75. Qi Dong, Donggang Liu, Peng Ning, "Pre-Authentication Filters: Providing DoS Resistance for Signature-Based Broadcast Authentication in Wireless Sensor Networks," in *Proceedings of 1st ACM Conference on Wireless Network Security (WiSec '08)*, March/April, 2008.

Acceptance ratio: 16% (regular papers)

76. Chongkyung Kil, Emre Can Sezer, Peng Ning, and Xiaolang Zhang, "Automated Security Debugging Using Program Structural Constraints," in *Proceedings of the 23rd Annual Computer Security Applications Conference (ACSAC '07)*, December 2007.

Acceptance ratio: 22%

77. Emre Can Sezer, Peng Ning, Chongkyung Kil and Jun Xu, "MemSherlock: An Automated Debugger for Unknown Memory Corruption Vulnerabilities," in *Proceedings of the 14th ACM Conference on Computer and Communications Security (CCS '07)*, pages 562—572, October/November, 2007.

Acceptance ratio: 18.2%

78. Cliff Wang, An Liu, Peng Ning, "Cluster-Based Minimum Mean Square Estimation for Secure and Resilient Localization in Wireless Sensor Networks," in *Proceedings of The International Conference on Wireless Algorithms, Systems and Applications (WASA '07)*, August 2007.

Acceptance ratio: Unknown

79. Tong Zhou, Romit Roy Choudhury, Peng Ning, Krishnendu Charkrabarty, "Privacy-Preserving Detection of Sybil Attacks in Vehicular Networks," in *Proceedings of 4th International Conference on Mobile and Ubiquitous Systems: Computing, Networking and Services (MobiQuitous 2007)*, August 2007.

Acceptance ratio: 22.7%

80. Ronghua Wang, Wenliang Du, Peng Ning, "Containing Denial-of-Service Attacks in Broadcast Authentication in Sensor Networks," in *Proceedings of the 8th ACM International Symposium on Mobile Ad Hoc Networking and Computing (MobiHoc '07)*, Montreal, Canada, September 2007.

Acceptance ratio: 18.5%

81. Young June Pyun, Young Hee Park, Xinyuan Wang, Douglas S. Reeves, Peng Ning, "Tracing Traffic through Intermediate Hosts that Repackage Flows," in *Proceedings of IEEE INFOCOM '07*, Anchorage, Alaska, May 2007.

Acceptance ratio: 18%

82. Qinghua Zhang, Douglas S. Reeves, Peng Ning, Purush Iyer, "Analyzing Network Traffic to Detect Self-Decrypting Exploit Code," in *Proceedings of the 2nd ACM Symposium on InformAtion, Computer and Communications Security (ASIACCS '07)*, pages 4-12, Singapore, March 2007.

Acceptance ratio: 17.6%

83. Pan Wang, Peng Ning, Douglas S. Reeves, "A K-anonymous Communication Protocol for Overlay Networks," *Proceedings of the 2nd ACM Symposium on InformAtion, Computer and Communications Security (ASIACCS '07)*, pages 45-56, Singapore, March 2007.

Acceptance ratio: 17.6%

84. Chongkyung Kil, Jinsuk Jun, Christopher Bookholt, Jun Xu, and Peng Ning, "Address Space

Layout Permutation (ASLP): Towards Fine-Grained Randomization of Commodity Software,” in *Proceedings of the 22nd Annual Computer Security Applications Conference (ACSAC'06)*, pages 339-348, December 2006.

Acceptance ratio: 26.5%

85. Kun Sun, Pai Peng, Peng Ning, Cliff Wang, “Secure Distributed Cluster Formation in Wireless Sensor Networks,” in *Proceedings of the 22nd Annual Computer Security Applications Conference (ACSAC'06)*, pages 131-140, December 2006.

Acceptance ratio: 26.5%

86. Kun Sun, Peng Ning, Cliff Wang, An Liu, Yuzheng Zhou, “TinySeRSync: Secure and Resilient Time Synchronization in Wireless Sensor Networks,” in *Proceedings of the 13th ACM Conference on Computer and Communications Security (CCS '06)*, pages 264-277, Alexandria, Virginia, November 2006.

