



# PortSec: Port Operations Modeling for Security Risk Management and Resource Allocation

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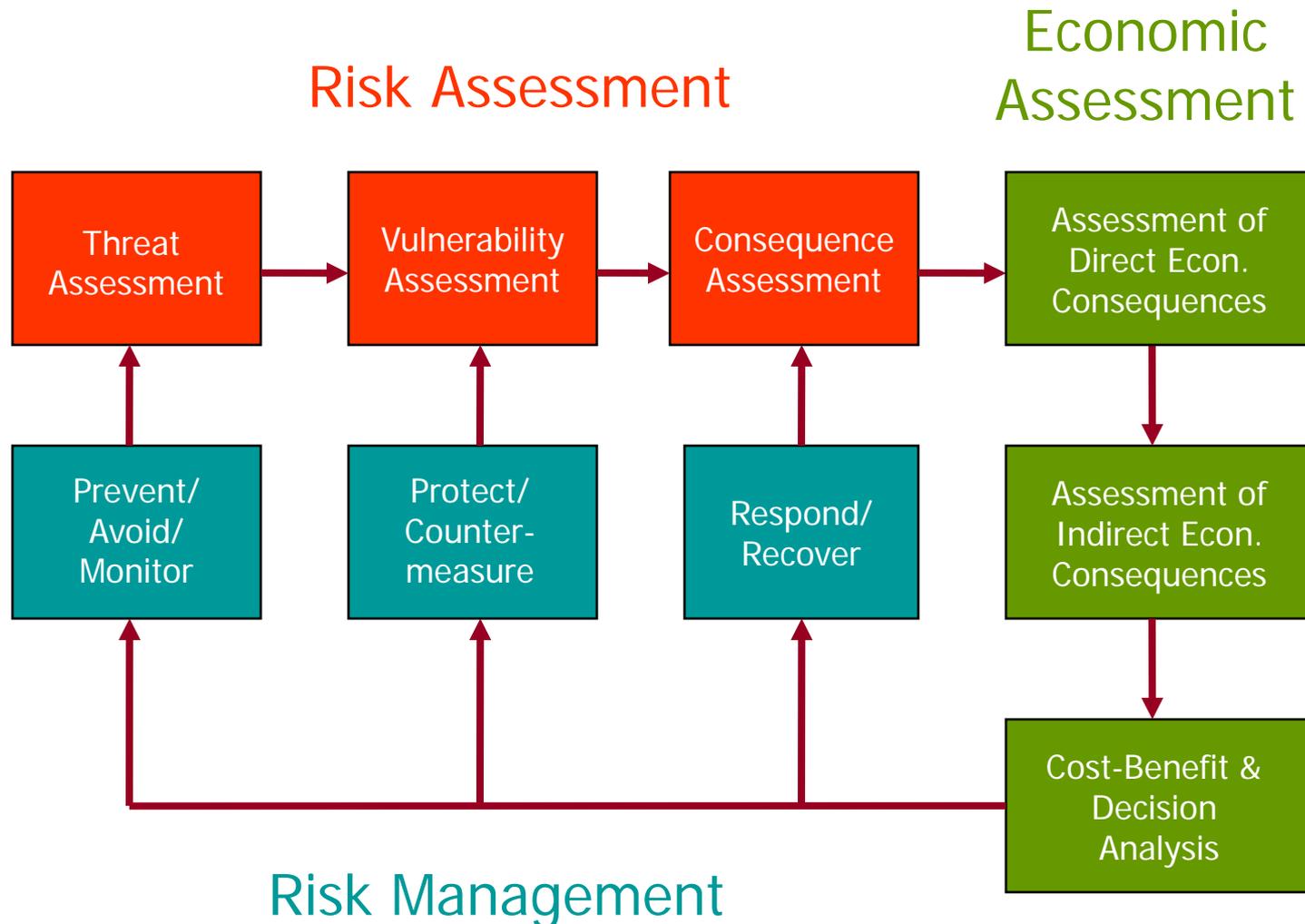
# The Problem

