



Homeland
Security

Modeling and Simulation (M&S) for Homeland Security

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Outline

- How is DHS advancing M&S for homeland security?
- How is “model” and “simulation” defined?
- What do we know about the role of M&S in DHS?
- What M&S issues does DHS still need to consider?
- How could guidelines help?
- How can the NDIA M&S Committee help?



Advancing M&S

Provide M&S expertise and support

- S&T Directorate
 - Test & Standards, CIO, and other Divisions
 - 2nd Annual DHS University Network Summit
 - Proposal Evaluation Panel for International Programs
 - S&T Stakeholder Conference East (M&S tutorial)
 - DHS T&E Council – 11 June brief
- Build DHS “community of interest” (e.g., Technical Interchange Meetings)
- Liaise with experts in other Federal departments and organizations
- Provide focal point for private sector/industry involvement

Support DHS with M&S Training and Guidance

- Develop DHS M&S Tutorial
- Recommend guidelines for analysis, acquisition, T&E, and training based on:
 - Reference material
 - Studies
 - Standards, policies, processes, and “best practice” developed in Federal departments, agencies, and entities

Develop M&S Vision and Strategic Plan

- Assess current approaches
- Evaluate capabilities and limitations for strategic focus areas
- Describe gaps and challenges



Draft M&S Course for PMs

What is a “Model”, “Simulation”, etc.?

How is M&S used for homeland security?

- National Infrastructure Simulation and Analysis Center (NISAC)
- National Atmospheric Release Advisory Center (NARAC)/Inter-Agency Modeling and Atmospheric Analysis Center (IMAAC)
- Emerging Capabilities in DHS S&T Directorate

Who in DHS should consider using M&S?

When and where in DHS is M&S useful?

What are some considerations in acquiring M&S capabilities?

- Economics
- Development
- Data
- Evaluation

Why are M&S guidelines, standards, and “best practice” important for DHS?

How do other Federal agencies/organizations approach M&S?



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- How could guidelines help?
- Where does Deputy Director, M&S fit into DHS, and what has been done so far?
- How can the NDIA M&S Committee help?



Definitions

Model

- (1) An **approximation, representation, or idealization of selected aspects** of the structure, behavior, operation, or other characteristics of a real-world process, concept, or system. Note: Models may have other models as components.
- (2) To serve as a model as (1).
- (3) To develop or use as a model as in (1).

Simulation

- (1) A model that **behaves or operates like a given system** when provided a set of controlled in-puts.
(Synonymous with: Simulation model)
- (2) The process of developing or using a model as in (1).

Source: IEEE Standard Glossary of Modeling and Simulation Terminology (IEEE STD 610.3 - 1989)

Lists 33 different types of models (e.g., computational, descriptive, discrete, iconic, mathematical) and 20 different types of simulations (e.g., continuous, discrete, event-oriented, Monte Carlo, process-oriented).



