



**Science & Technology Directorate  
U.S. Department of Homeland Security**

**Workshop on  
Future Directions in Critical Infrastructure Modeling & Simulation**

**October 28-30, 2008**

**Virginia Modeling, Analysis and Simulation Center (VMASC)  
1030 University Boulevard, Suffolk, VA**

**Overview**

Since 9/11, the United States has taken many important steps at federal, state and local levels to deal with potential risks to our Nation’s critical infrastructure caused by natural and man-made disasters. The United States Department of Homeland Security continues to observe and learn much about the impacts of catastrophic events on critical infrastructure from studying and analyzing natural and man-made events such as 9/11, Hurricanes Katrina and Rita, and numerous other natural disasters.

In keeping with the President’s 2007 proposed comprehensive ‘all hazards’ national security strategy and holistic approach to homeland security designed “to foster a Culture of Preparedness that permeates all levels of our society – from individual citizens, businesses, and non-profit organizations to Federal, State, local, and Tribal government officials and authorities,” the Department of Homeland Security will convene a special workshop on Critical Infrastructure and Key Resources (CI/KR) analysis and capabilities to document ‘best practices’ and ‘best uses’ of current and evolving modeling and simulation methodologies.

The Department of Homeland Security, Science and Technology Directorate (DHS-S&T) will host a workshop on understanding the consequences of catastrophic events on critical infrastructure using modeling and simulation tools and methods to represent, analyze and manage incidents entitled:

*“Future Directions in Critical Infrastructure Modeling and Simulation”*

**Program Committee**

- Dr. Nabil R. Adam, DHS-S&T (**Chair**)  
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- Dr. Luis Amaral, Northwestern U.
- Arlo Ames, Sandia NL
- Dr. Bilal M. Ayyub, UMD
- Dr. Vicki Bier, U. of Wisconsin-Madison
- Theresa J. Brown Sandia NL
- Dr. James E. Coolahan, JHU
- Dr. Steven Fernandez, Oak Ridge NL
- Gerry Frazier,  
DHS/NPPD/IP/IASD/NISAC
- Dr. Richard M. Fujimoto, GIT
- Zach Furness, MITRE Corp
- Dr. Yacov Y. Haimes, U. of Virginia
- R. Wayne Hardie, NISAC/Los Alamos NL
- Dan Horschel , Sandia NL
- Dr. Charles W. Hutchings, DHS-S&T
- Dr. Mary Ellen Hynes, DHS-S&T
- Dr. Jim Kadtko, National Defense  
U./GMU, CIP
- Dr. Frederick Krimgold, Virginia Tech
- William Laska, DHS-S&T
- Rene LeClaire, Los Alamos NL
- Jalal Mapar, DHS-S&T
- Dr. Ignacio Martinez-Moyano, Argonne  
NL
- Dr. Mike McGinnis, VMASC, ODU (Co-  
chair)
- Dr. Randy Michelsen, Los Alamos NL
- Dr. Pieter J. Mosterman, MathWorks,  
Inc.
- Dr. Michael D. Orosz, USC
- Curtis J. Papke, Idaho NL
- Dr. James P. Peerenboom, Argonne NL
- Dr. Walter M. Polansky, DOE
- Michael Samsa, Argonne NL
- Dr. William H. Sanders, U. of Illinois
- Larry Skelly, DHS-S&T
- Dr. James P. Smith, Los Alamos NL
- Dr. Laura J. Steinberg, SMU
- Dr. Samuel G. Varnado, NIHS
- Dr. Rae Zimmerman, NYU

## **Workshop Goals and Objectives**

The objective of the workshop is to provide a forum for researchers and practitioners dealing with critical infrastructure modeling & simulation (M&S) with a focus on multi-events, multi-threats and cascading effects, to assess the current state-of-the-art, identify challenges, and develop strategies for addressing these challenges. Specific infrastructure sectors considered are: Drinking Water/Wastewater; Commercial Facilities; Food & Agriculture; Transportation; Urban Mass Transit

The results of the workshop will help DHS-S&T formulate a near and long term investment decisions as well as research strategy, plans and objectives for modeling & simulation of the nation's critical infrastructure and key resources. The workshop will focus on a key subset of the critical infrastructure sectors.