- Ports and similar operations are composed of many different components (e.g., terminals, bridges, inspection points, etc.), agencies, and interactions between these "systems"
  - The complex operations and interactions within and between these components make risk assessment and management difficult.
  - These are "system of systems" problems which are difficult to model and analyze
- These "system of systems" are dynamic - constantly changing both day-to-day and long-term.
  - There are tactical risk-based decisions that influence strategic planning and vice versa

# Port Security Risk Management and Resource Allocation Project

1. Develop and apply systems-based risk management methodology and tools for assessing risk and evaluating alternative technology-based solutions and resource allocation policies.
  - Develop a useful port/terminal risk evaluation tool
    - Security officer
    - Resource analyst
  - Develop methodology for countermeasures/technology evaluations and resource allocation evaluations
2. Demonstrate benchmark case
  - Port boundary protection resource allocation (From among the 13+ security agencies at the POLA/POLB complex)
  - Strategic resource allocation trade-off example TBD

# PortSec Risk Analysis Methodology





# PortSec Approach

1. Research and understand the problem
  - Pre-existing scenarios reviewed and accepted by port community
  - Define attackers, modes, targets, conditions, probabilities
  - Define resources available, possible allocations, tradeoffs
2. Develop/refine technical solutions that address the problem
  - Scenario risk: Threat x Vulnerability x Consequence
  - Incorporate best available data
  - Reflect best Port estimates
  - Calculate based on developed/benchmarked models
3. Incorporate external inputs when and where available
  - MSRAM
  - FSIVA: HLD-ECAM (M/D-SHARPP, Criticality)
  - Port self-assessments
4. Demonstrate and collect stakeholder feedback
5. Repeat steps 1 through 4 as necessary
6. Deploy technology

# Analysis Begins with a Scenario: e.g., Conventional Truck Bomb at Single Terminal

Vulnerability: Low percentage of containers are currently adequately screened

Threat: Conventional bomb packed in a container

Countermeasures: ID checks, physical screening, chemical sniffers, dogs

Consequences: 25 Injuries, 10 Deaths, \$45 million in Property Damage, \$449 million in Business Interruption and Indirect Costs, Total Costs of about \$866 million



# Resources Engaged in Port Security

- **Example of agencies that provide security resources in and around the port complex:**
  - Los Angeles Port Police
  - Port of Long Beach Harbor Patrol
  - Los Angeles Police Department Harbor Division
  - Long Beach Police Department
  - California Highway Patrol
  - U.S. Coast Guard
  - U. S. Customs and Border Protection
  - Los Angeles County Fire Department
  - City of Long Beach Fire Department
  - City of Los Angeles Fire Department
  - U. S. Immigration and Customs Enforcement
  - Los Angeles County Sheriff's Department



# Identify Potential Countermeasures for Reducing Terrorism Risk

- **Potential countermeasures to improve physical security in and around the port complex could include:**
  - Patrol cars
  - Patrol boats
  - Motion/vibration/heat detectors
  - Security fences
  - Waterborne barriers and gates
  - Underwater surveillance systems
  - Radar surveillance systems
  - Pipeline protection systems
  - Unmanned aerial vehicles
  - Fixed and portable lighting systems
  - Car checkpoints
  - Gate inspections
  - Portable rad/nuke sensors
  - Biometric identification cards
  - Divers
  - Cameras
  - Automatic Identification Systems