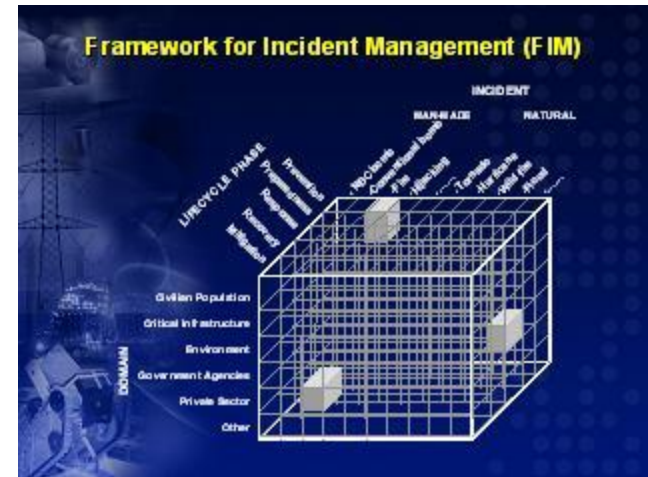
M&S in Perspective

Decision Analysis

Skilled analysts match the right M&S and data to answer the question at hand

Data

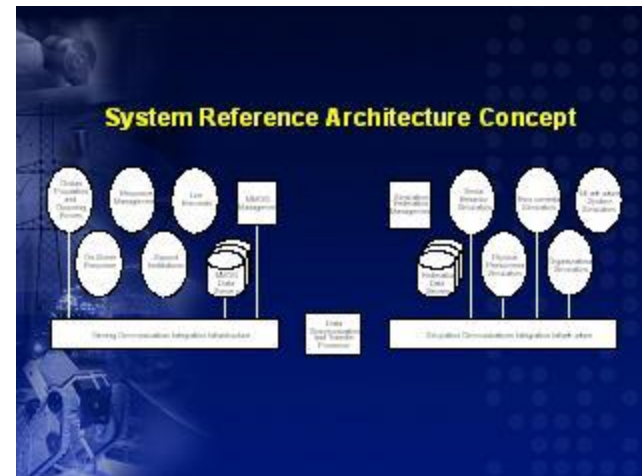
M&S



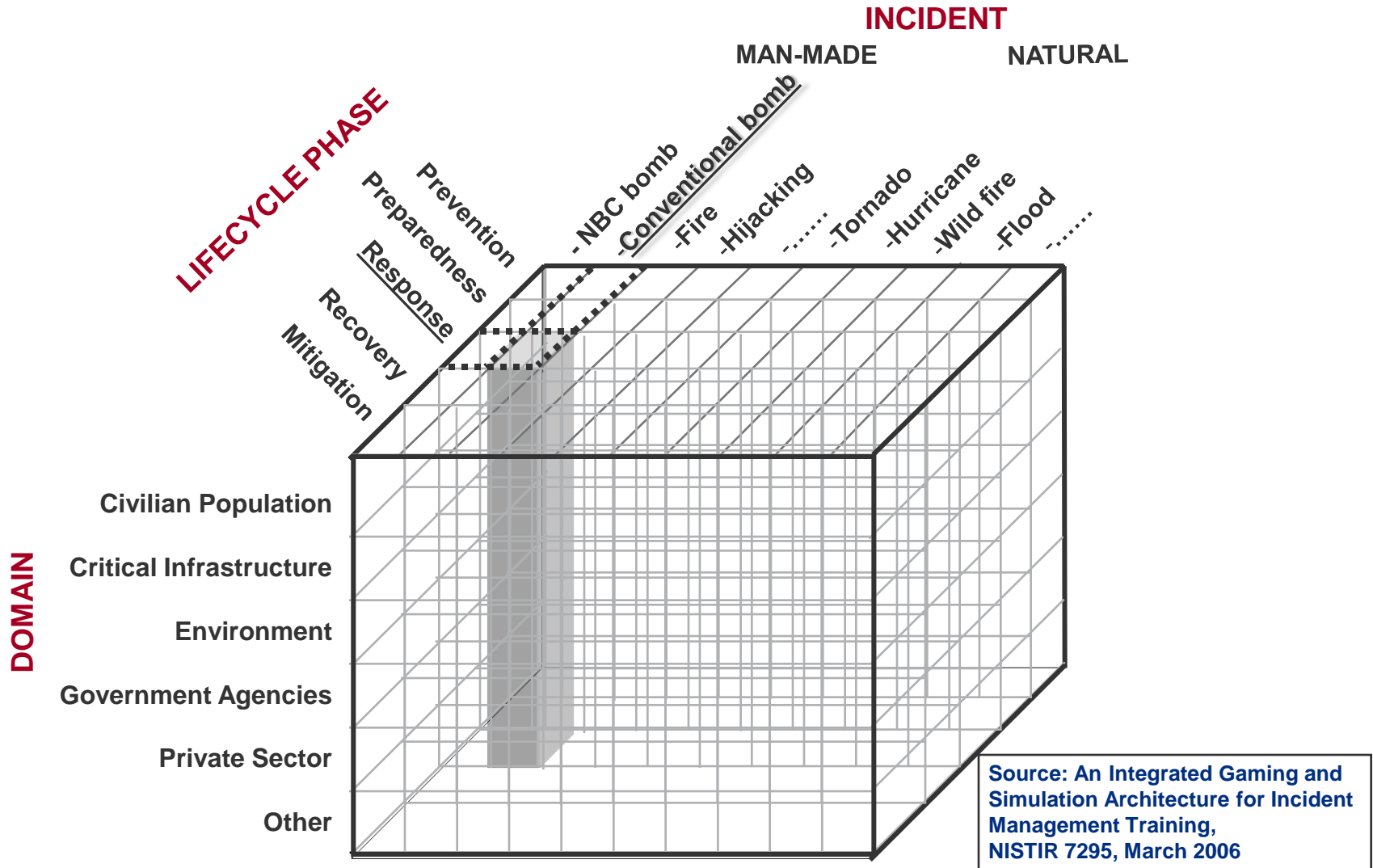
Framework – Examples of Incident Data



System Reference Architecture Concept



Framework For Incident Management (FIM)



