

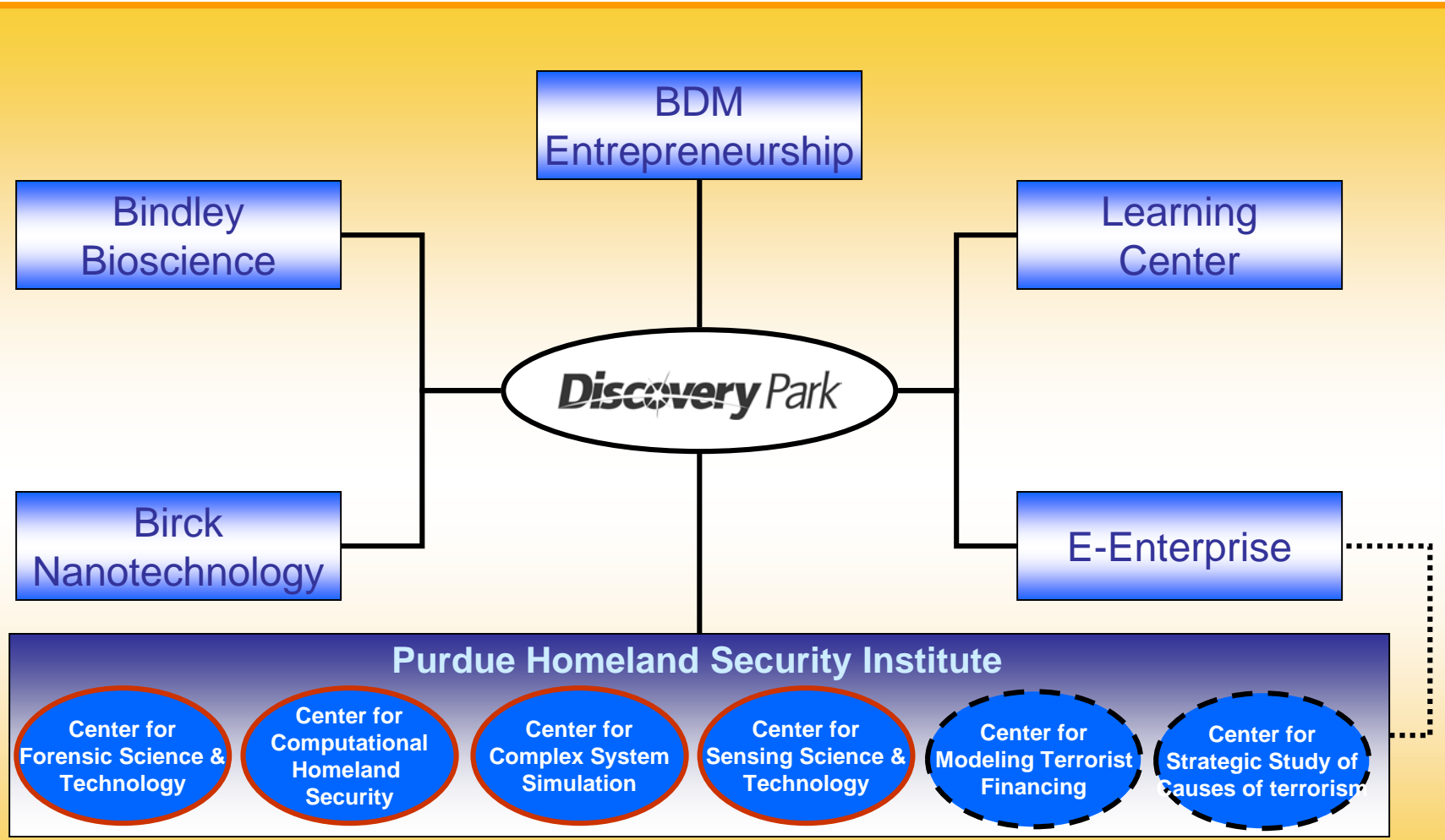
# Center for Computational Homeland Security