## **Themes**

The scope of this workshop will be limited to the following four workshop themes

1. ***State-of-the-art simulations, models, tools and methods for representing and analyzing critical infrastructure***
  - Deterministic vs. stochastic models; system dynamics-based models; agent-based models; discrete-event models; hybrid models; Monte Carlo, etc.
  - What is the scale and fidelity of the model and can it be scaled and to what level and maintain fidelity?
  - What assumptions are included in the model?
  - In what type of environment is the model designed to run (e.g. SOA, High Performance Computing, Stand-alone)?
2. ***The appropriateness of M&S methods and applications to critical infrastructure representation***
  - Which type of model is best suited for which application and why?
3. ***Model verification and validation***
  - How best to deal with the lack of data?
  - Critical Infrastructure Data – Who has it? Where is it? How current is it? Who maintains it?
  - What attributes are relevant for critical infrastructure M&S needs?
4. ***Near-term and long-term research direction***
  - What are the gaps and needs that should guide research planning efforts over the next five years?

## **Participation**

Approximately 100 leaders and SMEs, researchers, and practitioners will be invited from the Department of Homeland Security (the National Infrastructure Simulation and Analysis Center, Interagency Modeling and Atmospheric Assessment Center, Federal Emergency Management Agency, Office of Infrastructure Protection, and the Science & Technology Directorate), other federal agencies and federal laboratories. Participation is sought from state and regional preparedness agencies, academia, industry and foreign governments and agencies. Given the significance and broad applicability of critical infrastructure modeling and simulation, there will be international interest in this workshop, Therefore, the workshop be conducted as **Unclassified**.



## **Registration**

The workshop is free, i.e., there is no registration fee.

For Registration (on or before September 30) and for an up-to-date copy of the workshop details, please visit:

<http://cimic.rutgers.edu>

## **Workshop Structure and Format**

The format of the workshop is:

- Keynote Speakers
- Presentations, Panels – The presentations and panels will be discussing background useful for the breakout sessions
- Breakout sessions and reports – There will be four breakout groups each assigned one of the four themes. Each working group meeting at a specific breakout session (morning or afternoon) will be assigned a chair and co-chair. The chair/co-chair of a breakout session will lead the discussion and identify a set of subtopics related to the working group theme. In order to ensure maximum interaction among workshop participants, the group members and the chair/co-chair will rotate from one breakout sessions to another.

Speakers will be asked to submit a short abstract. The output of the workshop will consist of: i) the set of abstracts, all presentations and a copy of the breakout reports; ii) a selected number of presenters will be invited to submit a full paper that would be due 2 months after the conference. The tentative plan is to have papers together with the breakout reports be reviewed and the final version to be included in a special issue of a journal or an edited book.

## **Workshop Venue**

This workshop is scheduled for 28-30 October 2008 at the Virginia Modeling, Analysis and Simulation Center (VMASC), 1030 University Boulevard, Suffolk, Virginia 23435.

The Virginia Hampton Roads region, home to the Nation's largest concentration of military commands including the largest naval base in the world, is also the second largest seaport on the east coast of the U.S. VMASC is a multi-disciplinary modeling, simulation and visualization research center of Old Dominion University. VMASC supports the University's M&S Masters and Ph.D. degree programs and works in collaboration with more than one hundred industry, government and academic members on M&S research and develop cross a wide range of application domains including defense, homeland security, emergency management, social science, medical, transportation, education and game based learning and enterprise decision-making.

## **Hotel Accommodation**

Courtyard and TownePlace Suites Suffolk  
8060 Harbour View Blvd;  
Suffolk, VA 23435  
757-483-1144; Melissa Robles