Acceptance ratio: 14.8%

87. Dingbang Xu, Peng Ning, “A Flexible Approach to Intrusion Alert Anonymization and Correlation,” in *Proceedings of 2nd IEEE Communications Society/CreateNet International Conference on Security and Privacy in Communication Networks (SecureComm 2006)*, pages 1-10, August 2006.

Acceptance ratio: 26%

88. Qing Zhang, Ting Yu, Peng Ning, “A Framework for Identifying Compromised Nodes in Sensor Networks,” in *Proceedings of 2nd IEEE Communications Society/CreateNet International Conference on Security and Privacy in Communication Networks (SecureComm 2006)*, pages August 2006.

Acceptance ratio: 26%

89. Pai Peng, Peng Ning, Douglas S. Reeves, “On the Secrecy of Timing-Based Active Watermarking Trace-Back Techniques,” in *Proceedings of 2006 IEEE Symposium on Security and Privacy*, pages 334-348, Oakland, CA, May 2006.

Acceptance ratio: 12.7%

90. Yan Zhai, Peng Ning, Jun Xu, “Integrating IDS Alert Correlation and OS-Level Dependency Tracking,” in *Proceedings of IEEE International Conference on Intelligence and Security Informatics (ISI 2006)*, pages 272--284, May 2006.

Acceptance ratio: Unknown

91. Pan Wang, Peng Ning, Douglas S. Reeves, “Network Access Control for Mobile Ad-Hoc Networks,” in *Proceedings of the 7th International Conference on Information and Communications Security (ICICS '05), LNCS 3783*, pages 350-362, December 2005.

Acceptance ratio: 17.4%

92. Dingbang Xu, Peng Ning, “Privacy-Preserving Alert Correlation: A Concept Hierarchy Based Approach,” in *Proceedings of the 21st Annual Computer Security Applications Conference*, December 2005.

Acceptance ratio: 22.8%

93. Jun Xu, Peng Ning, Chongkyung Kil, Yan Zhai, and Chris Bookholt, “Automatic Diagnosis and Response to Memory Corruption Vulnerabilities,” in *Proceedings of the 12th ACM Conference on Computer and Communications Security (CCS '05)*, pages 223-234, November 2005.

Acceptance ratio: 15.3%

94. Donggang Liu, Peng Ning, Sencun Zhu, Sushil Jajodia, “Practical Broadcast Authentication in Sensor Networks,” in *Proceedings of The 2nd Annual International Conference on Mobile and*

Ubiquitous Systems: Networking and Services (MobiQuitous 2005), pages 118–129, July 2005.