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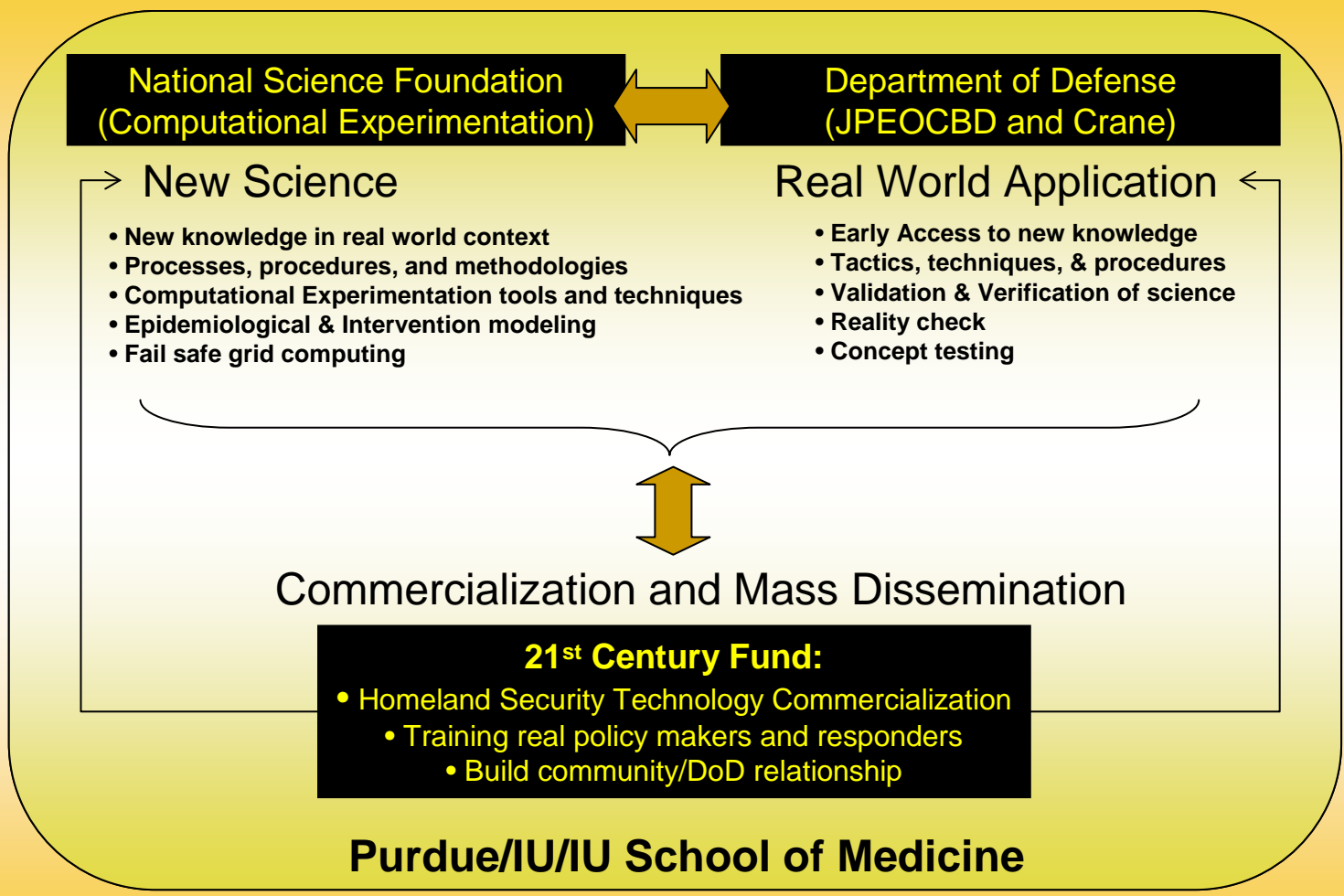
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# PHSI's Evolving Structure



