

Networking and Security Research Center
<http://nsrc.cse.psu.edu/>

Professor Thomas F. La Porta, Director
Department of Computer Science and Engineering

Networking and Security Research Center



Ben Franklin Center of Excellence

- Designated in January, 2007

Networking, security and systems experts

- 12 faculty
- Approximately 60 students
 - Ph.D., M.S. and Schreyer Honors College Seniors
 - 9 Ph.D., several MS and BS
- 3 Labs in addition to individual research groups

Diverse Expertise

- Wireless networking and communications
- Software systems
- Distributed algorithms
- All aspects of security: networking, protocols, systems, access controls and policies

Industrial partners

- Accipiter Systems, Ben Franklin, Boeing, Raytheon, Telcordia Technologies

Additional industrial funding

- Accipiter, AT&T, Cisco, IBM, Intel, Motorola, Narus, Raytheon, Samsung, VOCOLLECT

Accomplishments



Research Results

- 22 major journal publications
 - IEEE Transactions on Mobile Computing, IEEE Transactions on Vehicular Networks, IEEE Transactions on Distributed and Parallel Systems, IEEE Transactions on Knowledge and Data Engineering, IEEE Transactions on Communications, IEEE Transactions on Wireless Communications, IEEE Journal on Selected Areas of Communications, ACM/Kluwer Journal of Wireless Networks, Journal of Computer Security
- Over 50 conference publications
 - ACM MobiHoc, IEEE INFOCOM, Annual Computer Security Applications Conference (ACSAC), IEEE FOCS, IEEE/ICST SecureComm, CRYPTO, Usenix Annual Technical Conference, IEEE ICNP, IEEE STOC, USENIX Security Symposium, ACM Conference on Computer and Communications Security (CCS)

Funding: approximately \$12M in new funding in 2005-2007 (~\$4.5M in 2007)

- NSF: CyberTrust (6), Networking (7), CAREER (2), Computer Systems, Infrastructure, Communications
- Army Research Lab and UK Ministry of Defence (ITA Program)
- DARPA (CBMANET & ITMANET Programs)
- National Intelligence Community
- Army Research Office (ARO)
- The Technology Collaborative (6)

Awards (Faculty and Students)

- Penn State Alumni Dissertation Award
- Graduate Research Assistant Award (2)
- Best Student Paper, 22nd Annual Computer Security Applications Conference
- Outstanding Teacher Award
- NSF CAREER Award (2)
- DAPRA Young Investigator Award
- ACM Certificate of Meritorious Service
- Distinguished Professor

Accomplishments



Faculty Appointments

- Board of Governors, IEEE Communications Society
- Director of Magazines, IEEE Communications Society
- Editor-in-Chief, ACM Transactions on Internet Technology
- Editor-in-Chief, IEEE Applications and Practice Magazine
- General Chair, IEEE/ICST Ubiquitous 2007
- General Chair, IEEE Mobile and Ad Hoc Sensor Systems (MASS) 2008
- Program Co-Chair, IEEE Infocom 2007
- Program Co-Chair, IEEE Symposium on Security and Privacy
- Program Chair, IEEE Percom 2007
- Program Co-chair, ICC 2008, Wireless Communications Symposium
- Program Co-Chair, WiOPT 2007
- Program Co-Chair, ACM SASN 2007
- Industry and Government Track Chair, ACM Conference on Computer and Communications Security (CCS)
- Editor, IEEE Transactions on Wireless Communications, IEEE Transactions on Mobile Computing, IEEE Journal of Vehicular Technology, ACM Transactions on Information and System Security, IEEE Transactions on Software Engineering, Journal of Privacy and Technology
- Steering Committee: IEEE Trans. on Mobile Computing, IEEE Trans. on Networking

Student Employment

- Airvana, Cisco, ETRI, Frostburg State University, Microsoft, Saint Vincent's College, Samsung, Sprint Labs

Student internships

- Cisco, Google, IBM, Microsoft, MIT Lincoln Labs, Samsung, Yahoo

Research Areas



Telecommunications Security (T. Jaeger, T. La Porta, P. McDaniel, S. Zhu)

- Characterization and defenses for attacks on all aspects of telecom networks

Systems Security (T. Jaeger, P. McDaniel, A. Smith, S. Zhu)

- Access controls and integrity management

Secure Information Flow (T. Jaeger, G. Kesidis, P. McDaniel, S. Zhu)

- Secure languages, processing flow, and networking

Sensor Networks (G. Cao, C. Das, G. Kesidis, T. La Porta, W. C. Lee)

- Node mobility, sensor-mission matching and link configuration

Wireless Networking (T. La Porta, J. Metzner, A. Yener)

- Wireless communications, cooperative systems, physical layer security

Mobile Systems and Networks (R. Acharya, G. Cao, T. La Porta, W-C. Lee)

- Mobile networks, mobile data access, vehicular networks

Faculty

Prof. Patrick McDaniel (mcdaniel@cse.psu.edu)

network security, security modeling, critical infrastructure, security-typed languages, formal security policy

Prof. Trent Jaeger (tjaeger@cse.psu.edu)

operating systems security, policy design and analysis, source code analysis

Prof. Adam Smith (asmith@cse.psu.edu)

cryptography, applied cryptography, information science, theoretical computer science

Prof. Sencun Zhu (szhu@cse.psu.edu)

ad hoc and sensor networks, buffer-overflow and worm, p2p security



Systems and Internet
Infrastructure Security

Funding:

National Science Foundation

Army Research Office/DOD

CISCO

Motorola (SERC)

Raytheon (NSRC)

IBM Research

AT&T

Samsung

Ongoing Projects:

Hardware systems security

Secure Storage Systems

Language Based Security

Secure Linux and Virtual Machines

Telecommunications Security

Self-healing Sensor Networks

Voting Systems

Students: 10+ PhD, many MS

Factoids: Established September 2004, Location - 344 IST Building -
contact siislab@cse.psu.edu, URL: <http://siis.cse.psu.edu>

MCN lab conducts research in many areas of wireless networks and mobile computing, with an emphasis on designing and evaluating mobile systems, protocols, and applications.

