



**Homeland
Security**

**Science & Technology Directorate, US DHS
National Cyber Security Division, US DHS
Office of the Secretary of Defense, US DOD
National Institute of Standards and Technology
US Department of Energy
Operations, Plans & Requirements (A3/5), HQ USAF
Logistics, Installations, & Mission Support (A4/7), HQ USAF**

**Workshop on
Future Directions in Cyber-physical Systems Security**

July 22-24, 2009

**Gateway Hilton Newark Penn Station
Gateway Center, Newark, NJ 07102**

Overview

Cyber-physical systems (CPS) are characterized by the tight coupling and coordination among sensing, communications, computational and physical resources and are exhibited in many application areas including industrial control systems (ICS). ICS encompass several types of control systems including: supervisory control and data acquisition (SCADA) systems and distributed control systems (DCS). CPS are prevalent in almost every critical infrastructure sector such as: electricity, water, gas, transportation, chemical, and healthcare. Interconnections of cyber-physical systems form complex systems with interdependencies within a given sector as well as across sectors. For example, the electric power grid of today forms one of the largest and most complex systems of power generation, transmission, and distribution systems at local, regional, and national level. It is envisioned that the complexity of the cyber-physical systems of the future will far exceed that of today's. Such a complexity poses several research challenges related to resiliency, vulnerability, threat, and recovery assessment. There is a need for models, theories, methods, and tools to address the security of cyber-physical systems taking into account the cyber and physical components of a system in an Integrated and unified way and realizing the discrete and continuous aspects of the system.

Workshop Goals and Objectives

The objective of the workshop is to provide a forum for

Program Committee

- **Nabil R. Adam, DHS-S&T (Program Chair) nabil.adam@dhs.gov**
- Michael Aimone, U.S. Air Force
- S. Massoud Amin, U of Minnesota
- Elisa Bertino, Purdue U
- Alvaro Cardenas, UC Berkeley
- Peter Chen, Louisiana State U
- Lydia Duckworth, The MITRE Corporation
- Ronda Dunfee, U.S. DOE
- George Gross, UIUC
- Mark Hadley, Pacific Northwest NL
- Steve Hawkins, Raytheon Intelligence and Information Systems
- Clas A. Jacobson, United Technologies
- Sushil Jajodia, GMU
- Antwane Johnson, Office of the Secretary of Defense
- Bruce Larson, American Water Works, Inc. and Water Sector Coordinating Council
- Insup Lee, U of Pennsylvania
- Chung-Sheng Li, IBM
- Marija D.Ilic, CMU
- Sean P. McGurk, National Cyber Security Division, DHS
- Frank Mueller, NCSU
- Raj Rajkumar, CMU
- Riley Repko, US Air Force
- William H. Sanders, UIUC
- Ronald M. Sega, Colorado State U
- Kang G. Shin, The Univ. of Michigan
- Lawrence Skelly, DHS-S&T (General Chair)
- James A. St. Pierre, NIST
- John A. Stankovic, U of Virginia
- Kevin Sullivan, Microsoft
- Bhavani Thuraisingham, U Texas at Dallas
- Bill Woodward, DHS/TSA
- Yelena Yesha, UMBC



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- i) representatives from various government agencies to briefly present their strategic vision of securing the cyber-physical systems as it relates to the nation's critical infrastructures;
- ii) researchers from academia, industry and national laboratories to assess the state of the art, identify related R&D challenges, and propose solutions to address these challenges;
- iii) subject matter experts, practitioners and state and local representatives to discuss their perspectives on the current state of the security of cyber-physical systems; where should the technology and science be in 5-10 years from now; why we are not there now - What are some of the challenges that are in the way of to be there now?; and why do we need to be there? That is, what legitimate case can be made to justify the needed R&D investments?

The results of the workshop will help DHS-S&T formulate near and long term investment decisions as well as research strategies, plans and objectives for cyber-physical systems security.

Classification

The workshop will be conducted as **Unclassified**.

Workshop Structure and Format

Format for the workshop:

- Keynote Speakers
- Presentations, Panels, posters – The presentations and panels will be discussing background useful for the breakout sessions
- Breakout sessions and reports

Submission Requirements

Presentations at the workshop will be by invitation. If interested, please submit 3-page position paper (excluding references).

Papers not selected for presentations at the workshop will be considered for a poster session.

Workshop discussions will focus on identifying detailed research challenges and promising avenues for satisfying the unique security needs in cyber-physical systems. Infrastructure sectors of special interest include Electricity, Chemical, Transportation, Drinking Water/Wastewater, and Healthcare.