Acceptance ratio: 35.4%

95. Wenliang Du, Ronghua Wang, and Peng Ning. “An Efficient Scheme for Authenticating Public Keys in Sensor Networks,” in *Proceedings of the 6th ACM International Symposium on Mobile Ad Hoc Networking and Computing (MobiHoc '05)*, pages 58–67, May 2005.
Acceptance ratio: 14.2%
96. Donggang Liu, Peng Ning, Wenliang Du, “Detecting Malicious Beacon Nodes for Secure Location Discovery in Wireless Sensor Networks,” in *Proceedings of the 25th International Conference on Distributed Computing Systems (ICDCS '05)*, pages 609–619, June 2005.
Acceptance ratio: 13.8%
97. Donggang Liu, Peng Ning, Wenliang Du, “Attack-Resistant Location Estimation in Sensor Networks,” in *Proceedings of The Fourth International Symposium on Information Processing in Sensor Networks (IPSN '05)*, pages 99–106, April 2005.
Acceptance ratio: 20%
98. Wenliang Du, Lei Fang, Peng Ning, “LAD: Localization Anomaly Detection for Wireless Sensor Networks,” in *Proceedings of the 19th IEEE International Parallel & Distributed Processing Symposium (IPDPS '05)*, April 2005.
Acceptance ratio: 34.3%; Best Paper Award
99. Lei Fang, Wenliang Du, Peng Ning, “A Beacon-Less Location Discovery Scheme for Wireless Sensor Networks,” in *Proceedings of the IEEE INFOCOM '05*, March 13-17, 2005.
Acceptance ratio: 17.2%
100. Yan Zhai, Peng Ning, Purush Iyer, Douglas S. Reeves, “Reasoning about Complementary Intrusion Evidence,” in *Proceedings of 20th Annual Computer Security Applications Conference (ACSAC '04)*, pages 39–48, December 2004.
Acceptance ratio: 26.1%
101. Dingbang Xu, Peng Ning, “Alert Correlation through Triggering Events and Common Resources,” in *Proceedings of 20th Annual Computer Security Applications Conference (ACSAC '04)*, pages 360–369, December 2004.
Acceptance ratio: 26.1%
102. Pan Wang, Peng Ning, Douglas Reeves, “Storage-Efficient Stateless Group Key Revocation,” in *Proceedings of the 7th Information Security Conference (ISC '04)*, pages 25–36, September 2004.
Acceptance ratio: 33%
103. Qinglin Jiang, Douglas Reeves, Peng Ning, “Certificate Recommendations to Improve the Robustness of Web of Trust,” in *Proceedings of the 7th Information Security Conference (ISC '04)*, pages 292–303, September 2004.
Acceptance ratio: 33%
104. Sencun Zhu, Sanjeev Setia, Sushil Jajodia, and Peng Ning, “An Interleaved Hop-by-Hop Authentication Scheme for Filtering False Data in Sensor Networks,” in *Proceedings of IEEE Symposium on Security and Privacy*, pages 259–271, Oakland, California, May 2004.
Acceptance ratio: 10.2%
105. Peng Ning, Dingbang Xu, Christopher Healey, and Robert St. Amant, “Building Attack Scenarios through Integration of Complementary Alert Correlation Methods,” in *Proceedings of the 11th Annual Network and Distributed Systems Security Symposium (NDSS '04)*, pages 97–111, February 2004.

- Acceptance ratio: 16.7%
106. Qinglin Jiang, Douglas S. Reeves, Peng Ning, "Improving Robustness of PGP Keyrings by Conflict Detection," in *Proceedings of 2004 RSA Conference Cryptographers' Track (CT-RSA2004)*, pages 194–207, February 2004.
- Acceptance ratio: 36.4%
107. Peng Ning, Dingbang Xu, "Learning Attack Strategies from Intrusion Alerts," in *Proceedings of the 10th ACM Conference on Computer and Communications Security (CCS '03)*, pages 200–209, Washington D.C., October, 2003.
- Acceptance ratio: 13.8%
108. Donggang Liu, Peng Ning, Kun Sun, "Efficient Self-Healing Group Key Distribution with Revocation Capability," in *Proceedings of the 10th ACM Conference on Computer and Communications Security (CCS '03)*, pages 231–240, Washington D.C., October, 2003.
- Acceptance ratio: 13.8%
109. Donggang Liu, Peng Ning, "Establishing Pairwise Keys in Distributed Sensor Networks," in *Proceedings of the 10th ACM Conference on Computer and Communications Security (CCS '03)*, pages 52–61, Washington D.C., October, 2003.
- Acceptance ratio: 13.8%
110. Peng Ning, Dingbang Xu, "Adapting Query Optimization Techniques for Efficient Intrusion Alert Correlation," in *Proceedings of the 17th IFIP WG 11.3 Working Conference on Data and Application Security*, August 2003.
- Acceptance ratio: Unknown
111. Donggang Liu, Peng Ning, "Efficient Distribution of Key Chain Commitments for Broadcast Authentication in Distributed Sensor Networks," in *Proceedings of the 10th Annual Network and Distributed System Security Symposium (NDSS '03)*, pages 263–276, February 2003.
- Acceptance ratio: 20.7%
112. Peng Ning, Yun Cui, Douglas S. Reeves, "Constructing Attack Scenarios through Correlation of Intrusion Alerts," in *the 9th ACM Conference on Computer & Communications Security (CCS '02)*, pages 245–254, Washington D.C., November 2002.
- Acceptance ratio: 17.6%
- Permanently collected by DoD Information Assurance Technology Analysis Center (IATAC) and Total Electronic Migration System (TEMS).
113. Peng Ning, Yun Cui, Douglas S. Reeves, "Analyzing Intensive Intrusion Alerts Via Correlation," in *Proceedings of the 5th International Symposium on Recent Advances in Intrusion Detection (RAID 02)*, pages 74–94, Zurich, Switzerland, October 2002.
- Acceptance ratio: 25%
114. Peng Ning, Yiqun Lisa Yin, "Efficient Software Implementation for Finite Field Multiplication in Normal Basis," in *Proceedings of the 3rd International Conference on Information and Communication Security (ICICS 01)*, LNCS 2229, pages 177–188, November 2001.
- Acceptance ratio: Unknown
115. Yingjiu Li, Peng Ning, X. Sean Wang, Sushil Jajodia, "Discovering Calendar-based Temporal Association Rules," in *Proceedings of the 8th International Symposium on Temporal Representation and Reasoning (TIME 01)*, pages 111–118, Italy, June 2001.
- Acceptance ratio: Unknown
116. Peng Ning, X. Sean Wang, Sushil Jajodia, "Query Facility for Common Intrusion Detection Framework," in *Proceedings of the 23rd National Information Systems Security Conference*, pages 317–328, October 2000.