## Future Directions in Critical Infrastructure Modeling & Simulation

### AGENDA

**Tuesday, October 28, 2008**

<b>Time</b>	<b>Event/Activity</b>	<b>Speaker</b>
12:30 – 1:00pm	<b>Registration</b>	
1:00 – 1:10 pm	Welcome and Administrative Remarks	Dr. Michael McGinnis, VMASC
1:10 – 1:20pm	Welcome to ODU	Dr. John Broderick, President
1:20 – 1:30 pm	Workshop Kickoff Address	Dr. Nabil R. Adam, IGD, DHS-S&T
1:30 – 1:45 pm	Modeling and Simulation for the Nation's Critical Infrastructure Protection	Christopher Doyle, Director, Infrastructure Geophysical Division, DHS
1:45 – 2:00 pm	National Infrastructure Simulation and Analysis Center (NISAC)	Merrick E. Krause, Director, Analysis & Strategy Division Office of Infrastructure Protection, DHS
2:00 – 2:40 pm	Gaps and Needs – OIP Perspective	Gerry Frazier, DHS / NPPD / IP / IASD / NISAC
2:40 – 3:00 pm	<b>Break</b>	
3:00 – 3:40 pm	FEMA – Emergency Management, the National Response Framework and M&S Needs	Dr. Keith Holtermann, FEMA
3:40 – 4:10 pm	Critical Infrastructure Owners' Perspective – Drinking Water/Wastewater; Commercial Facilities; Food & Agriculture; Transportation; Urban Mass Transit	Richard J. Weisman, P.E. Water Security Division
4:10 – 4:35	New Jersey's perspective of the needs for modeling and simulation for the protection of the New Jersey's critical infrastructure	Cherri Black, Chief Critical Infrastructure Protection Bureau Office of Homeland Security & Preparedness The State of New Jersey
4:35 – 5:00 pm	Homeland Infrastructure Foundation Level Dataset (HIFLD) Working Group and the Homeland Security Infrastructure Protection (HSIP) Gold data set	Justin Sherin The HIFLD Working Group
5:00 – 5:20	Public domain data sources (the national map)	Wendy A. Budd, USGS
5:20 – 5:45 pm	The Interagency Modeling and Atmospheric Assessment Center: A Process	Albert H. Mongeon, NWS Homeland Security Activities
6:00 – 7:00 pm	<b>Reception</b>	



**Wednesday, October 29, 2008**

<b>Time</b>	<b>Event/Activity</b>	<b>Speaker/Session Chair/Co-Chair</b>
7:00 – 8:00 am	Continental Breakfast	
8:00 – 8:15 am	DHS Welcome Back, Charge to Attendees	
8:15 – 10:00 am	Breakout Sessions Working Groups 1 – 4 WG1 - Survey of current models & applications WG2 - Model best suited for which application WG3 - Model validation and verification WG4 - Gaps & needs to guide future research plans	WG1.1 - Curtis J. Papke, Idaho NL Dr. James E. Coolahan, JHU  WG2.1 - Dr. Jim Kadtke, National Defense U./GMU, CIP Dr. Voicu Popescu, Purdue U.  WG3.1 - Michael Samsa, Argonne NL Dr. Luis Amaral, Northwestern U.  WG4.1 - Dr. Laura J. Steinberg, Syracuse U David L. Sallach, , Argonne NL
10:00 – 10:15 am	<b>Break</b>	
10:15 – 10:35am	<b>Breakout Reports</b> WG1 - Survey of current models & apps	WG1.1 - Curtis J. Papke, Idaho NL Dr. James E. Coolahan, JHU
10:35 – 10:55am	WG2 - Model best suited for which application	WG2.1 - Dr. Jim Kadtke, National Defense U./GMU, CIP Dr. Voicu Popescu , Purdue U
10:55 – 11:15am	WG3 - Model validation and verification	WG3.1 - Michael Samsa, Argonne NL Dr. Luis Amaral, Northwestern U.
11:15 – 11:35am	WG4 - Gaps & needs to guide future research plans	WG4.1 - Dr. Laura J. Steinberg, Syracuse U David L. Sallach, , Argonne NL
11:35 – 12:30 pm	<b>Lunch</b>	
12:30 – 1:15 pm	Panel Session 1 - Survey of current models& applications	Paul Trushell, Director, Critical Infrastructure Protection Branch, Security and CI Division, Australia; Dr. Charles Hutchings, DHS-S&T
1:15 – 2:00 pm	Panel Session 2 - Model best suited for which application	Dr. Jim Kadtke, National Defense U./GMU, CIP; Arlo Ames, Sandia NL; Dr. Yacov Haimas, U. Virginia ; Dr. Kevin McCabe, GMU
2:00 – 2:45 pm	Panel Session 3 - Customizing M&S VV&A - Tailoring existing VV&A processes and finding and utilizing authoritative data	Dr. John Hummel, Argonne NL; Dr. Donna Blake, AER, Inc. Mr. Steve Lowe, AER, Inc.
2:45 – 3:30 pm	Panel Session 4 - Gaps & needs to guide future research plans	Michael Samsa, Argonne NL; Dr. Theresa J. Brown, Sandia NL ; David L. Sallach, Argonne NL; Dr. Mike Dunaway, DHS S&T
3:30 – 3:45 pm	<b>Break</b>	
3:45 – 5:30 pm	Breakout Sessions WG1 - Survey of current models & applications WG2 - Model best suited for which application WG3 - Model validation and verification WG4 - Gaps & needs to guide future research plans	WG1.2 - Dr. Seth Guikema, JHU Dr. Theresa J. Brown, Sandia NL  WG2.2 - Dr. Pieter J. Mosterman, The MathWorks, Inc. Arlo Ames, Sandia NL  WG3.2 - Dr. Steven Fernandez, Oak Ridge NL Dr. Rae Zimmerman, NYU  WG4.2 - Dr. Frederick Krimgold, Virginia Tech Dr. Ignacio Martinez-Moyano, Argonne NL
6:30 –	<b>Dinner</b>	