## PortSec Software – Users

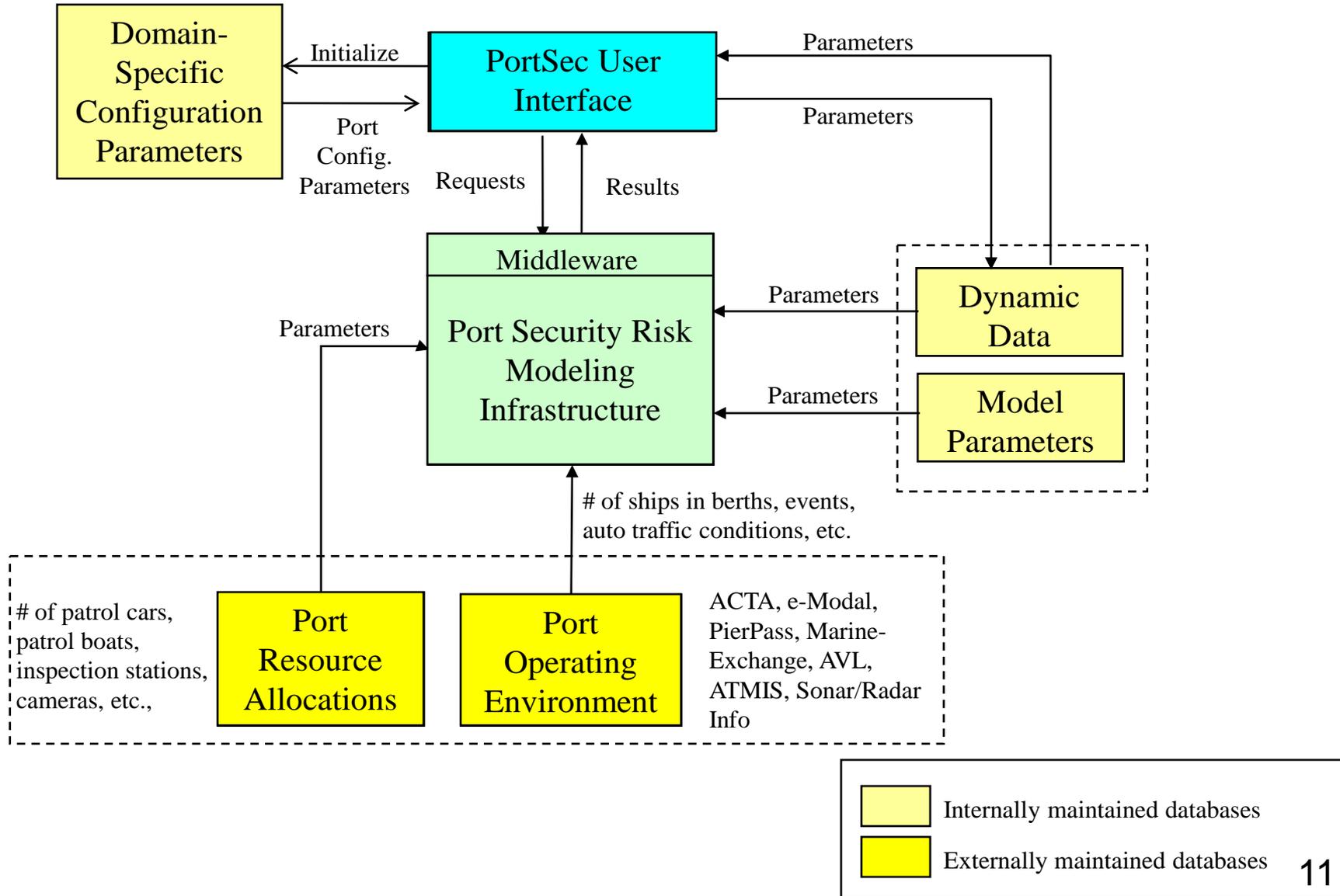
- Port Security Officer – tactical responsibility for daily security arrangements, has limited additional resources that can be reasonably reallocated on an as-needed basis
- Port Security Analyst – strategic analysis of potential long-term resource allocation investments for port security