Acceptance ratio: Unknown

117. Jiahai Yang, Peng Ning, X. Sean Wang, and Sushil Jajodia, “CARDS: A Distributed System for Detecting Coordinated Attacks,” in *Proceedings of IFIP TC11 Sixteenth Annual Working Conference on Information Security*, pages 171–180, August 2000.

Acceptance ratio: Unknown

118. Peng Ning, Jiwu Jing, Yingxia Dai, “A Key Exchange Protocol based on Distributed Certificate Authorities,” in *Proceedings of the Fifth Annual Conference of Information Security Professional Committee of Chinese Computer Federation*, pages 233–237, 1995.

Acceptance ratio: Unknown

Refereed Workshop Publications

119. Sangwon Hyun and Peng Ning, “Mitigating Wireless Jamming Attacks via Channel Migration,” To appear in *Proceedings of the 8th ICDCS Workshop on Wireless Ad Hoc and Sensor Networks (WWASN 2011)*, June 2011.

Acceptance ratio: Unknown

120. Jinpeng Wei, Xiaolan Zhang, Glenn Ammons, Vasanth Bala, and Peng Ning, “Managing Security of Virtual Machine Images in a Cloud Environment,” in *Proceedings of the 1st ACM Cloud Computing Security Workshop (CCSW '09)*, November 2009.

Acceptance ratio: Unknown

121. Donggang Liu, Peng Ning, Wenliang Du, “Group-Based Key Pre-Distribution in Wireless Sensor Networks,” in *Proceedings of 2005 ACM Workshop on Wireless Security (WiSe 2005)*, September 2005.

Acceptance ratio: 13.9%

122. Pai Peng, Peng Ning, Douglas S. Reeves, Xinyuan Wang, “Active Timing-Based Correlation of Perturbed Traffic Flows with Chaff Packets,” in *Proceedings of the International Workshop on Security in Distributed Computing Systems (SDCS-2005)*, pages 107–113, June 2005.

Acceptance ratio: 28.6%

123. Qinghua Zhang, Pan Wang, Douglas S. Reeves, Peng Ning, “Defending Sybil Attacks in Sensor Networks,” in *Proceedings of the International Workshop on Security in Distributed Computing Systems (SDCS-2005)*, pages 185–191, June 2005.