Projects

- secure sensor networks, collaborative data access in wireless P2P networks, mobile sensor networks, vehicular networks, resource management in wireless networks



Mobile Computing and
Networking Laboratory

Students: 9 PhD, 1 MS, and 2 honor BS students

- Alumni: 4 Ph.D.
 - Faculty members at Iowa State University and Florida International University, Frostburg State University
 - Motorola Research
 - 9 MS students went to various companies

Support: NSF (CAREER, ITR, NeTS/NOSS, CT, WN, CNS), Army Research Office, DoD/muri, PDG/TTC and companies such as Cisco, IBM and Narus

Contact: Prof. Guohong Cao, gcao@cse.psu.edu

URL: (<http://mcn.cse.psu.edu/>)

Wireless Communication and Networking Laboratory



Faculty: Prof. Aylin Yener, yener@ee.psu.edu

URL: <http://labs.ee.psu.edu/labs/wcan>

Fundamental research on wireless communication network design
Areas: Information Theoretic Security, Capacity of Ad hoc networks,
Cross Layer Design for Cognitive Networks

Support

- Five awards from the National Science Foundation (NSF)
- Two large programs from DARPA (ITMANET and CBMANET)

**Wireless Communications
& Networking Laboratory**
WCAN@PSU

Members 6 Ph.D. students, 2 visiting professors

Academic collaborators

- Penn State (NSRC), UMD, Lehigh, MIT, UT, UMN, UCI, USC, Drexel, Notre Dame, Northwestern

Industrial Partners

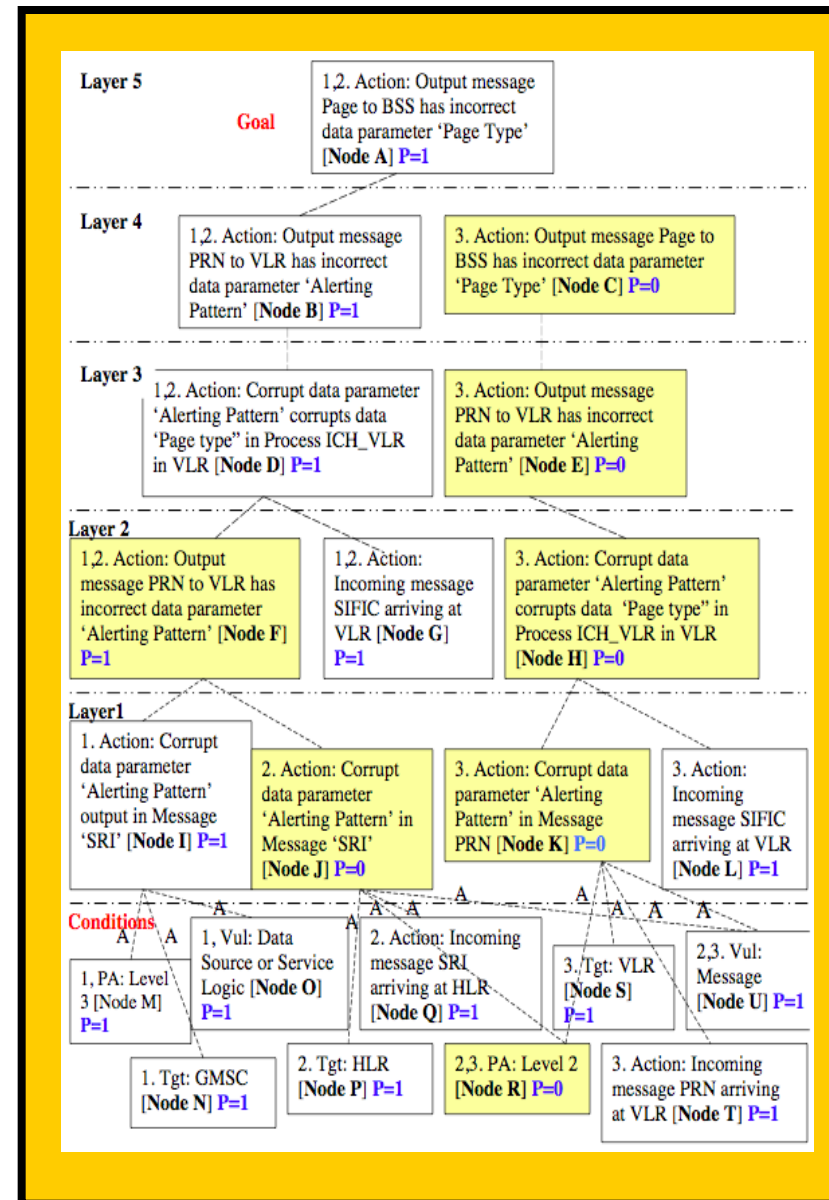
- Raytheon, Telcordia (via NSRC)