A position paper should address one or more of the following questions. Authors should feel free to add more questions as they see fit.

- What makes CPS security different from traditional IT security?
- What is the current state-of-the-art in CPS security?
- What are some grand challenges for CPS security?
- Can different degrees of security be applied to CPS?
- Can security and hard real-time constraints co-exist?
- What physical properties of CPS influence security/cryptography and vice-versa?
- How does network infrastructure need to change in order to support security in large-scale distributed CPS?
- What new scientific foundations (e.g. temporal security, dynamics-based cryptography, location-based encryption/decryption) need to be explored for security in CPS?



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- Does the distributed nature of ICS and critical infrastructure help or hinder security? How can any hindrances be removed?
- What are good architectures and programming paradigms for secure CPS?
- What new operating systems, components and services are suited for securing CPS?
- What human factors challenges that are unique to CPS security?
- What are possible appropriate analytical frameworks for the assessment of CPS reliability, security, and risk?
- What are the viable approaches for addressing economics of security measures so as to justify related expenditures?
- How can we address the formulation of appropriate policy for security measures?

Poster Submission

Inviting one page submission for Posters. The deadline for submitting the poster description is July 6, 2009. Please email a pdf copy of the description to Basit Shafiq at basit@andromeda.rutgers.edu

For more information, please visit <http://cimic.rutgers.edu/>

Paper Submission

Submission site: <http://www.easychair.org/conferences/?conf=cpssw09>

Important Dates

- **July 6, 2009** – Deadline for submitting poster description.
- ~~June 1, 2009~~ **Extended** Deadline for Position paper submission: **June 8, 2009**
- **June 29, 2009**- Author notification
- **July 22-24, 2009**- Workshop

Travel and Lodging Support for Students

PhD students are encouraged to apply for Travel & Lodging support - the first 6 students will receive such a support. To apply for travel & lodging support, Please send a copy of your resume including a description of your research work to "Mr. Ron Bilbrey" at Ron.Bilbrey@associates.dhs.gov. Also copy Dr. Nabil Adam (Nabil.Adam@dhs.gov) in the email. For more information, please visit <http://cimic.rutgers.edu/>

Registration

Workshop attendance is open subject to space availability, with July 10 as the cut-off date. Workshop registration is free. For registration detail and for an up-to-date copy of this workshop write up, please visit:

<http://cimic.rutgers.edu/>

or

<https://www.enstg.com/signup/passthru.cfm?ConferenceCode=WOR89068>

Workshop Venue

This workshop is scheduled for July 22-24, 2009 at the Hilton Newark Penn Station, Newark, NJ

Hotel Accommodation

[Hilton Newark Penn Station](#)

Gateway Center - Raymond Blvd, Newark, New Jersey, United States 07102-5107



Tel: 1-973-622-5000 Fax: 1-973-824-2188. The hotel offers a block of rooms at the government rate of \$133.00 per night, with July 6 as the cut –off date.

Travel

1. Flying

i. Newark International Airport

Distance from hotel: 5 mi.

Drive time: 15 min.

Directions to Hilton Gateway:

Car - From airport, take route 9 to route 21. It will turn into McCarter Highway. Proceed down route 21 North for 2.5 miles. Make right hand turn onto Market Street. At next light turn left onto Raymond Plaza West. Hotel is on left.

Shuttle – Courtesy Bus HRLY-Call for PU 11PM-6AM

Taxi- Approx. 15.00 USD from airport

Train – Take AirTrain Newark to the Newark Liberty International Airport Station and purchase a ticket for a NJ TRANSIT to Newark Penn Station. Hilton Gateway is across the street from Newark Penn Station.

ii. John F. Kennedy International Airport

Distance from hotel: 24 mi.

Drive time: 1 hr.

Directions to Hilton Gateway:

Car - From airport, take the Van Wyck expressway to Belt Parkway to over the Verrazano-Narrows Bridge. Follow the signs for Goethals Bridge to the New Jersey turnpike north to Exit 15. Raymond Boulevard go west for 2.5 miles. Hotel on left.

Taxi- Approx. 60.00+ USD from airport

iii. La Guardia Airport

Distance from hotel: 22 mi.

Drive time: 40 min.

Directions to Hilton Gateway:

Car - Follow signs for BQE/278W. Take Exit 35 and follow signs for the Queens Midtown Tunnel. After tunnel, follow signs for Lincoln Tunnel. NJ Tpke South to Exit 15W (280W). Exit 15A (RT 21 S). Left onto Raymond Blvd., hotel on right.

2. Trains from Washington/Boston Area – Coming from Washington or Boston Area, take an Amtrak Train to Newark Penn Station. Hilton Gateway is across the street from Newark Penn Station.