**Homeland  
Security**

8:00 pm

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**Thursday, October 30, 2008**

<b>Time</b>	<b>Event/Activity</b>	<b>Speaker/Session Chairs</b>
7:00 – 8:00 am	Continental Breakfast	
8:00-8:20am	<b>Breakout Reports</b> WG1 - Survey of current models & applications	WG1.2 - Dr. Seth Guikema, JHU Dr. Theresa J. Brown, Sandia NL
8:20-8:40am	WG2 - Model best suited for which application	WG2.2 - Dr. Pieter J. Mosterman, The MathWorks, Inc. Arlo Ames, Sandia NL
8:40-9:00am	WG3 - Model validation and verification	WG3.2 - Dr. Steven Fernandez, Oak Ridge NL Dr. Rae Zimmerman, NYU
9:00-9:20am	WG4 - Gaps & needs to guide future research plans	WG4.2 - Dr. Frederick Krimgold, Virginia Tech Dr. Ignacio Martinez-Moyano, Argonne NL
9:20 – 9:35 am	<b>Break</b>	
9:35 – 11:20 am	Breakout Sessions WG1 - Survey of current models & applications WG2 - Model best suited for which application WG3 - Model validation and verification WG4 - Gaps & needs to guide future research plans	WG1.3 - Dr. Vicki Bier, U. of Wisconsin Dr. Heidi Ammerlahn, Sandia NL  WG2.3 - Dr. Yacov Y. Haimes, U. of Virginia Zach Furness, MITRE Corp  WG3.3 – Dr. Michael Orosz, CREATE Dr. Charles Hutchings, DHS-S&T  WG4.3 - Dr. Richard M. Fujimoto, GIT Dr. Randy Michelsen, Los Alamos NL
11:20 – 12:00 pm	<b>Lunch</b>	
12:00 – 12:20 pm	<b>Breakout Reports</b> WG1 - Survey of current models & applications	WG1.3 - Dr. Vicki Bier, U. of Wisconsin Dr. Heidi Ammerlahn, Sandia NL
12:20 – 12:40 pm	WG2 - Model best suited for which application	WG2.3 - Dr. Yacov Y. Haimes, U. of Virginia Zach Furness, MITRE Corp
12:40 – 1:00 pm	WG3 - Model validation and verification	WG3.3 – Dr. Michael Orosz, CREATE Dr. Charles Hutchings, DHS-S&T
1:00 – 1:20 pm	WG4 - Gaps & needs to guide future research plans	WG4.3 - Dr. Richard M. Fujimoto, GIT Dr. Randy Michelsen, Los Alamos NL
1:20–1:40 pm	<b>Closing Remarks</b>	