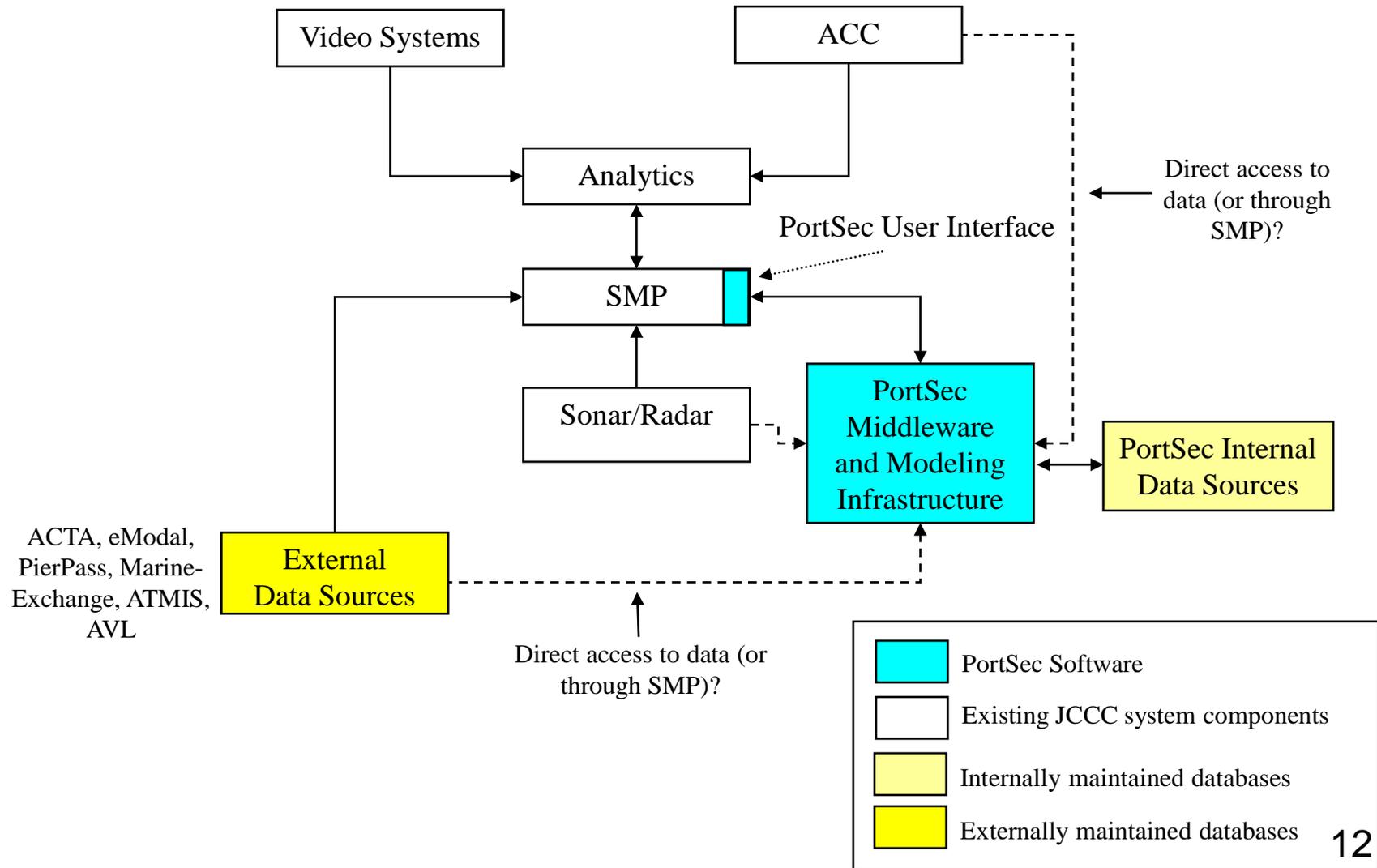
# PortSec Software – Approach

- Develop generalized “infrastructure” security software – support multiple domains
- Tailor generalized “infrastructure” security software for the port environment

# Software Architecture



# Potential PortSec Interface in JCCC



# Tactical Usage: Port Security Officer

The screenshot shows the Port Security software interface. On the left, the 'Port Components' panel lists 'Camera' and 'Squad Car', both with '(Available: 10 Used: 8 Spare: 2)'. Below it is the 'Counter Measures Allocat...' panel with sliders for 'World Cruise Center' (set to 5), 'West Basin Container Terminal' (set to 1), 'POLA Container Terminal' (set to 1), 'Yusen Container Terminal' (set to 0), and 'Seaside Container Terminal' (set to 0). The main map shows a port area with regions color-coded by risk: red for high risk, yellow for medium, and green for low. A red region is highlighted, and a callout points to it. The 'Resource Allocation' panel on the right shows 'Squad Car' and 'Camera' each with an allocation of 1. The 'Risk' table shows scores for threat, vulnerability, consequence, Risk, and Port Risk. The 'Optimiza...' panel shows 'Optimization: %' and 'Reommendation:'. Callouts are yellow boxes with black text and arrows pointing to specific UI elements.