Acceptance ratio: 28.6%

124. Donggang Liu, Peng Ning, “Location-Based Pairwise Key Establishments for Static Sensor Networks,” in *2003 ACM Workshop on Security in Ad Hoc and Sensor Networks (SASN '03)*, pages 72–82, October 2003.

Acceptance ratio: 19.7%

125. Peng Ning, Kun Sun, “How to Misuse AODV: A Case Study of Insider Attacks against Mobile Ad-hoc Routing Protocols,” in *Proceedings of the 4th Annual IEEE Information Assurance Workshop*, pages 60–67, West Point, June 2003.

Acceptance ratio: Unknown; Best Paper Award

126. Yingjiu Li, Peng Ning, X. Sean Wang, Sushil Jajodia, “Generating Market Basket Data with Temporal Information,” in *ACM KDD Workshop on Temporal Data Mining*, August 2001.

Acceptance ratio: Unknown

127. Peng Ning, X. Sean Wang, Sushil Jajodia, “An Algebraic Representation of Calendars (Extended Abstract),” in *Proceedings of AAAI-2000 International Workshop on Spatial and Temporal Granularity*, pages 1–8, July 2000.

Acceptance ratio: Unknown

128. Peng Liu, Peng Ning, Sushil Jajodia, "Avoiding Loss of Fairness Owing to Process Crashes in Fair Data Exchange Protocols," in *Proceedings of 2000 International Conference on Dependable Systems and Networks (FTCS-30 and DCCA-8)*, pages 631–640, New York City, June 2000.

Acceptance ratio: Unknown

Others

129. An Liu, Young-Hyun Oh, Peng Ning, "Secure and DoS-Resistant Code Dissemination in Wireless Sensor Networks Using Seluge (Demo Abstract)," in *Proceedings of the 7th International Conference on Information Processing in Sensor Networks (IPSN 2008)*, April 2008.
Demo abstract
130. Pan Wang, Douglas S. Reeves, Peng Ning, "Secure Address Auto-Configuration for Mobile Ad Hoc Networks," in *The 2nd Annual International Conference on Mobile and Ubiquitous Systems: Networking and Services (MobiQuitous 2005)*, pages 519–521, July 2005.
Poster paper
131. Lloyd Williams, Sean McBride, Robert St. Amant, and Peng Ning. "Toward interface customization in intrusion detection systems," in *Workshop on Behavior-based Customization, International Conference on Intelligent User Interfaces (IUI)*. 2004.
Invited paper
132. Peng Ning, Yun Cui, Douglas S. Reeves, and Dingbang Xu, "Towards Automating Intrusion Alert Analysis," in *2003 Workshop on Statistical and Machine Learning Techniques in Computer Intrusion Detection*, September 2003.
Invited paper
133. Peng Ning, "Abstraction-Based Intrusion Detection in Distributed Environments," *PhD Dissertation*, George Mason University, July 2001.
134. Peng Ning, "Fast Implementation of A Cryptographic Library for Elliptic Curves over $GF(p)$ and $GF(2^m)$," *Master Thesis*, University of Science & Technology of China, July 1997.

Patent

1. Yiqun L. Yin, Peng Ning, "Efficient Finite Field Multiplication in Normal Basis," US Patent No. 6,389,442, May 2002.

Software Packages

1. Seluge: Secure and DoS-Resistant Code Dissemination for Wireless Sensor Networks
URL: <http://discovery.csc.ncsu.edu/software/Seluge/>
2. TinySeRSync: Secure and Resilient Time Synchronization for Wireless Sensor Networks
URL: <http://discovery.csc.ncsu.edu/software/TinySeRSync/>
3. TinyECC: Elliptic Curve Cryptography for Sensor Networks
URL: <http://discovery.csc.ncsu.edu/~pning/software/TinyECC/>
4. TIAA: Toolkit for Intrusion Alert Analysis