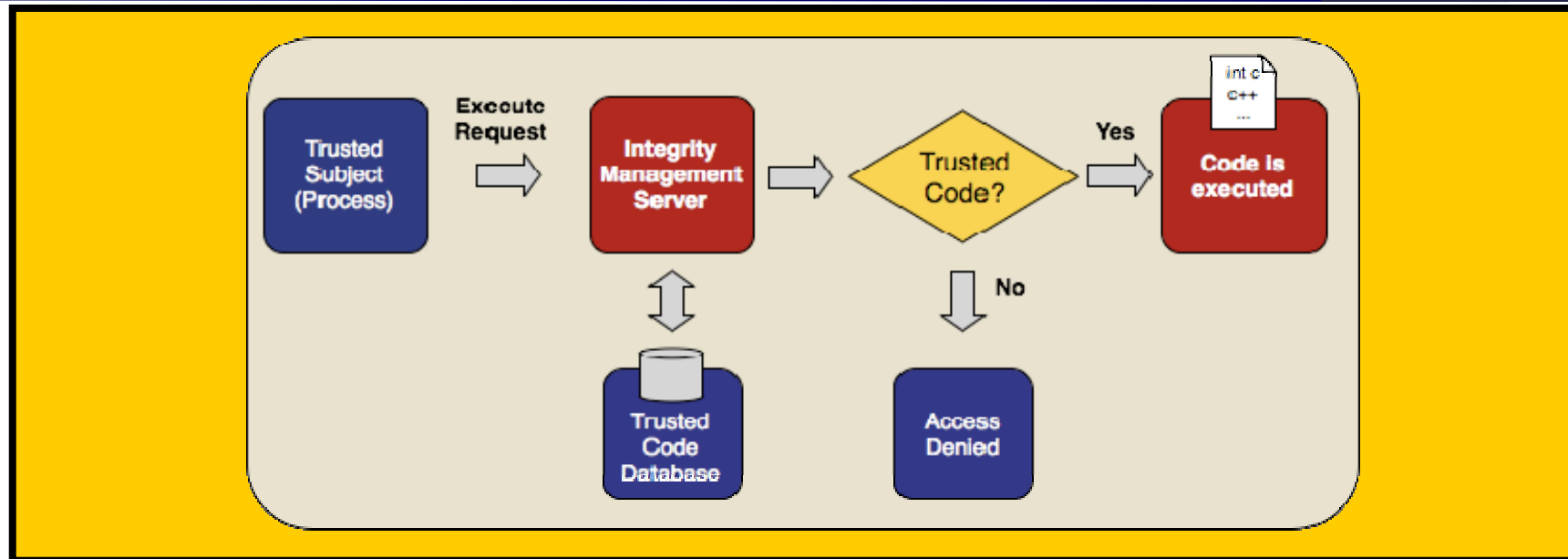
Research Areas: Telecom Security



Jaeger, La Porta, McDaniel, and Zhu

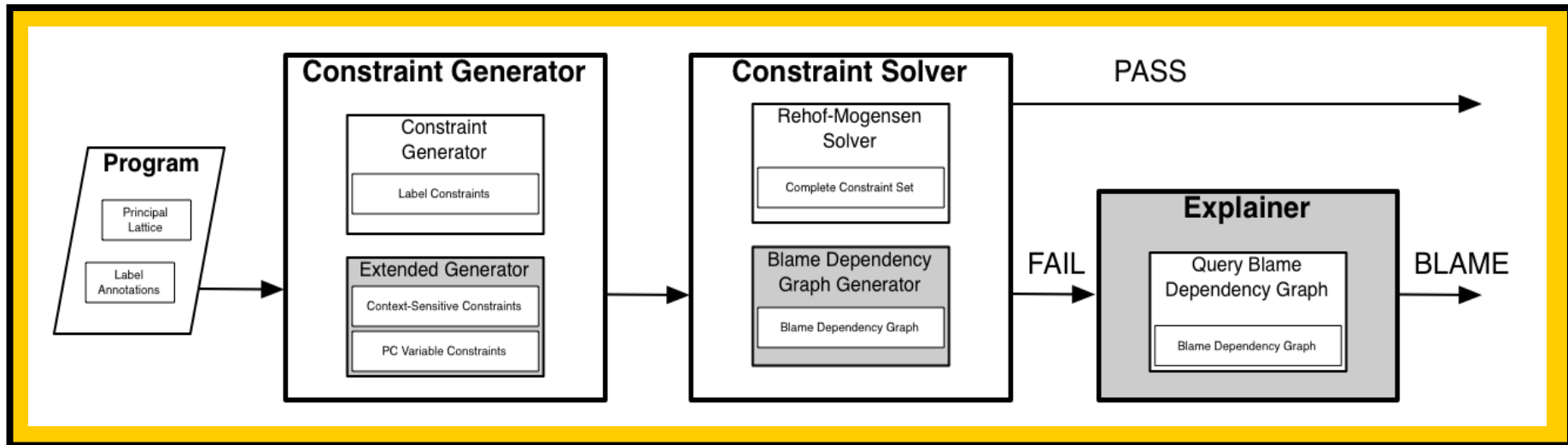
- Inherent architectural weaknesses (Raytheon)
 - Interconnection of telephony and mobile data networks
- Toolkit for evaluating security solutions for 3G networks (Raytheon, demo)
 - Map migration of data corruption across networks and estimate threat
- Integrity and vulnerabilities of mobile devices (Raytheon, Samsung)
 - Threats to core network launched by massive, distributed, targeted attacks (demo)





Jaeger, McDaniel, Smith and Zhu

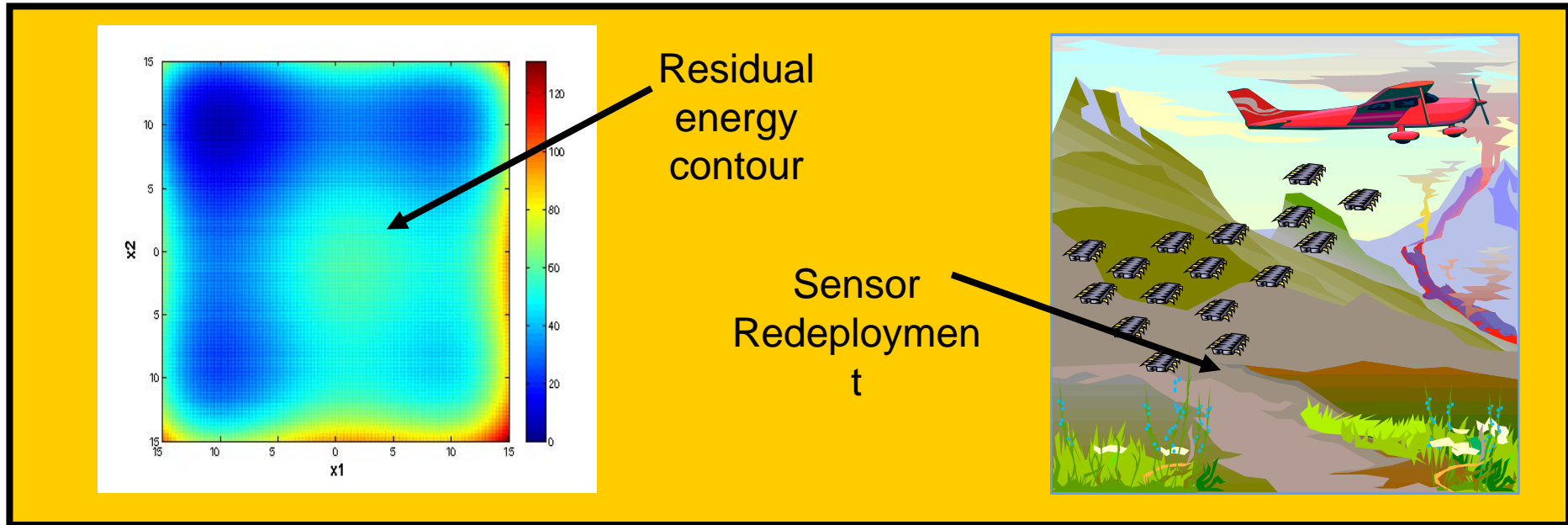
- Access controls
 - Coalition of virtual machines to form distributed reference monitor
 - Limiting application access
- System attestation (IBM)
 - Trace back to root of installation
- Secure storage
 - Autonomously secure disks
 - Memory spots



