Modeling and Simulation Tools use in Security Vulnerability Assessments

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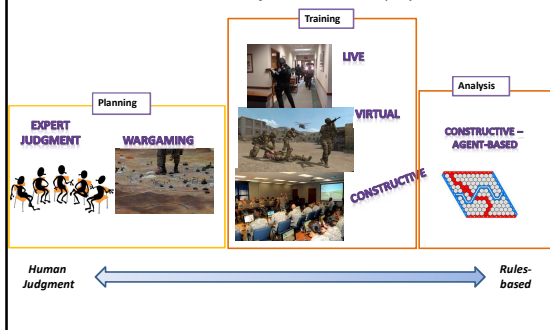

Why employ Mod/Sim for Security

- Extensive analytical basis – generate large data sets which are advantageous based on costs, minimized site impacts, safety concerns, and multiple event analysis
- Significant investments in site security
  - Improved understanding of system performance might offer additional tradeoff opportunities
- Can efficiently supplement training programs
- Informs the development and promulgation of policies, standards and regulations

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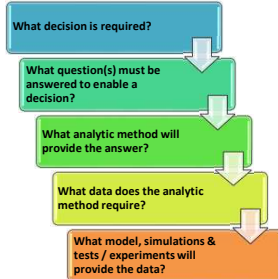

Simulation Types
Considerations for Mod/Sim Employment

Training

Planning

Analysis

LIVE

VIRTUAL

CONSTRUCTIVE

EXPERT JUDGMENT   WARGAMING

CONSTRUCTIVE – AGENT-BASED

Human Judgment ⟷ *Rules-based*
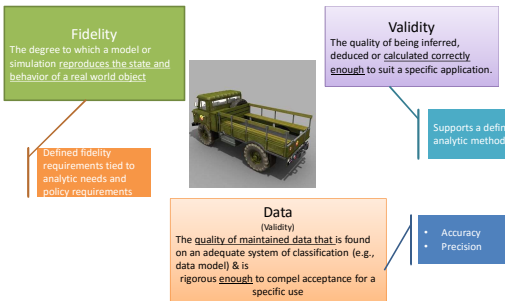
Choosing a Simulation Approach
Considerations for Modeling and Simulation

- Understand the question we seek to answer
- Understand how the simulation & its models work
  - Attributes
  - State changes
  - Interactions with other models
  - Limitations
- Understand the ability of a given approach to provide relevant data
  - Reproducibility
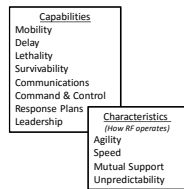 - Probabilistic vs. Deterministic
  - Flexibility

- What decision is required?
- What question(s) must be answered to enable a decision?
- What analytic method will provide the answer?
- What data does the analytic method require?
- What model, simulations & tests / experiments will provide the data?

How Good is Good Enough?
Considerations for Modeling and Policy Development

Fidelity
The degree to which a model or simulation reproduces the state and behavior of a real world object

Defined fidelity requirements tied to analytic needs and policy requirements

Validity
The quality of being inferred, deduced or calculated correctly enough to suit a specific application.

Supports a defined analytic method

Data
(Validity)
The quality of maintained data that is found on an adequate system of classification (e.g., data model) & is rigorous enough to compel acceptance for a specific use

- Accuracy
- Precision

Challenges in Employing Mod/Sim

- Documenting assumptions to cover information gaps
- Developing acceptable workarounds to overcome model / simulation limitations
- Replicating human behavior accurately
- Managing & interpreting data
- Deriving meaningful trends from data points (leading to policy development)

Capabilities
Mobility
Delay
Lethality
Survivability
Communications
Command & Control
Response Plans
Leadership

Characteristics
(How RF operates)
Agility
Speed
Mutual Support
Unpredictability

Summary

- Understand the analytic goals & required data
- Understand the protection system
  - Structure, operation, functions
- Understand the simulation
  - Model fidelity & validity
  - Underlying data
- Tools can be used for multiple purposes if the analytical basis is clearly defined

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