Optimize Available Here

List of Available/Used Countermeasures/Resources

Calculated Risk for the Highlighted Region

Resources Assigned to the Highlighted Region

Resource Allocation Options

Critical Regions Color Coded to Reflect Calculated Risk

Risk	Score
threat	9.1311400...
vulnerability	6.4566842...
consequence	7.6473933...
Risk	450.86651...
Port Risk	1251.5010...

Resource	Allocation
Squad Car	1
Camera	1

Port Security
\_ □ ×

File Edit View Run Analyze Help

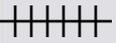
Port Components

  
 Surveillance Station

  
 Cargo Truck

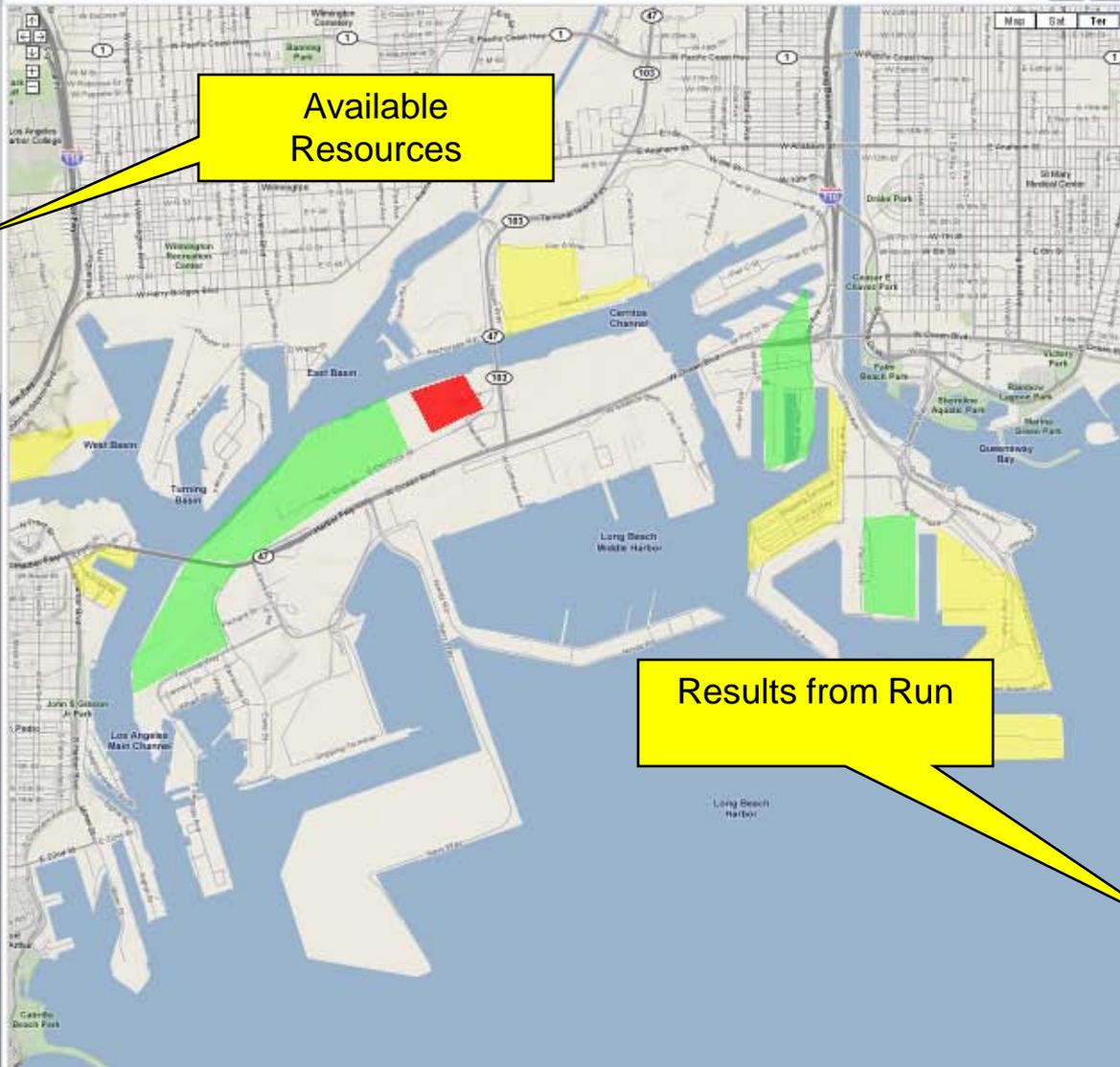
  
 Squad Car

  
 Crane

  
 Rail Line

  
 Highway/Street (Movement)

Port Map : POLA Container Terminal
\_ □



Region S...

Risk	Score
threat	9.1311400...
vulnerability	6.4566842...
consequence	7.6473933...
Risk	450.86651...
Port Risk	1251.5010...

Resource...

Resource	Allocation
Squad Car	1
Camera	1

Counter Measures Allocat...

**Squad Car**

World Cruise Center

0 5 10

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West Basin Container Terminal