- URL: <http://discovery.csc.ncsu.edu/~pning/software/correlator/>
5. TinyKeyMan: Key Management for Sensor Networks
URL: <http://discovery.csc.ncsu.edu/~pning/software/TinyKeyMan/>
 6. Multi-Level μ TESLA: Broadcast Authentication for Distributed Sensor Networks
URL: <http://discovery.csc.ncsu.edu/~pning/software/ML-microTESLA/>
 7. Attacks against the AODV Protocol
URL: <http://discovery.csc.ncsu.edu/~pning/software/MisuseAODV/>

VII. GRANTS

Externally Sponsored Competitive Research Grants

1. **Title:** TC: Small: Defending against Insider Jammers in DSSS- and FH-Based Wireless Communication Systems
Source: NSF
Amount: \$499,064
Duration: 09-01-2010 to 08-31-2013
Principal Investigator: Peng Ning
Co-Principal Investigators: Huaiyu Dai
2. **Title:** A Virtual Computing Testbed for Research and Education in Information Security
Source: ARO
Amount: \$150,000
Duration: 07-01-2010 to 6-30-2011
Principal Investigators: Peng Ning
Co-Principal Investigators: Xuxian Jiang, Tao Xie
3. **Title:** TC: Large: Collaborative Research: Trustworthy Virtual Cloud Computing
Source: NSF
Amount: \$1,523,686
Duration: 09-15-2009 to 08-31-2013
Principal Investigator: Peng Ning
Co-Principal Investigators: Xuxian Jiang, Mladen Vouk
4. **Title:** Computer-aided Human Centric Cyber Situation Awareness
Source: ARO MURI (Subcontract from: PennState)
Amount: \$979,463
Duration: 06-1-2009 to 05-31-2014
Principal Investigator: Peng Ning
Co-Principal Investigator: R. Michael Young
5. **Title:** Secure Open Systems Initiative
Source: ARO
Amount: \$5,636,000
Duration: 04-03-2008 to 12-31-2012
Principal Investigator: Dennis Kekas
Co-Principal Investigators: Peng Ning, Mladen Vouk, Rudra Dutta
6. **Title:** CT-M: Collaborative Research: A Resilient Real-Time System for a Secure and Reconfigurable Power Grid
Source: NSF
Amount: \$50,000
Duration: 08-01-2008 to 07-31-2011

- Principal Investigator:** Peng Ning
7. **Title:** NeTS-NOSS: Secure, Robust and DoS-Resilient Code Dissemination in Wireless Sensor Networks
Source: NSF
Amount: \$269,902
Duration: 08-16-2007 to 08-15-2010
Principal Investigator: Peng Ning
 8. **Title:** Collaborative Research: CT-T: A Resilient Real-Time System for a Secure and Reconfigurable Power Grid (seed grant)
Source: NSF
Amount: \$28,500
Duration: 08-16-2007 to 8-15-2008
Principal Investigator: Peng Ning
 9. **Title:** Reliable Medium Access in Wireless Networks: Vulnerabilities, Protection, and Recovery
Source: ARO
Amount: \$223,071
Duration: 08-01-2007 to 7-31-2010
Principal Investigator: Wenye Wang
Co-Principal Investigator: Peng Ning
 10. **Title:** Cyber-TA: NCSU: Large-Scale Privacy-Preserving Collaborative Intrusion Analysis
Source: SRI International
Amount: \$80,107
Duration: 07-01-2006 to 6-30-2008
Principal Investigators: Peng Ning
 11. **Title:** SEED: Developing Instructional Laboratories for Computer Security Education
Source: Syracuse University
Amount: \$20,000
Duration: 08-21-2006 to 8-20-2011
Principal Investigators: Peng Ning
 12. **Title:** WiSeNeT: Wireless Sensor Network Testbed for Research and Education
Source: ARO
Amount: \$108,105
Duration: 05-01-2006 to 4-30-2008
Principal Investigators: Peng Ning
Co-Principal Investigator: Injong Rhee
 13. **Title:** CAREER: Towards Trustworthy and Resilient Sensor Networks
Source: NSF
Amount: \$400,000
Duration: 07-01-2005 to 06-30-2010
Principal Investigator: Peng Ning
 14. **Title:** Efficient and Resilient Key Management for Wireless Sensor Networks
Source: ARO (subcontract through Syracuse University)
Amount: \$173,215
Duration: 05-01-2005 to 04-30-2008
Principal Investigator: Peng Ning
 15. **Title:** Collaborative Research: Trustworthy and Resilient Location Discovery in Wireless Sensor Networks