Jaeger, Kesidis, McDaniel and Zhu

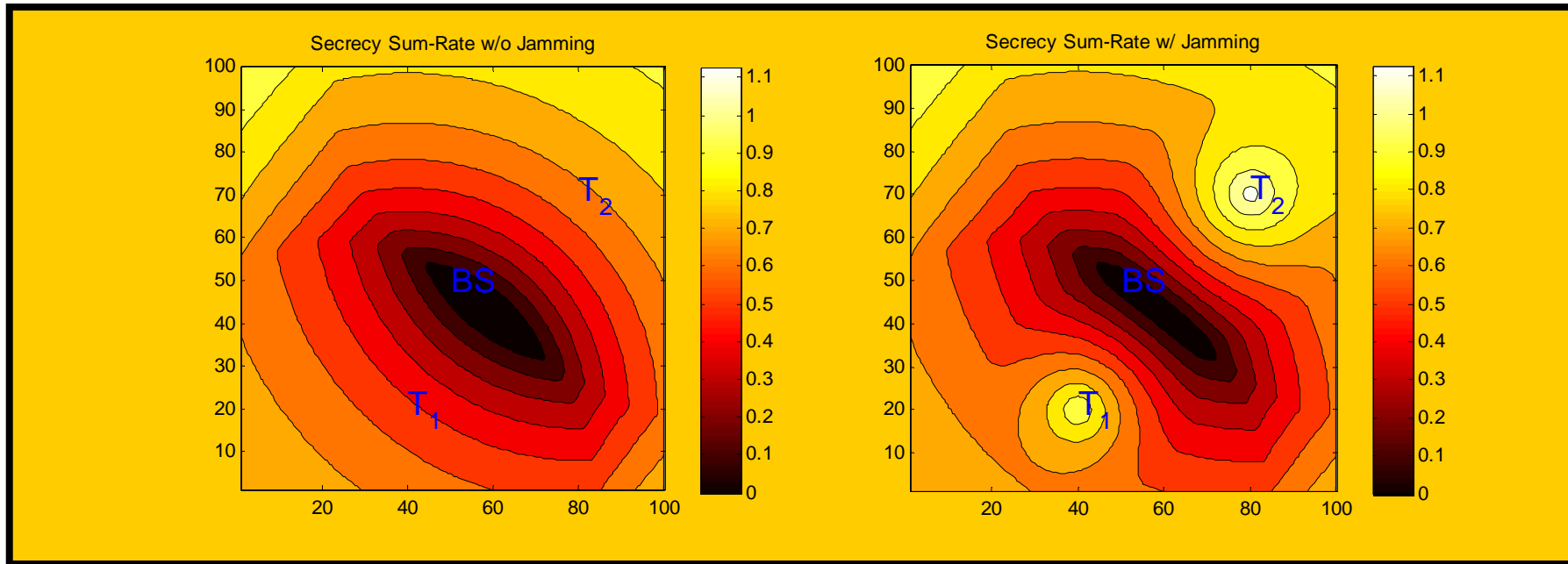
- Retrofitting Programs
 - Semi-automatic correction of programs to ensure no information leakage
- Policy Compliance
 - Ensure security across layers within a system, e.g., application, OS, ...
- Networking
 - Virtual machine-base network access control
 - Worm containment
 - VoIP Spam reduction (Cisco)
 - SYN attack protection (Cisco)

Research Areas: Sensor Networks



Cao, Das, Kesidis, La Porta, Lee and Zhu

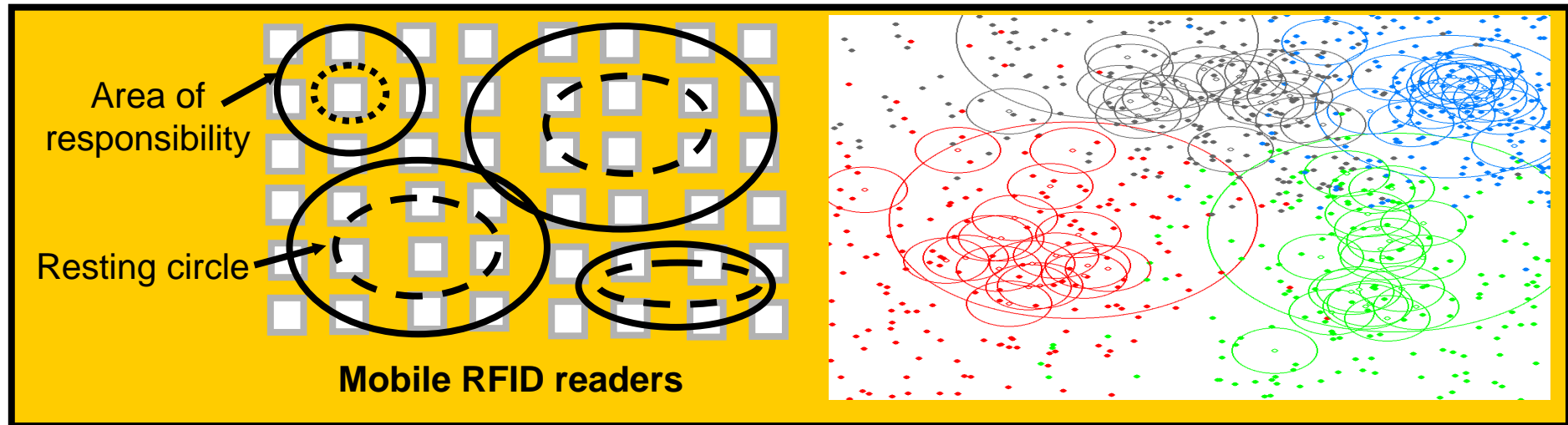
- Network Management
 - Monitoring for fault tolerance
 - Network (bandwidth and rate) allocation (IBM)
 - Assigning sensors to missions (IBM) - demo
- Data management
 - Cooperative data retrieval
- Security
 - Distributed software attestation



La Porta, Metzner and Yener

- Channelization in multi-hop wireless networks (BAE Systems)
 - Optimized to work with network coding
- Physical layer security
 - Optimizing rate and security through cooperative means
- Cognitive networks
 - Cooperative spectrum sensing

Research Areas: Mobility Management



Acharya, Cao, La Porta and Lee

- Group mobility
 - Multiple backhaul mobile access router (Bell Labs, demo)
- Efficient data transfer
 - Mobility prediction used for positioning relays
- Data collection
 - Mobile RFID readers applied to querying and inventorying environments (Accipiter, Vocollect) - demo
 - Data dissemination
 - Efficient data transfer in vehicular networks