0 5 10

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POLA Container Terminal

0 5 10

---

Yusen Container Terminal

0 5 10

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Seaside Container Terminal

0 5 10

---

Pier F

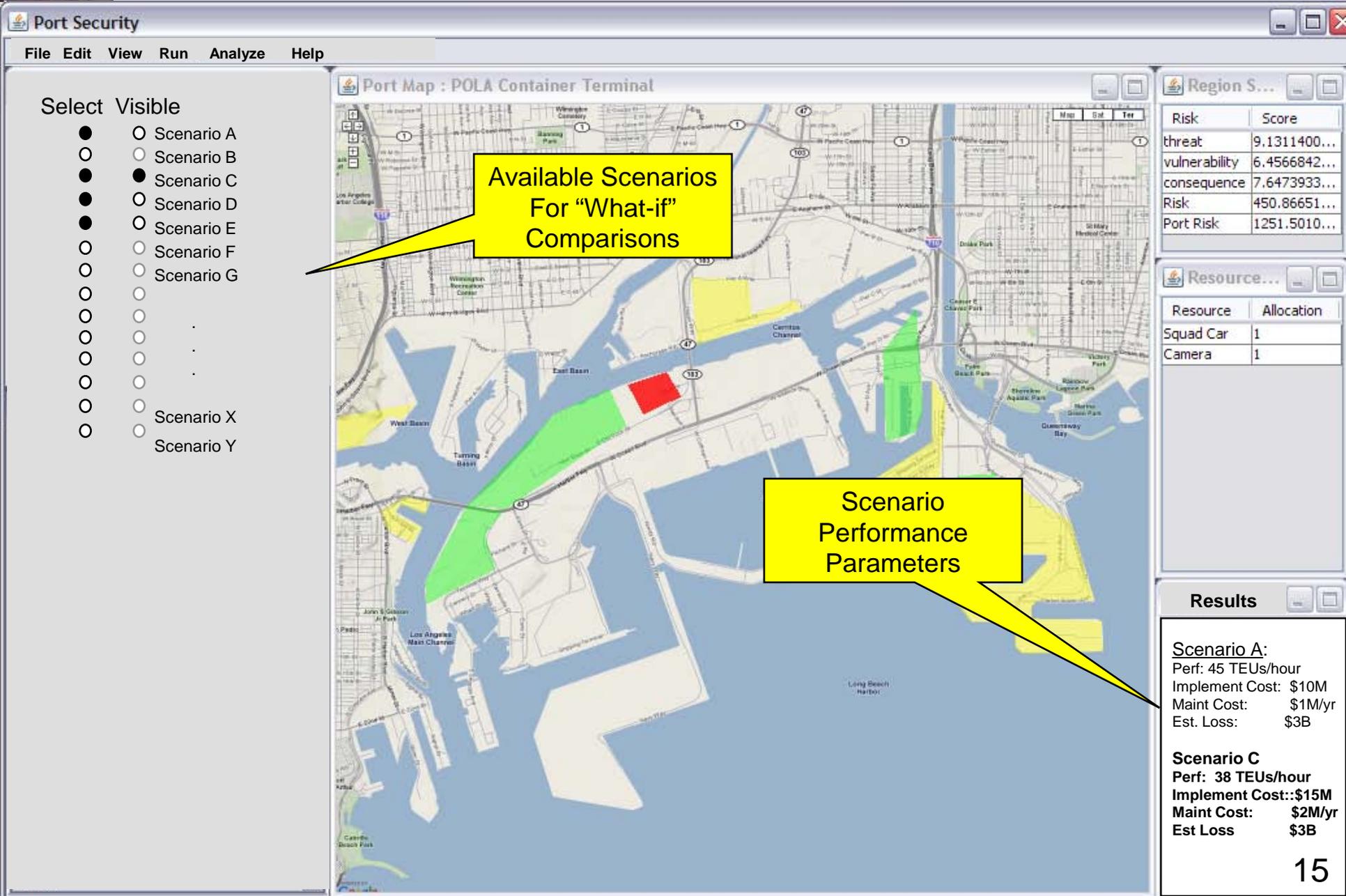
Results

Throughput):  
100 TEUs/hour

Cost:  
\$400/TEU

Available Resources

Results from Run



**Port Security**

File Edit View Run Analyze Help

Port Map : POLA Container Terminal

Select Visible

- Scenario A
- Scenario B
- Scenario C
- Scenario D
- Scenario E
- Scenario F
- Scenario G
- Scenario X
- Scenario Y

Available Scenarios For "What-if" Comparisons

Scenario Performance Parameters

Risk	Score
threat	9.1311400...
vulnerability	6.4566842...
consequence	7.6473933...
Risk	450.86651...
Port Risk	1251.5010...

