Enterprise Systems Analysis

Principal Investigator: Michael Pennock
Stevens Institute of Technology

Problem Statement

Many of the challenges that confront the Department of Defense (DoD) are characterized by the intersection of complex social, political, economic, and technical phenomena where conventional modeling techniques are inadequate. Human and organizational effects can dominate technical outcomes. For example:

- Combating the proliferation of counterfeit parts in military systems
- Managing joint and international acquisition programs
- Coordinating disaster and humanitarian responses involving governments, NGOs, and US agencies
- Sustaining the defense supplier base in the face of declining acquisition quantities

Goals & Objectives

Enterprise problems challenge conventional modeling and simulation approaches because they involve the sometimes unpredictable behavior of humans and organizations as well many interacting elements with feedback and adaptation. Consequently, our objectives are to:

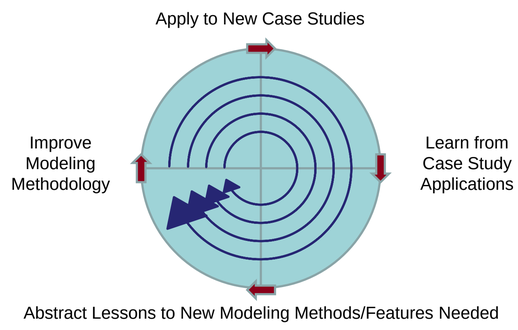
- Develop a modeling methodology that will allow analysts to study enterprise problems by intelligently scoping the problem space in a way that allows complex elements to be identified and mitigated
- Enable key stakeholders to “Drive the Future” before they commit to changes
- Providing means for experimentation and creation of response surfaces for key tradeoffs
- Creating an interactive environment for discussion and debate of strategies, policies & plans

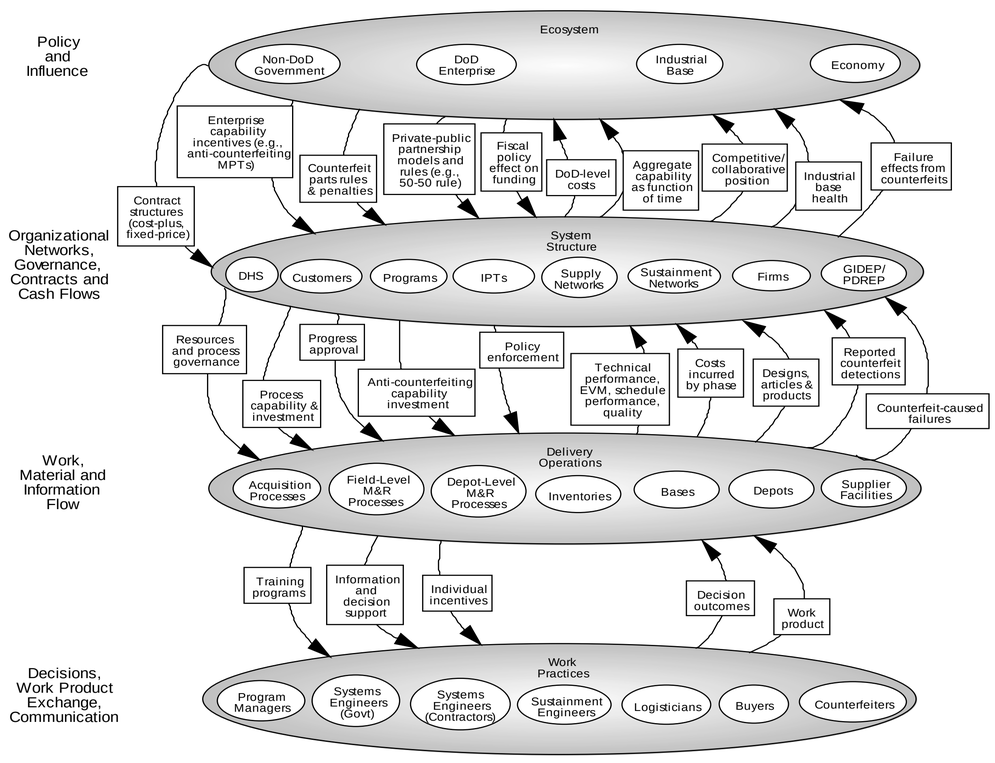
Planned Outputs

- A ten-step modeling methodology to guide analysts through the enterprise modeling process, with a focus on the currently difficult problems of multi-perspective representations and model composition
- Methods for visualizing enterprise systems
- Guidelines for composing models from economics and other social science domains with traditional systems engineering models
- A case study that analyzes approaches to mitigating the risk of counterfeit parts in defense supply chains

Counterfeit Parts Case Study

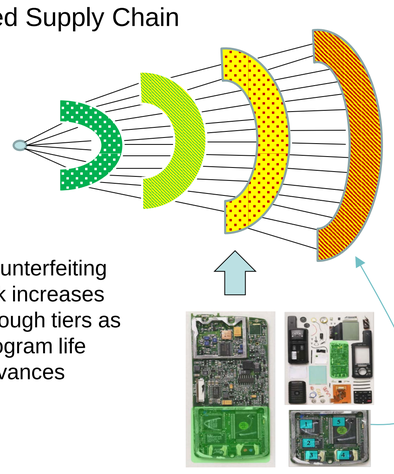
- In tandem with methodology development, we are pursuing enterprise case study problems
- For RT-110, we are studying the problem of counterfeit parts as it relates to multiple DoD agencies and globalized supply chains that sustain DoD programs





- The objective is to allow policy makers to look for the right mix of economic and acquisition policies to combat the risk of counterfeit parts in the defense supply chain, understanding various trade-offs

Tiered Supply Chain



Counterfeiting risk increases through tiers as program life advances

Potential Anti-Counterfeiting Policies
- Use of trusted suppliers
- Subsidy of OEMs
- Supply chain monitoring (prevent, detect, respond)
- Incentives to primes and secondaries to monitor
- Reporting and information-sharing (GIDEP/PRDEP)
- Traceability of components
- Penalties for counterfeits/pass-throughs

Counterfeit parts typically are ICT components embedded in sub-systems, sourced through multiple supply chain tiers (often from overseas)

Selected Potential Trade-Offs
- Investing in system design & development (robustness) vs. supply chain (counterfeit detection)
- Reduced counterfeiting via supplier penalties (including pass-throughs) vs. vulnerabilities created by supplier diminishment
- Reduced counterfeiting via trusted suppliers vs. vulnerabilities due to limited supply sources
- Scope of component inspections: cost vs. counterfeit reduction (detection effectiveness)

Immersion Lab

To facilitate exploratory interactions and allow stakeholders to “test drive” the future, Stevens has developed an Immersion Lab that will allow teams and stakeholders to interact with models and visualizations

Research Team & Contact Information

Michael Pennock, PhD – Principal Investigator
Assistant Professor – Stevens Institute of Technology
mpennock@stevens.edu

William Rouse, PhD – Co-Principal Investigator
Alexander Crombie Humphreys Professor – Stevens Institute of Technology
wrouse@stevens.edu

Doug Bodner, PhD – Senior Researcher
Principal Research Engineer – Georgia Institute of Technology
doug.bodner@gatech.edu