Networking Research Center



Faculty	Department/College	Expertise
Raj Acharya	Computer Science and Engineering (CSE)/College of Engineering (COE)	QoS
Guohong Cao	CSE/COE	Mobility, Distributed Systems
Chita Das	CSE/COE	Network Performance
Trent Jaeger	CSE/COE	Secure operating systems
George Kesidis	CSE & Electrical Engineering/COE	Network Performance, Modeling, Pricing, Security
Thomas La Porta, Director	CSE/COE	Mobility, Networking Software, Telecommunications
Wang-Chien Lee	CSE/COE	Pervasive computing, Network Services, Data Management
Patrick McDaniel	CSE/COE	Network Security
John Metzner	CSE & EE/COE	Coding, Reliable Data Communication
Adam Smith	CSE/COE	Cryptography
Aylin Yener	EE/COE	Wireless Communications, Physical Layer Optimization, Cross-layer Design
Sencun Zhu	CSE/COE and IST	Network Security

Networking and Security Research Center



For Penn State

- Build relationships with Industry
- Define interesting and realistic research problems
- Diversify research collaborators
- Expose students to industrial research environments
- Increase impact of research

For companies

- Build relationship with Professors and students
- Develop new collaborations to solve interesting problems
- Partner on proposals
- Access to wide area of expertise

Members

- Ben Franklin
- Telcordia Technologies
- Raytheon
- Boeing
- Accipiter Systems

Industrial funding

- Raytheon, AT&T, Motorola, Intel, IBM, Telcordia, Samsung, Cisco, Vocollect

Remainder of the day...



Lunch – IST Atrium, Greeting by Eva Pell

- Posters and demonstrations (outside Cybertorium, 344)

Faculty Talks (Center Faculty, PSU Admin, and Industry guests first)

- Room 333, IST – 2:15-4:00

Center Discussion/Feedback

- Room 333 – Center Faculty, PSU Admin, and Industry guests only

Tom La Porta – Distinguished Professor, CSE



Education

- PhD, Columbia University, Electrical Engineering

Background

- Director of Mobile Networking Research at Bell Labs until 2002

Professional Activities

- Member, Board of Governors, IEEE Communications Society, 2007-
- Director of Magazines, IEEE Communications Society, 2006-present
- Editor-in-Chief, IEEE Applications and Practice Magazine
- Founding Editor-in-Chief, *IEEE Transactions on Mobile Computing*, 2001-2004
- Past Editor-in-Chief, *IEEE Personal Communications*
- General Chair, *IEEE MASS*, 2008
- Program Chair, *IEEE Percom*, 2007
- General Co-Chair, *Mobiquitous*, 2006
- General Co-Chair: *ACM Mobicom 2005*
- Member, Steering Committee, *IEEE Transactions on Mobile Computing*, *IEEE/ACM Transactions on Networking*

Awards

- Bell Labs Fellow
- IEEE Fellow
- Thomas Alva Edison Patent Award
- Bell Labs Distinguished Technical Staff Award
- IEEE Computer Society Golden Core Member
- IEEE Computer Society Meritorious Service Award

Expertise

- Mobile networking, wireless networking, secure telecommunication network signaling and control, protocol design

Support

- National Science Foundation
- Army Research Lab/UK MoD, ITA Program (IBM Prime)
- DARPA, CBMANET Program (BAE Systems, Prime)
- Technology Collaborative
- IBM, Raytheon, Accipiter Systems, Vocollect, Teclordia
- NSRC



- **Sensor Information Processing**
 - Mission specific network configuration and data collection
 - Routing in sensor networks
- **Secure all-IP Mobile Telecommunication Networks**
 - Combat (exploit) threats introduced by interfaces to IP networks
- **Channelization in ad hoc wireless networks**
 - New architecture to improve performance and capacity
- **Security for sensor and ad hoc networks**
 - Efficient key distribution in constrained environments, privacy and clone detection
- **Evolution of all-IP Mobile Networks**
 - Network architectures and protocols for 3G/Mobile Internet interworking
- **Node mobility for Robust Mission-Oriented Sensor Networks**
 - Deployment and relocation strategies for sensors



Education

- PhD, Ohio State University, Computer Science

Professional Activities

- Associate Editor, *IEEE Transactions on Mobile Computing*
- Associate Editor, *IEEE Transactions on Wireless Communications*
- Guest Editor, *ACM MONET special issues on Heterogeneous Wireless Networks, 2006*
- *General Chair, Int'l Conf. on Mobile and Ubiquitous Systems (MobiQuitous), 2007*
- Program Vice Chair: *IEEE Int'l Conf. on Mobile Ad-hoc and Sensor Systems (MASS), 2005*
- Program committee of *ACM MOBICOM, IEEE INFOCOM, ACM MOBIHOC, IEEE ICNP*

Awards

- Presidential Fellowship at the Ohio State University
- NSF CAREER, 2001

Expertise

- Mobile computing, wireless networks, sensor networks, wireless network security, distributed fault-tolerant computing, resource management and data dissemination in mobile environments

Support

- NSF (ITR, CAREER, NeTs/NOSS, WN, CT, CNS)
- Army Research Office
- PDG/TTC
- DoD/MURI

- **Collaborative Data Access in Mobile Peer-to-Peer Networks**
 - Improves performance in constrained environments through collaboration.
- **Controllable Node mobility for Mission-Oriented Sensor Networks**
 - Deployment and relocation strategies for sensors
- **Secure Wireless Sensor Networks**
 - Defend against node compromises; self-healing mechanisms for sensor networks
- **Data dissemination in vehicular ad hoc networks**
 - Reduce data access delay and exploit mobility pattern to assist data delivery.
- **A Data-Centric Framework for Target Tacking and Data Dissemination in Sensor Networks**
 - New architecture for wireless sensor networks
- **Designing Efficient Resource Management Schemes to Support Integrated Services in Mobile Computing Systems**
 - Consider both power issues and QoS issues
- **Efficient Power Aware Data Access in Pervasive Computing Environment**
 - Consider both single-hop and multi-hop models



Co-Director of the Systems and Internet Infrastructure Security Lab: <http://siis.cse.psu.edu>