Resource	Allocation
Squad Car	1
Camera	1

**Results**

**Scenario A:**  
Perf: 45 TEUs/hour  
Implement Cost: \$10M  
Maint Cost: \$1M/yr  
Est. Loss: \$3B

**Scenario C**  
Perf: 38 TEUs/hour  
Implement Cost: \$15M  
Maint Cost: \$2M/yr  
Est Loss: \$3B

15

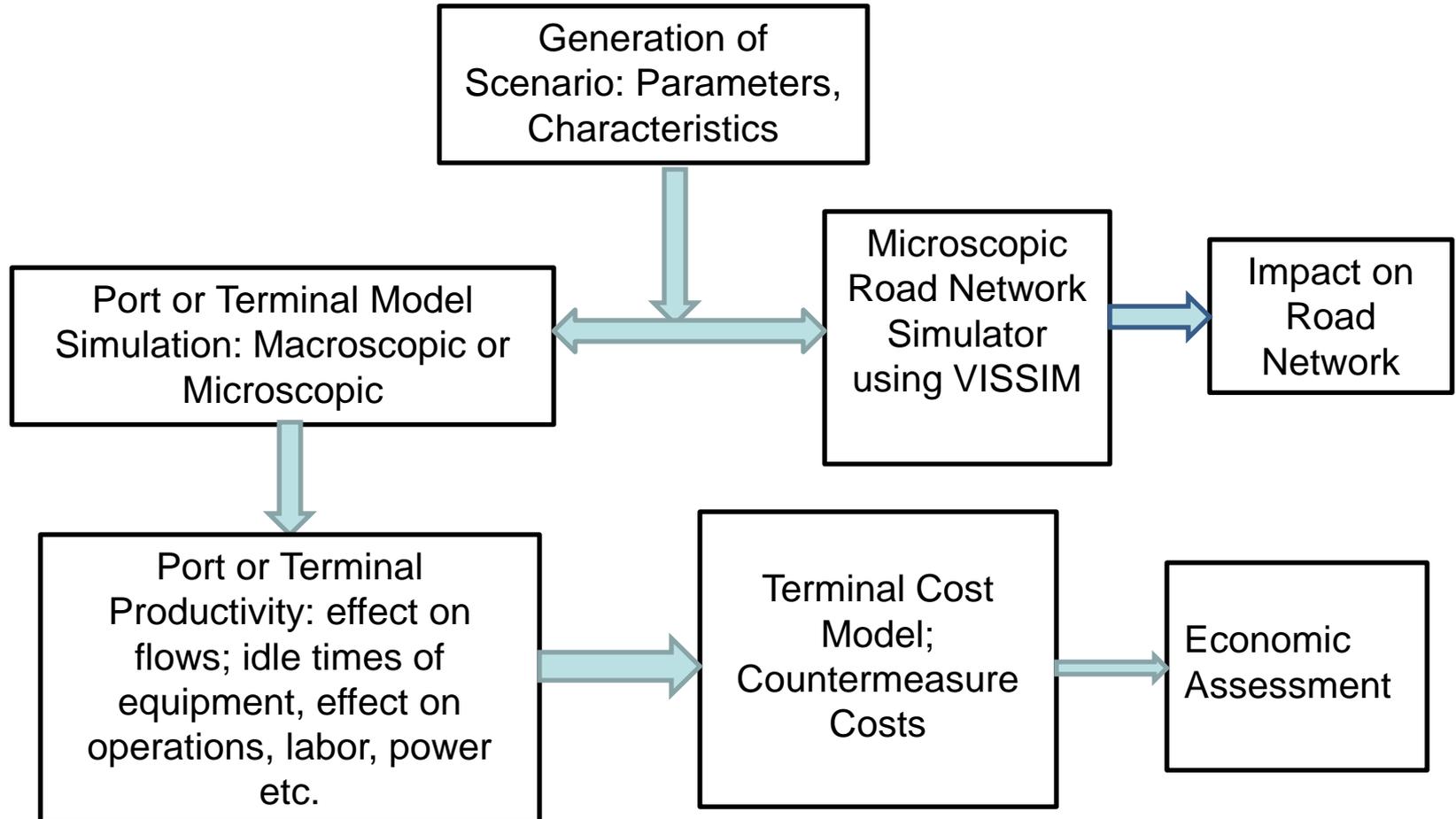
## Near Real-time Marine and Land Traffic



Marine Traffic

Vehicle Traffic

# Port Operations Economic Impact Modeling: CM acquisition and maintenance costs, port operation costs



# Why PortSec?

- PortSec is focused on the terrorist scenarios that may interfere with the capabilities and missions of ports (as business entities, transport hubs, etc.,) and the ports' various partners (e.g., carriers, stevedores, truckers) in performing these tasks and accomplishing these goals
  - Ports and similar operations are composed of many different components (e.g., terminals, bridges, inspection points, etc.), agencies, businesses, and interactions between these "systems"
  - PortSec focuses on the "system of systems"
- PortSec supports both tactical and strategic planning
  - These operations complement each other
  - Allows "what-if" cost-benefit analyses
- PortSec scales from local (e.g., terminal operations) to overall port operations.
  - For example, we calculate a risk assessment for a specific terminal and for the complete port complex.

# Next Steps

- Complete development of prototype tactical-only system (May 2009)
  - User interface and middleware modeling infrastructure
  - Incorporate stakeholder feedback
- Refine port risk models (Aug/Sept 2009)
  - Terminal, port, and transportation models
  - Execute selected scenarios
- Complete development of combined tactical and strategic port security prototype system (Winter 2010)
  - Integrate terminal, port, and transportation models into modeling infrastructure
  - Beta test with stakeholders
  - Incorporate stakeholder feedback
- Integrate system into existing port operations (Fall 2010)



# Summary

- Completed project requirements and system design
- Developed a generic “infrastructure” security design and refined it for port operations
  - Generic “infrastructure” design allows for system use in other domains
- Produced an initial demonstration tactical prototype and presented to port officials
  - Positive feedback
- Currently extending demonstration prototype to include support for both tactical and strategic operations
  - Includes terminal, port, and transportation model refinements through scenario runs
- Planned Fall/Winter 2010 insertion of system into Ports of LA and Ports of Long Beach operations
  - Working closely with port officials throughout the development and testing effort with this goal in mind