Homeland Security

**Cells Represent Potential M&S Applications:
Many potential uses for Incident Management!**

System Reference Architecture Concept

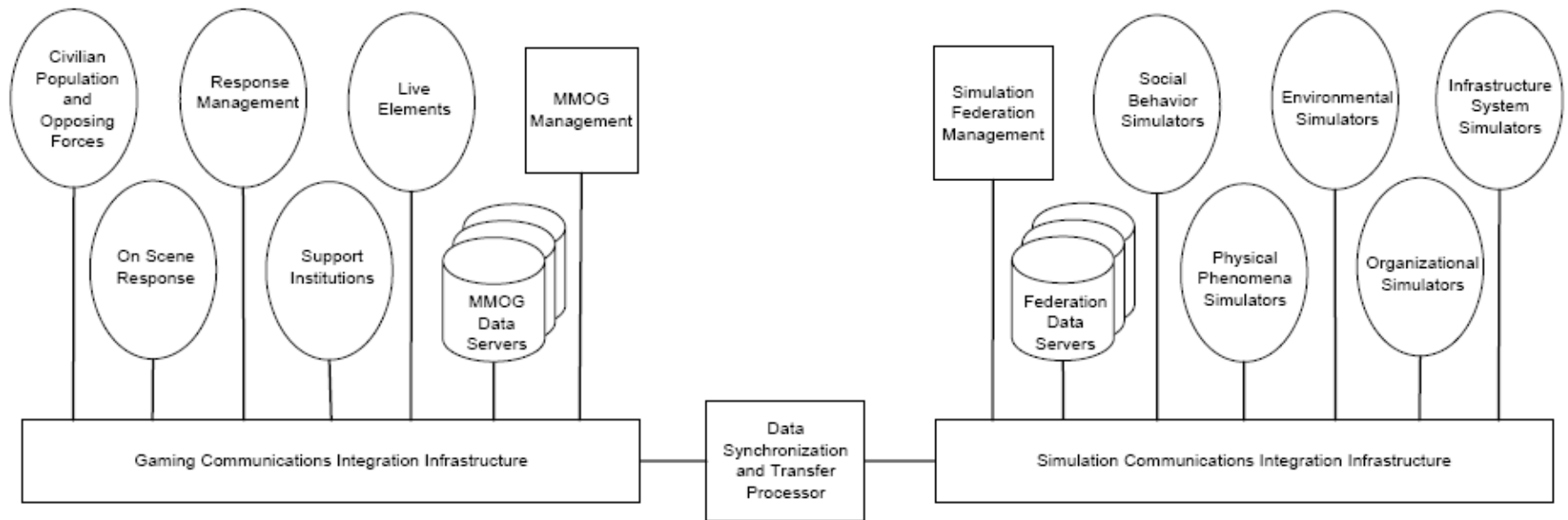


Figure 2. Architecture concept for Simulation and Gaming Incident management Training System

Source: An Integrated Gaming and Simulation Architecture for Incident Management Training, NISTIR 7295, March 2006