Education

- PhD, University of Michigan, Electrical Engineering and Computer Science

Professional Activities

- **Program Co-Chair**, *2007 and 2008 IEEE Symposium on Security and Privacy*, May 2007, May 2008.
- **Program Chair**, *15th USENIX Security Symposium*, August 2005.
- **Vice-Chair**, *Security and Privacy Track, 14th World Wide Web Conference (WWW)*, May 2005.
- **General Chair**, *Financial Cryptography 2006*, February 2006
- **Program Chair**, *Industry Track, ACM Conference on Computer and Communications Security (CCS)*, November 2004, 2007.
- **Editor-in-Chief**, *ACM Transactions on Internet Technology (TOIT)*, April 2004-present.
- Associate editor, *ACM Transactions on Information and System Security (TISSEC)*, Summer 2007.
- Associate editor, *IEEE Transactions on Software Engineering (TSE)*, Spring 2007.
- Guest editor, *Journal of Computer Networks*, Special issue on Web Security, Summer 2005.
- Program Committee Member (2005): *ESORICS, ACSAC, ACNS, CCS, ICIS, ACM EC, SACMAT, SNS, ACNS, USENIX Security, USENIX Technical*, many more

Expertise

- Systems security, security policy, network security, digital rights management, digital content and public policy, network management, applied cryptography, privacy

Current Support

- PI, EVEREST: Evaluation and Validation of Election-Related Equipment, Standards, and Testing, The State of Ohio, \$332,066, (10/01/07-01/07/08).
- Co-PI, Protecting Services for Emerging Wireless Telecommunications Infrastructure, NSF, \$658,032, (09/01/07-08/31/11).
- Co-PI, Security for Internet/IMS Convergence, Cisco, \$100,000, (9/1/07-8/31/08).
- Co-PI, System-Wide Information Flow Enforcement, BAA 06-11-IFKA, "National Intelligence Community Enterprise Cyber Assurance Program", \$496,000, (2/1/07-8/1/08).
- PI, CAREER: Realizing Practical High Assurance through Security-Typed Information Flow Systems, NSF, \$400,000, (1/2/07-1/1/12).
- Co-PI, CT-IS: Shamon: Systems Approaches for Constructing Distributed Trust, NSF, \$400,000, (9/1/06-8/31/10).
- Co-PI, Exploiting Asymmetry in Performance and Security Requirements for I/O in High-end Computing, NSF, \$699,690, (9/1/06-8/31/10).
- PI, CT-T: Flexible, Decentralized Information-flow Control for Dynamic Environments, NSF, \$234,585, (8/1/05-7/31/08).



- **Shamon: Systems Approaches for Constructing Distributed Trust**
 - Extending mandatory access control from applications, to operating systems, to distributed environments
- **Realizing Practical High Assurance through Security-Typed Information Flow Systems**
 - Extending strong language type-safety to distributed environments
- **On Attack Causality in Internet-Connected Cellular Networks**
 - Understanding and fixing evolving threats in cellular phone systems
- **Analysis of Communities of Internet in Data Networks**
 - Understanding interrelationships between users, hosts, and service locality
- **Path Validation in Interdomain Routing**
 - Design and application of efficient constructions for secure path discovery and validation on the Internet
- **Exploiting Asymmetry in Performance and Security Requirements for I/O in High-end Computing**
 - Exploring performance/security tradeoffs in large-scale distributed storage



Co-Director of the Systems and Internet Infrastructure Security Lab: <http://siis.cse.psu.edu>

Education

- PhD, University of Michigan, Electrical Engineering and Computer Science

Professional Activities

- **Program Chair**, USENIX Workshop on Hot Topics in Security, August 2007.
- **Program Vice Chair**, IEEE International Conference on Sensor Networks, Ubiquitous Computing, and Trustworthy Computing, June 2008
- **Program Chair**, Industry Track, *ACM Conference on Computer and Communications Security (CCS)*, November 2003.
- **Program Chair**, *ACM Symposium on Access Control Models and Technologies*, 2001.
- **Steering Committee**, *ACM Symposium on Access Control Models and Technologies*, 2001-
- Associate Editor, [ACM Transactions on Internet Technologies \(TOIT\)](#), 2007-
- Guest editor, [ACM Transactions on Information Systems Security \(TISSEC\)](#), November 2002.
- Program Committee Member: [IEEE Security and Privacy](#), [ESORICS](#), [ACSAC](#), [NDSS](#), [CCS](#), [USENIX Security](#), [WWW \(security\)](#), [SACMAT](#), many more
- Active participant in the Linux security community, including the development of open source code (kernel and systems applications) and an organizer of the yearly Security-Enhanced Linux Symposium.

Expertise

- Host security, operating systems, source code analysis, security policy, secure hardware, distributed security architectures, embedded systems security

Current Support

- NSF (2 projects): Distributed systems security architecture and telecommunication system security
- IARPA/DTO: System-wide information flow enforcement
- Samsung Research (Korea)
- IBM Research
- Cisco Corp



- **Shamon: Systems Approaches for Constructing Distributed Trust**
 - Expand Mandatory Access Control guarantees in breadth (at Internet scale) and depth (across the application, system, and network layers)
- **System-Wide Information Flow Enforcement**
 - Leverage information flow guarantees of applications (e.g., via security-typed languages) to verify compliance with system security goals
- **Retrofitting Security in Legacy Code**
 - Develop source code analysis approaches and tools to (mostly) automate the addition of security code (e.g., authorization) to existing server applications
- **Hardware-based Integrity Measurement**
 - Apply TCG hardware to develop and convey practical proofs of system integrity
- **Linux Mandatory Access Control**
 - Develop mechanisms (e.g., Labeled IPsec) and tools (e.g., SELinux policy analysis) for the Linux Security Modules MAC framework
- **Virtual Machine Security**
 - Construct a Mandatory Access Control mechanism (sHype) for the Xen virtual machine system
- **Mobile Phone Systems Security**
 - Identify attacks and propagation methods for attack and develop MAC policies and integrity measurement techniques to verify integrity of key system components (installer and telephony)



Member, Systems and Internet Infrastructure Security (SIIS), Algorithms and Complexity groups

Education

- PhD, M.I.T., Electrical Engineering and Computer Science

Professional Activities

- **Associate Editor**, *Journal of Privacy and Confidentiality*
- **Program Committee Member**: *Crypto*, *WWW*, *ACM Electronic Commerce*, *Theory of Cryptography*, *RSA - Cryptographer's Track*, many more

Expertise

- Cryptography, privacy in statistical databases, quantum computing, information theory

Awards

- Microsoft Graduate Fellowship
- NSERC Graduate Fellowship
- Runner-up, *Privacy-Enabling Technology of the Year* (2006)

Current Support

- PI, CFF: Algorithmic and learning-theoretic aspects of data privacy, NSF, \$278,000