# Joint Funding

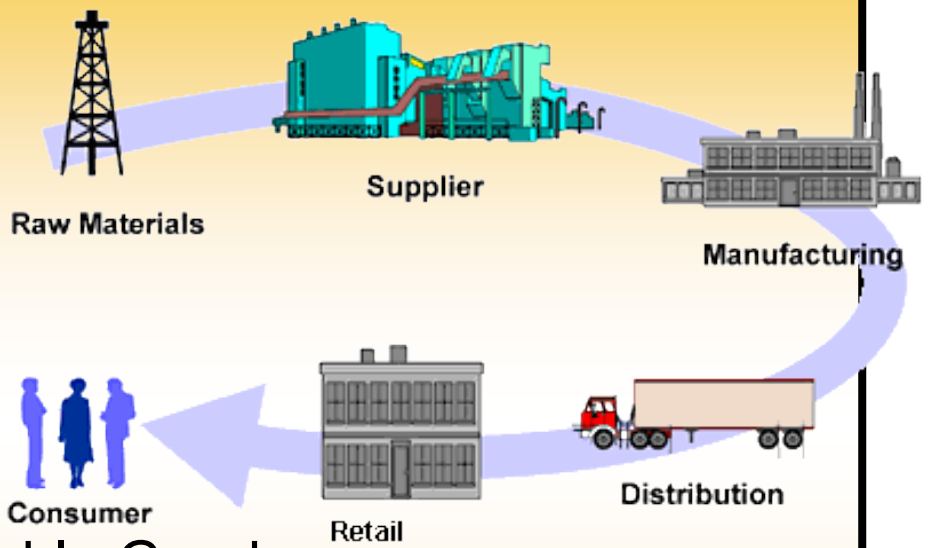


# Post Harvest Food Supply-Chain Security Simulation

# The Simulation

- Supply Chain Security Simulation

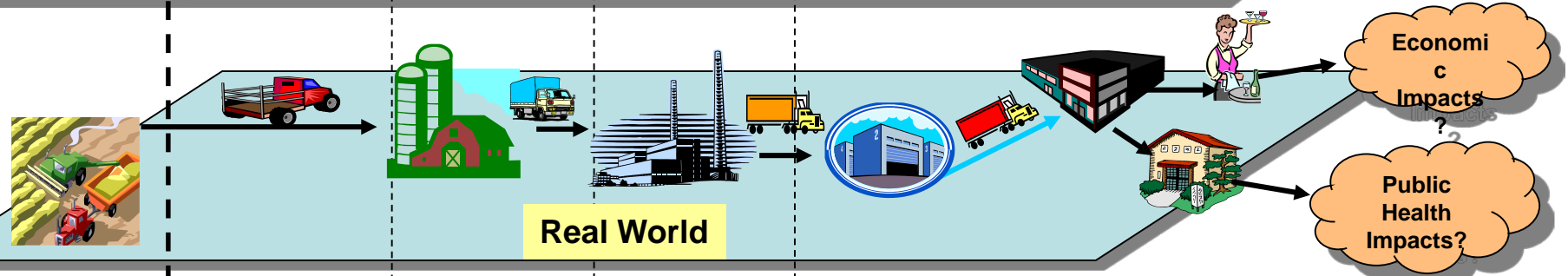
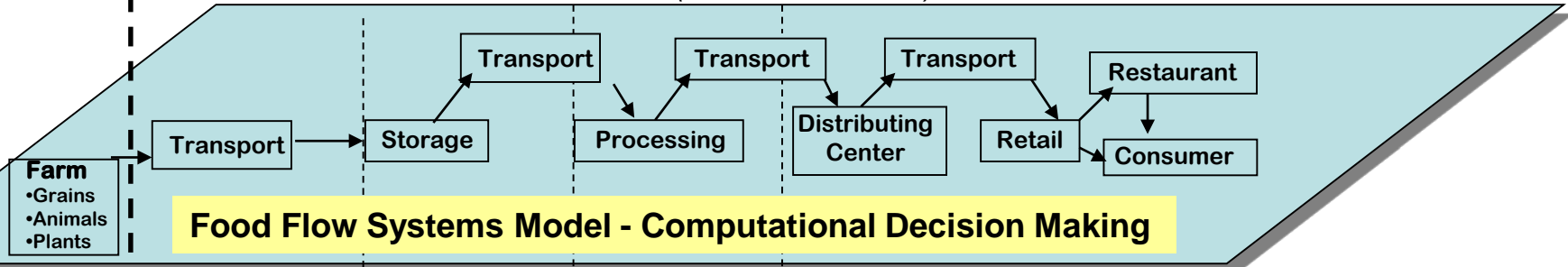
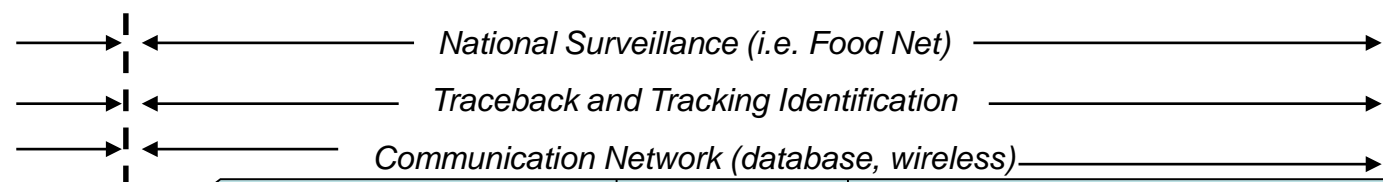
- Multi-Layered
- Multi-Tiered
- Network Model