- Source:** NSF
Amount: \$150,000
Duration: 10-01-2004 to 09-30-2007
Principal Investigator: Peng Ning
16. **Title:** Positioning and Reliable Data Transmission of Sensor Networks
Source: ARO
Amount: \$199,823
Duration: 08-01-2004 to 07-31-2007
Principal Investigator: Wesley Snyder
Co-Principal Investigator: Peng Ning
17. **Title:** Tracing Attacks Through Non-Cooperative Networks and Stepping Stones with Timing-Based Watermarking (Phases I & II)
Source: Advanced Research and Development Activity (ARDA)
Amount: \$1,179,321
Duration: 10-01-2003 to 11-30-2006
Principal Investigator: Douglas S. Reeves
Co-Principal Investigator: Peng Ning
18. **Title:** ITR: Integrating Intrusion Detection with Intelligent Visualization and Interaction Strategies
Source: NSF
Amount: \$415,099
Duration: 09-15-2002 to 08-31-2005
Principal Investigator: Peng Ning
Co-Principal Investigators: Christopher G. Healey and Robert A. St. Amant
19. **Title:** Reduce False Alerts, Uncover High-Level Attack Strategies and Predict Attacks in Progress Using Prerequisites of Intrusions
Source: NSF
Amount: \$330,000
Duration: 07-01-2002 to 06-30-2005
Principal Investigator: Peng Ning
Co-Principal Investigator: Douglas S. Reeves
20. **Title:** Correlating Alerts Using Prerequisites of Intrusions: Towards Reducing False Alerts & Uncovering High Level Attack Strategies
Source: Army Research Office (ARO)
Amount: \$258,812 (base + option 1 + option 2 + extension)
Duration: 07-01-2002 to 05-31-2005
Principal Investigator: Peng Ning
Co-Principal Investigator: Douglas S. Reeves

Total External Research Grants: : \$12,674,168

Internally Sponsored Competitive Research Grants

21. **Title:** Efficient Group Key Distribution for Mobile Ad-hoc Networks
Source: NCSU Center for Advanced Computing & Communication (CACC)
Amount: \$42,100
Duration: 07-01-2003 to 06-30-2004
Principal Investigator: Peng Ning

22. **Title:** A Toolkit for Analyzing Intrusion Alerts
Source: NCSU Center for Advanced Computing & Communication (CACC)
Amount: \$26,805
Duration: 07-01-2002 to 06-30-2003
Principal Investigator: Peng Ning

Total Internal Research Grants: \$68,905

Others

23. **Title:** IBM Open Collaborative Faculty Award
Source: IBM
Amount: \$300,000
Award Time: 2009, 2010, 2011, & 2012
Principal Investigator: Peng Ning
24. **Title:** ARO Workshop on Security of Embedded Systems and Networks
Source: Army Research Office
Amount: \$21,000
Award Time: 09-15-2006 to 09-14-2007
Principal Investigator: Peng Ning
Co-Principal Investigators: Frank Mueller
Note: Not competitive
25. **Title:** Cisco CIAG Equipment Grants
Source: Cisco
Amount: \$123,860
Award Time: Spring 2004
Principal Investigator: Peng Ning
Co-Principal Investigators: Annie Antón and Julie M. Starr
Note: Competitive equipment grant