- **Rigorous Privacy Guarantees for Statistical Databases**
 - Tools for reasoning about information leaked when aggregate statistics are released about dataset (e.g. census, medical studies, network traffic information)
 - Understand and prevent attacks that combine information available from multiple “anonymized” datasets with widely available side information (marketing datasets, etc)
- **Machine Learning and Data Privacy**
 - What can we learn from a database while satisfying strong restrictions on privacy?
 - Robust algorithms for classification and density estimation
- **Efficient Multiparty Cryptographic Protocols**
 - Efficient distribution of computation and secret data among mutually untrusting network of participants
- **Key Extraction from Biometrics and Other “Noisy” Secrets**
 - Generation of reliable and secret keys/passwords from biometric data
- **Protocols Secure Against Quantum Attacks**
 - Understand and limit use of quantum information processing to break deniability and zero-knowledge in cryptographic protocols
- **Deniability in Message Authentication and Key Exchange**
 - Develop new, stronger attacks against deniability and protocols that resist them



Education

- Ph.D. in Information Technology from George Mason University (Aug. 2004)

Recent Professional activities

- Program Co-Chair: ACM SASN'06.
- TPC member: ACM CCS'07, IEEE Infocom'07, ICICS'07
- Treasure: ACM CCS'07, ACM CCS'08

Expertise

- Network and systems security, applied cryptography
- Ad hoc and sensor network security
- Peer-to-peer computing Security
- Code security: Worm, Buffer overflow

Current Support

- Army Research Office (ARO)
- NSF CyberTrust (including a CAREER Award)
- TTC

- **Security and Reliability for Sensor Networks**
 - Source location anonymity
 - Applications of sensor networks to vehicle-theft detection
 - Secure data aggregation
- **Security for Ad-hoc Networks/Delay-Tolerant Network (DTN)**
 - Traceback of compromised nodes in mobile ad hoc networks
 - Key management, authentication, DoS prevention in DTN
- **Security for Peer-to-Peer Networks**
 - Worm containment through active patching
 - Pollution detection
- **Code Security**
 - Blocking buffer overflow attacks by static code analysis and data mining
- **Security for Cellular Network**
 - Detecting and containing cell phone worms

George Kesidis – Professor, CSE and EE



Education

- 1992 Ph.D. in EECS from U.C. Berkeley

Background

- 1992-2000: prof. in E&CE Dept, University of Waterloo, Canada
- 1999: sabbatical with Nortel Networks, Ottawa
- 2001: part-time technical staff at Mahi Networks

Current Professional Activities

- IEEE INFOCOM 2007, Anchorage, TPC co-chair
- Workshop on Spatial Stochastic Models for Wireless Networks 2007, Cyprus, TPC co-chair
- ACM SIGCOMM Workshop on Large-Scale Attack Defense 2007, Kyoto, TPC co-chair

Expertise

- queuing, optimization, scheduling, performance evaluation and testing (simulation and emulation), traffic and network measurement and modeling, traffic engineering, incentive engineering

Past Support

- NSF ITR: Routing of Dynamic SLAs: Internet economics, pricing, billing, traffic control
- Cisco Ltd URP: Internet forensics, reputation systems
- DARPA/ONR MURI: Emerging Surveillance Plexsus (ESP): mobile sensor networking
- NSF ITR: Video surveillance networks
- DHS/NSF: Evaluation Methods for Internet Security Technology (EMIST, sister project of DETER)

Current Support

- NSF NOSS: Controlled node mobility in mission-oriented sensor networks
- NSF Cyber Trust: Protecting TCP congestion control
- NSF WN – incentive engineering for multihop wireless networks
- Cisco Ltd URP: VoIP antispam systems

Aylin Yener – Associate Professor, EE



Education

- PhD, Wireless Information Network Laboratory (WINLAB), Rutgers University

Background

- NSF CAREER Award, 2003
- Research group: [Wireless Communications and Networking Laboratory: WCAN@PennState](#)

Selected Professional Activities

- IEEE Information Theory Society Student Committee Chair (Sept. 2007-Present)
- IEEE Transactions on Wireless Communications, Editor (2001- Present)
- Co-chair, Wireless Comm. Symposium, IEEE Int. Conf. on Communications, ICC 2008.
- Co-chair, Asilomar Conference Communications Track (2005); Co-chair, WirelessCom Symposium on Information Theory (2005); TPC member in *IEEE Globecom*, *ICC*, *VTC*, *WCNC* (yearly)

Expertise

- Information theory, physical layer security, cross-layer design, relay networks, MIMO, CDMA.

Support

- NSF:
 - **CAREER (CCF) – Multiuser Multi-antenna Communications**
 - **CCF – Information Theoretic Security**
 - **CNS – NeTS Multi-tier Hybrid Wireless Networks**
 - **CNS – NeTS Cognition, Cooperation, Competition in Wireless Networks**
 - **CNS – CT Secure Capacity of Wireless Networks**
- DARPA: Information Theory for Mobile Ad Hoc Networks (**ITMANET**)
- DARPA: Control Based Mobile Ad Hoc Networks (**CBMANET**)

- **Capacity of Mobile Ad Hoc Networks (MANETs)**
 - Development of a new fundamental theory for information transfer for MANETs.
 - Performance optimization of channelized MANETs employing network coding.
- **Secure physical layer design for multiuser systems/wireless networks**
 - Transmit waveform, multi-access strategy, and power allocation for secure wireless communications.
 - Information theoretic limits. User strategies in response to various adversarial capabilities.
 - Cooperation for security.
- **Relay networks/Hybrid networks and cooperative communications**
 - Physical layer design for networks that relay information on behalf of other nodes, network formation, transmission strategies, impact of physical layer on MAC/routing.
 - Distributed resource allocation algorithms.
 - User cooperation strategies, multiuser relay networks.
- **Multiuser MIMO systems**
 - Design of transceivers to realize the potential capacity that multiple antenna systems offer in an environment where multiple simultaneous MIMO users transmit.
- **Cross-layer design for Ad Hoc wireless networks and wireless sensor networks**
 - Power control for multi-hop Ad Hoc networks, the impact of optimum physical layer design on MAC and network layers for Ad Hoc networks
 - Physical layer inspired techniques for lifetime maximization for sensor networks.