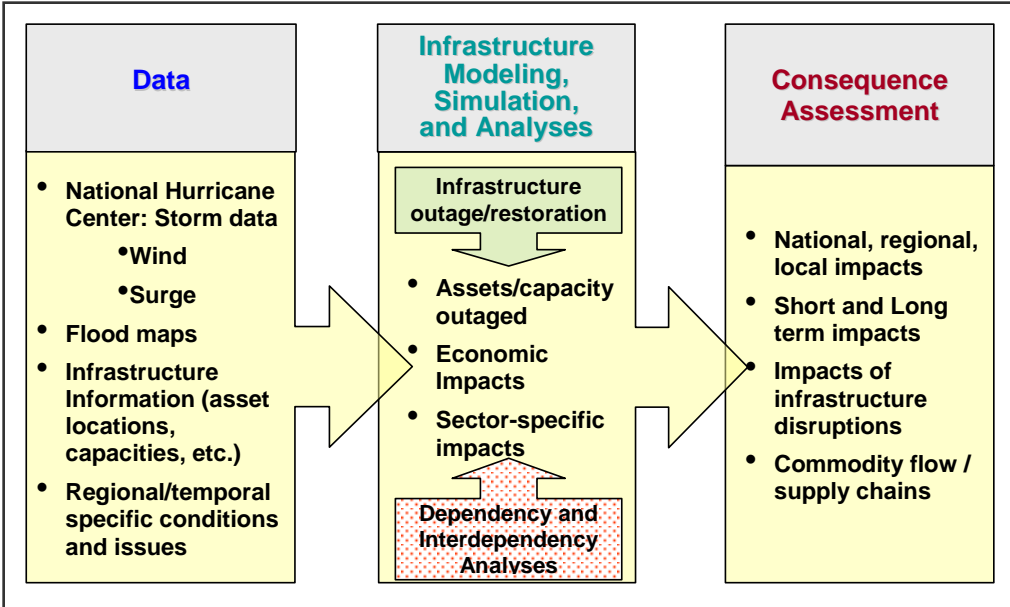


Outline

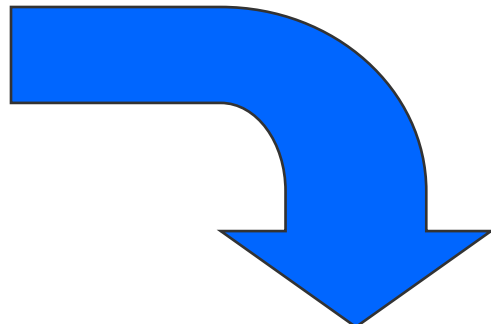
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National Infrastructure Simulation and Analysis Center (NISAC)



NISAC Delivers Infrastructure Analysis



National Infrastructure Protection Plan Risk Management Framework



Governance and Information Sharing



Home Security

Inter-Agency Modeling and Atmospheric Analysis Center (IMAAC)



- Created by Homeland Security Council (April 2004)
- NARAC designated as the interim provider of IMAAC services
- Eight-agency Memorandum of Understanding and Interagency Working Group
- National deployment plan
 - Federal operations centers
 - Regional response assets (DHS/FEMA, DOE, EPA, NOAA)
 - States
- Local Integration of NARAC w/Cities pilot program
- Permanent site selection process underway



“The IMAAC provides a single point for the coordination and dissemination of Federal dispersion modeling and hazard prediction products that represent the Federal position during actual or potential incidents requiring federal coordination” - **National Response Plan (NRP) Notice of Change May 2006**

National Exercise Simulation Center

- For training, exercises, and command and control functions at the operational level
- Includes mix of live, virtual, and constructive simulations to prepare elected officials, emergency managers, emergency response providers, and emergency support providers at all levels of government to operate cohesively.
- Concepts in development at FEMA



Emerging M&S Capabilities in DHS S&T Directorate

Explosives

Computational models to predict aircraft vulnerability to Explosive threats



Chemical/Biological

Foreign Animal Diseases Modeling Project

Joint Modeling Operations Center (JMOC)



Command, Control, & Interoperability

Visual Analytic and Physics-based Simulation Program



Borders/Maritime

Secure Border Initiative Systems Engineering and Modeling & Simulation Project



Human Factors

Group Violent Intent Modeling Project

Open Source Modeling Applicability Project



Infrastructure/Geophysical

Integrated Modeling, Mapping and Simulation Program



M&S is integral to analysis and supports decision making at many levels

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M&S Issues for DHS Consideration

- Provide guidance and oversight for the development and use of M&S across DHS
- Develop and establish policies for integrated management of M&S within DHS programs
- Establish technical and procedural standards to guide the development and use of M&S in DHS
- Provide strategic vision and direction for prioritizing M&S capabilities, integrating M&S requirements, and maintaining visibility of M&S activities throughout DHS
- Support R&D of emerging M&S technologies



M&S Issues for DHS Consideration

- Examine M&S tool coverage overlaps, redundancies, and gaps to optimize investments
- Configuration Management (CM) of M&S tools
- Data Management (DM) of input and result data used to support (program) decisions
- Perform verification and validation of models, simulations, and auxiliary tools, input and output data used to support (program) decisions
- Accredite M&S supporting critical decisions to document their acceptability for a specific intended use



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Importance of Guidelines

M&S is an integral tool to support the DHS mission. Guidelines should:

- **Enhance Decision Maker confidence in M&S results**
- **Ensure M&S results meet requirements**
- **Promote integration and interoperability of tools**
- **Enable private sector and commercial involvement in developing homeland security tools**
- **Promulgate “best practice” from government and private sector experience**
- **Advance the maturity of M&S as a field of technology**



Some Federal Guidelines for M&S

Federal Activity	M&S Guideline or Policy		
	Development	Evaluation	Use
DoD	X	X	X
DOE/NNSA	X	X	X
EPA	X	X	X
FDA	X		
Federal Highway Administration	X	X	X
GAO	X	X	X
NASA	X	X	X
NOAA	X		X
NRC	X	X	X
USGS		X	X



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Questions for the M&S Committee

- What should we be looking for from industry and the private sector?
- What strategic perspective should DHS have regarding M&S development?
- General comments or recommendations?





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Back-Up Slides

S&T Organization