Total Equipment Grant: \$440,860

Total grants: \$13,187,933

VIII. TEACHING

A. Courses Taught

1. Fall 2011, CSC/ECE 774 Advanced Network Security, 15 students
2. Spring 2011, CSC 474 Network Security, 28 students
3. Fall 2010, CSC/ECE 774 Advanced Network Security, 13 students
4. Fall 2009, CSC/ECE 574 Computer and Network Security, 61 students
5. Spring 2009, CSC 774 Advanced Network Security, 12 students
6. Fall 2008, CSC 474 Network Security, 36 students
7. Spring 2008, CSC 440 Database Management Systems, 32 students
8. Spring 2008, CSC/ECE 774 Advanced Network Security, 7 students
9. Spring 2007, CSC/ECE 774 Advanced Network Security, 10 students
10. Fall 2006, CSC 405 Introduction to Computer Security, 40 students

11. Fall 2005, CSC 774 Advanced Network Security, 16 students
12. Spring 2005, CSC 474 Information Systems Security, 13 students
13. Fall 2004, CSC 474/574 Information Systems Security, 60 students
14. Spring 2004, CSC 774 Network Security, 23 students
15. Fall 2003, CSC474/574 Information Systems Security, 57 students
16. Spring 2003, CSC 774 Network Security, 18 students
17. Fall 2002, CSC 574/495N Information Systems Security, 61 students
18. Spring 2002, CSC 742 Database Management Systems, 43 students
19. Fall 2001, CSC 575 Network Security, 52 students

B. Master's and Doctoral Theses Directed

Doctoral Thesis Directed

1. Ahmed Azab, "New System Security Mechanisms for Cloud Computing Infrastructure," December 2011
2. Sangwon Hyun, "Secure and Resilient Code Dissemination in Wireless Sensor Networks," October 2011
3. Attila Yavuz, "Efficient, Compromise Resilient and Compact Cryptographic Constructions for Digital Forensics," August 2011
4. An Liu, "Security Mechanisms for Protecting Foundational Services in Wireless Sensor Networks", August 2010
5. Chongkyung Kil, "Mechanisms for Protecting Software Integrity in Networked Systems", November 2008
6. Pan Wang, "Securing Communication in Dynamic Network Environments", February 2007. (Co-direct with Douglas Reeves)
7. Yan Zhai, "Integrating Security Evidence from Multiple Sources", December 2006
8. Pai Peng, "Active Timing Based Techniques for Attack Attribution through Stepping Stones", August 2006
9. Kun Sun, "Trustworthy and Resilient Time Synchronization in Wireless Sensor Networks", July 2006. (Co-direct with Cliff Wang)
10. Dingbang Xu, "Correlation Analysis of Intrusion Alerts", May 2006
11. Qinglin Jiang, "Improving the Robustness of Webs of Trust," January 2006 (Co-direct with Douglas Reeves)
12. Donggang Liu, "Security Mechanisms for Wireless Sensor Networks", July 2005

Master's Theses Directed

13. Arun Natarajan, "NSDMiner: Automated Discovery of Network Service Dependencies," August 2011
14. Varagur Karthik Sriram Iyer, "Misbehavior Resistant Fair Scheduling in Wireless Backhaul Mesh Networks," August 2008
15. Yuzheng Zhou, "Mitigating Voice Over IP Spam Using Computational Puzzles," August 2007
16. Panos Kampanakis, "Pairing-Based Cryptography on Sensor Platforms," August 2007
17. Ting Wang, "Mitigating Automatic Spamming against IP Phones," May 2007

18. Pratik Shah, "Feasibility of Secure and Resilient Location Discovery in Current Generation of Sensor Networks", January 2006
19. Jaideep Mahalati, "Facilitating Alert Correlation Using Resource Trees", August 2005
20. Srinath Anantharaju, "Resilient Aggregation in Wireless Sensor Networks", July 2005
21. Yiquan Hu, "TIAA: A Toolkit for Intrusion Alert Analysis", December 2003
22. Alfredo Serrano, "Integrating Alerts From Multiple Homogeneous Intrusion Detection Systems", May 2003
23. Yun Cui, "A Toolkit for Intrusion Alerts Correlation Based on Prerequisites and Consequences of Attacks", December 2002