- Modeling

- Inventory Control
- Perishable v/s Non-Perishable Goods
- Propagation of Inventory
- Consumer and Supplier Supply and Demand

# The Synthetic Environment



Source (Pre-harvest)	Transport (Post-harvest)	Storage	Processing	Retail & Consumption	
Detection: ● ● ● Response: ● ● ● Recovery: ● ● ● Prevention: ● ● ●	Detection: ● ● ● Response: ● ● ● Recovery: ● ● ● Prevention: ● ● ●	Detection: ● ● ● Response: ● ● ● Recovery: ● ● ● Prevention: ● ● ●	Detection: ● ● ● Response: ● ● ● Recovery: ● ● ● Prevention: ● ● ●	Detection: ● ● ● Response: ● ● ● Recovery: ● ● ● Prevention: ● ● ●	●: Biological Hazard ●: Chemical Hazard ●: Radiological Hazard  ●: Mitigation ●: Investigation ●: Corrective action ●: Recall ●: Communication ●: Decontamination ●: Education ●: Risk Analysis ○: Good Business Practices

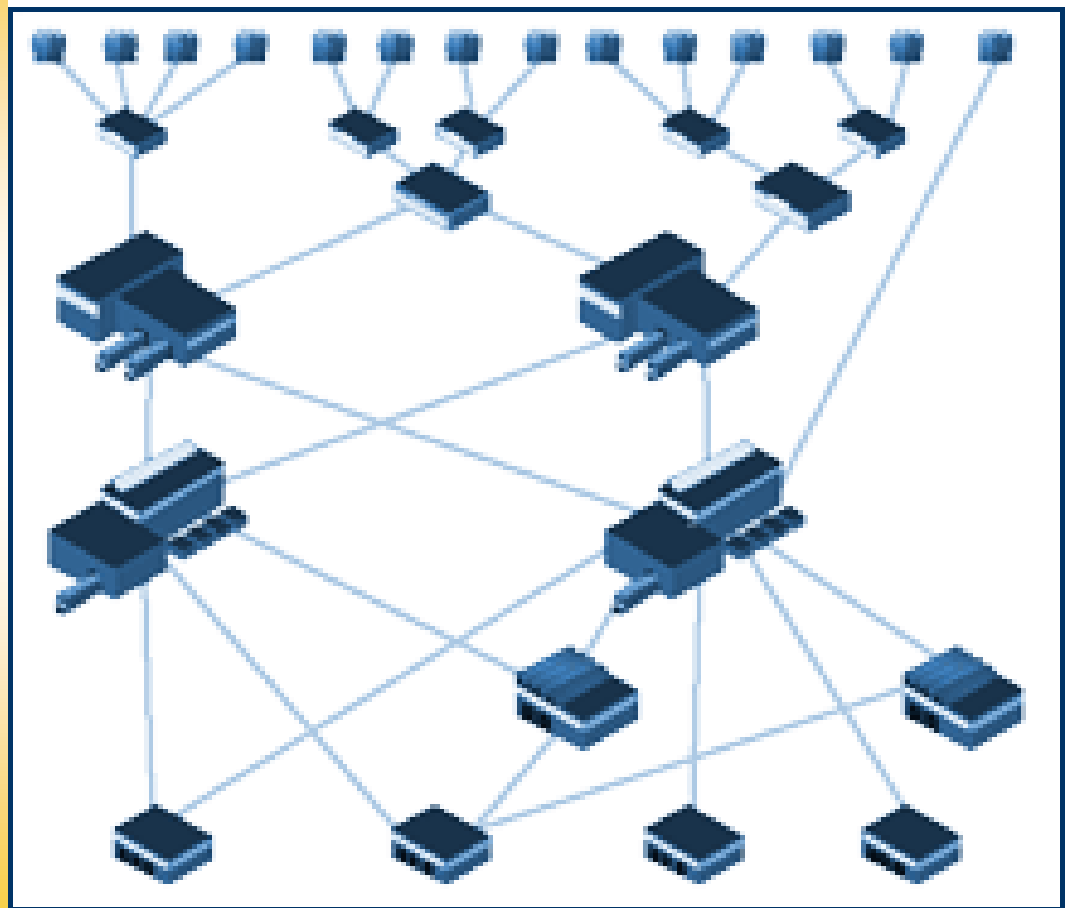
# The Inputs

- Products
  - Dairy, Meat, Grains, Fruits
- Infrastructure
  - Bulk, Processing, Distribution, Retail, Consumers
- Inventory Control Protocols
  - Shelf Life, Inventory Size, JIT Inventory
- Supply and Demand of Consumers
  - Fluctuations in consumption, Influence of media
- Supply and Demand of Suppliers
  - Consumer Demand, Cost of Warehousing
- Economic Aspects of Supply Chain
  - Production, Transportation, Warehousing, Quality Maintenance



# The Process

- SEAS Propagation Model
  - Agent-based, scalable
- Model
  - Supply-Chain
  - Supply and Demand
  - Product Life
- Track
  - Lots and packages
  - Inventory transfer
  - Cost