Education

- Ph.D., University of Louisiana

Background

- IIT Kharagpur (India)
- Joined Penn State in 1986

Awards

- IEEE Fellow
- Best Paper Awards (ICPP, ICDCS, PRDC)
- CSE Dept Teaching Award

Expertise

- communication networks & communication mechanisms; resource management (scheduling); QoS support in clusters and Internet; mobile computing; performance evaluation; parallel distributed computer architectures; clusters; fault-tolerant computing

Support

- NSF (scheduling, QoS, Infrastructure), Unisys (performance)

- **Dynamic Quarantine of Unresponsive TCP Flows**
 - Detect and isolate non-conforming TCP flows
- **Adaptive AQM Schemes for Internet and Wireless Networks**
 - Improve performance of Internet and limited wireless networks
- **QoS Provisioning in InfiniBand Architecture (IBA) for System Area Networks**
 - Design and analysis of IBA-style SANs
- **Scalable and Efficient Scheduling Techniques for Clusters**
 - Aims at developing practical scheduling techniques for large clusters
- **Performance Analysis with Commercial Workloads**
 - Analysis of TPC-C workloads
- **Design of Cluster-based Datacenters**
 - Design of 3-tier data centers on cluster platforms
- **Design and Analysis of System-on-Chip (SoC) Interconnects**
 - Design of on-chip interconnects considering area, power and reliability constraints



Education

- PhD, Ohio State University

Background

- 1996 - 2001, GTE/Version Research Laboratories, Inc.
- Research group at Penn State (2002-Present): Pervasive Data Access Research Group (<http://www.cse.psu.edu/pda>)

Awards

- Excellence Award: GTE/Verizon Laboratories Incorporated (1997, 1999, 2000).
- Achievement Award: GTE/Verizon Laboratories Incorporated (1999).

Professional Activities

- Guest Editor, IEEE Transaction on Computer, IEEE Personal Communication Magazine, ACM Mobile Networks and Applications (MONET), ACM Wireless Networks (WINET)
- Technical Program Chair: International Conference on Mobile Data Access (1999); International Workshop on Pervasive Computing (2000); International Workshop on Wireless Networks and Mobile Computing (2000/2001). International Workshop on Peer-to-Peer Information Management (2006); International Conference on Scalable Information Systems (2007);
- Industrial Program Chair: International Conference on Mobile Data Management (2001-2002).
- Steering Committee: International Conference on Mobile Data Management
- TPC Member (2006): ICNP, ICDE, ICDCS, SAC, DASFAA, INFOSCALE, PERCOM

Expertise

- Pervasive Computing, Wireless Networks, Network Services, Data Management, TMN

Current & Past Support

– NSF, ARDA, GENUITY, RGC (Hong Kong)

- **Location-Based Information Access in Pervasive Computing**

- Investigate new ways of indexing and caching spatial data in support of location based services in pervasive computing environments.

- **Semantic Small World: A Multi-Dimensional Overlay Network**

- Design of a multi-dimensional overlay network, called *semantic small world (SSW)*, that facilitates efficient semantic based search in P2P systems.
- SSW is adaptive to distribution of data and locality of interest; is very resilient to failures; and has great load balancing property.

- **Location-Aware Wireless Sensor Networks**

- Design of a suite of protocols, algorithms and services to provide energy-aware, time-efficient, robust and scalable location-aware wireless sensor networks.
- Tackled research issues include communication collisions, communication voids, packet losses, location errors, scalability, service latency and validity of services.

- **Automata-Based XML Access Control for Networked Computing**

- Design of a new XML access control mechanism, called QFILTER, for Internet-scale networked information systems.

- **Secure Wireless Data Broadcast**

- Development of new air indexing and key management techniques to address the security concerns in wireless data broadcast systems.

John Metzner - Professor, CSE and EE



Education

- Eng. Sc. D., New York University

Background

- Acting director of the Computer Engineering Program in Electrical Engineering (two years)
- Acting Dean, School of Engineering and Computer Science, Oakland University, Rochester 1974-1980
- Professor, Electrical Engineering, Wayne State University, Detroit, Michigan
- Associate Professor, Electrical Engineering New York University
- Associate Professor, Polytechnic Institute of New York
- Research Scientist, Electrical Engineering Department, New York University

Awards

- IEEE Fellow
- Fellowships: Link Aviation, National Science Foundation, David Sarnoff
- IEEE Computer Society Distinguished Speaker/Visitor

Expertise

- ARQ protocols for reliable and efficient data communication, methods for efficient comparison of remote replicated data files, efficient reliable and secure multicasting, improved utilization of ALOHA in multi-access, error correction techniques, efficient use of wireless network resources

Support

- Many previous grants from NSF

- **Vector and packet symbol decoding**
 - Discovered a new packet-symbol decoding method for reliable communication despite errors, deletions, out-of order packet receptions, no sequence numbers and no per-packet error detection. Working on extending idea to very long codes, convolutional codes.
 - Method discovered for enhanced and simpler burst error correction of vector symbol codes.
 - Applications to multi-reception code combining with vector symbol codes
- **Reliable multicasting**
 - Efficient methods of gathering acknowledgments with a tree topology and a virtual ring
 - Improved efficiency by cooperation of local network stations Ultra wideband or light traffic ALOHA
 - Increased value of hop-by-hop versus end-to-end error control in multicasting.
- **Multi-user networks**
 - Improved efficiency by cooperation of local network stations Ultra wideband or light traffic ALOHA
 - Reliable communication from a mobile to a network of cooperating base stations or to other stations in an Ad Hoc network for minimal interference and energy utilization.
 - Window controls and acknowledgment protocols for efficient multi-path wireless routing to a base station or multi-base network.
- **Secure Reliable Multicasting (SAM)**
 - Simple acknowledgment and key changing for combined secure and reliable multicast in moderate size groups

Raj Acharya – Head and Professor, CSE



Education

- PhD, University of Minnesota, Mayo Graduate School of Medicine

Background

- Research Scientist, Mayo Clinic
- Research Scientist, GE (Thomson)
- Faculty Fellow, Night Vision Laboratory, Fort Belvoir, Washington, D.C.
- NASA-ASEE Faculty Fellow, Johnson Space Center, Houston, TX
- Director, Advanced Laboratory for Information Systems and Analysis

Professional Activities

- General Chair, *SPIE International Conference on Physiology and Function from Multidimensional Images*
- Co-Chair, *IEEE Workshop on Biomedical Image Analysis*
- General Chair, *SPIE Conference on Biomedical Image Processing*
- Associate Editor, *International Journal of Computerized Medical Imaging and Graphics*

Expertise

- Net-centric computing, resource management for ad hoc networks, information fusion, bioinformatics, data mining

Support

- NSF ITR