Workshop on Future Directions in Cyber-physical Systems Security

AGENDA (DRAFT)
Wednesday July 22, 2009

12:00-1:00 pm	Registration (Outside Garden State Ball Room)
1:00-1:10 pm	Workshop Kickoff Dr. Nabil Adam , DHS-Science and Technology Directorate
1:10-1:25 pm	Welcome Address by Christopher Doyle , DHS-Science and Technology Directorate (Garden State Ball Room)
1:25-1:55 pm	Keynote Speech by Robert Menendez , US Senator (Invited)
1:55-2:25 pm	DHS Perspective Speaker- Philip Reiting , Deputy Undersecretary of National Protection & Programs Directorate, DHS
2:25-2:55 pm	NSF Perspective Speaker- Dr. Jeannette Wing , Asst. Director, National Science Foundation
2:55-3:10 pm	Break
3:10-3:40 pm	DOE Perspective Speaker- TBD
3:40-4:10 pm	NIST Perspective, Speaker- George Arnold , National Coordinator for Smart Grid Interoperability
4:10-5:40 pm	State/Local perspective, Speaker- Representatives from Nine states (Members of All Hazards Consortium)
6:00-7:30 pm	Reception (Essex Room)



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AGENDA (Draft)
Thursday July 23, 2009

7:00-7:45 am	Continental Breakfast (Bergen Room)		
7:45-7:55 am	Welcome Back Christopher Doyle , DHS-Science and Technology Directorate (Garden State Ball Room)		
7:55-8:15 am	DHS Perspective Speaker- Bradley Buswell , Under-Secretary of Science & Technology (Acting), DHS		
8:15-8:45m	Keynote Speech by Yvette Clark (Invited), chair, Subcommittee on Emerging Threats, Cyber Security and Science and Technology		
8:45-9:15 am	DOD Perspective Speaker- Robert F. Lentz , Deputy Assistant Secretary of Defense for Cyber, Identity, and Information Assurance, DOD		
9:15-10:45 am	Industry Panel Microsoft (Kevin Sullivan), IBM (Chung-Sheng Li) Raytheon (Steve Hawkins), United Technologies (Clas Jacobson), Cisco Systems (Dave Dalva), Siemens (TBD) Chair/Co-chair: Riley Repko, USAF/TBD		
10:45-11:00 am	Break		
11:00-12:30 pm	Position Paper Sessions (parallel sessions)		
	Session 1 Chair/Co-chair – TBD (Monmouth Room)	Session 2 Chair/Co-chair – TBD (Seth Boyden Room)	Session 3 Chair/Co-chair – TBD (Menlo Park Room)
12:30-1:30 pm	Lunch		
1:30-3:00 pm	Sectors Panel Electricity & Gas Chemical Transportation Healthcare Chair/Co-chair: Dr. William Sanders, UIUC		
3:00-4:15 pm	Breakout Sessions (Working Groups 1 – 3)		
	WG1 Chair/Co-chair – TBD (Monmouth Room)	WG2 Chair/Co-chair – TBD (Seth Boyden Room)	WG3 Chair/Co-chair – TBD (Menlo Park Room)
4:15-4:30 pm	Break		
4:30-5:30 pm	Breakout Reports		
	WG1 Report, Speakers: Chair/Co-chair – TBD WG2 Report, Speakers: Chair/Co-chair – TBD WG3 Report, Speakers: Chair/Co-chair – TBD (Garden State Ball Room)		
5:30-6:45 pm	Poster Session		



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**AGENDA (Agenda)
Friday July 24, 2009**

7:00-8:00 am	Continental Breakfast (Bergen Room)		
8:00-9:00 am	Venture Capitals Perspective Speaker - Ken Minihan, Paladin Capital Jack Biddle, Novak Biddle Elad Yoran, Security Growth Partners LLC (Garden State Ball Room)		
9:00-10:30 am	NSF Panel Chair/Co-chair: TBD		
10:30-10:45 am	Break		
	Breakout Sessions (Working Groups 1 – 3)		
10:45-12:00 pm	WG1 Chair/Co-chair – TBD (Monmouth Room)	WG2 Chair/Co-chair – TBD (Seth Boyden Room)	WG3 Chair/Co-chair – TBD (Menlo Park Room)
	Breakout Reports		
12:00-1:00 pm	WG1 Report, Speakers: Chair/Co-chair – TBD WG2 Report, Speakers: Chair/Co-chair – TBD WG3 Report, Speakers: Chair/Co-chair – TBD (Garden State Ball Room)		
1:00 pm	Adjourn		