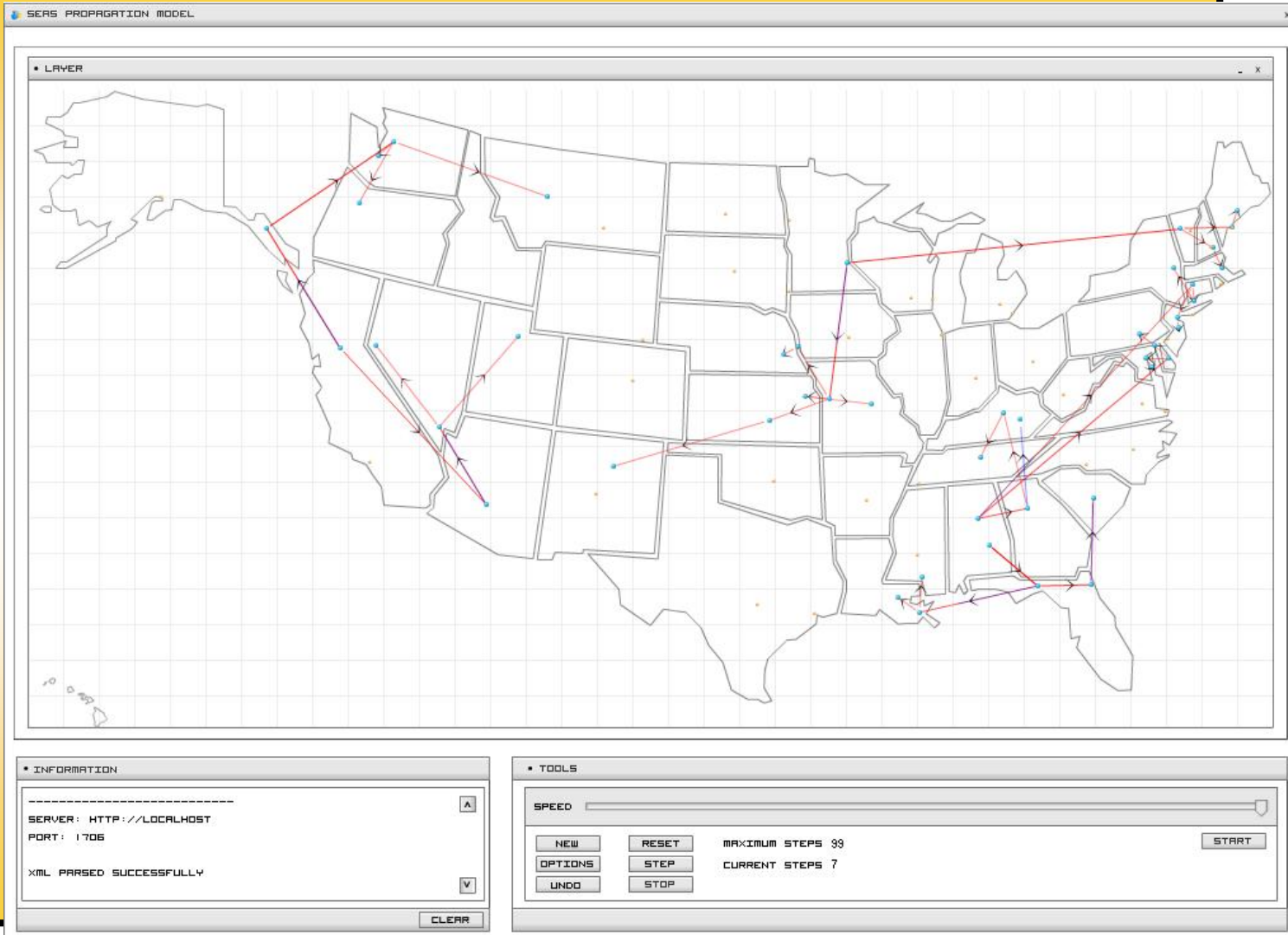
# The Real-Time Visualization

## Visualize

- Supply-Chain
- Flow paths
- Flow rates
- Cost
- Critical Infrastructures

## Control

- Inventory
- Production
- Emergency Responses



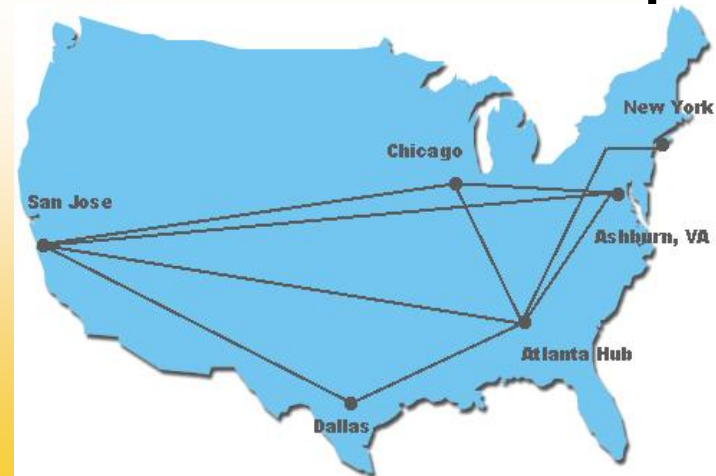
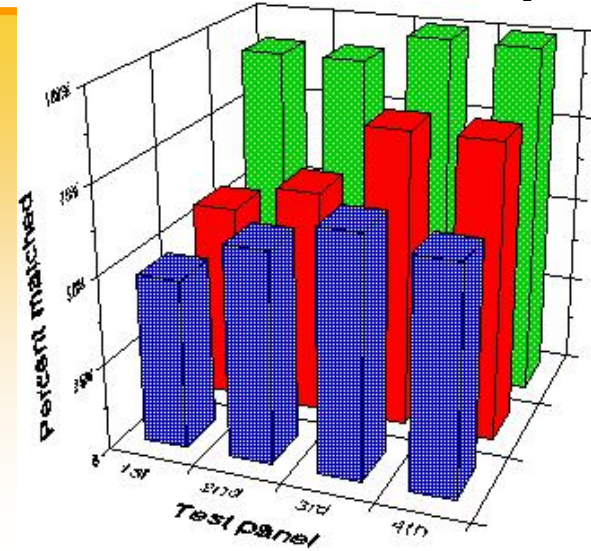
# The Scenario

- Chemical and Biological Terrorist Attacks
- Terror attacks can be caused by
  - Bombs, Sabotages, Contaminations
- Preventive Actions
  - Quality control, Inventory management
- Response Actions
  - Test, recall, de-contaminate, control



# The Result

- We get out of the simulation...
  - Emergency Preparedness
  - Emergency Response
  - Analysis of options and actions
  - Effective communication procedures
  - Identify weak spots in the infrastructure
- Questions like...
  - Authority to make decisions?
  - Responsibility to prevent, respond?



# Thank You

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<http://www.mgmt.purdue.edu/centers/perc>

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