



# Port Operations and Economic Conditions Simulators

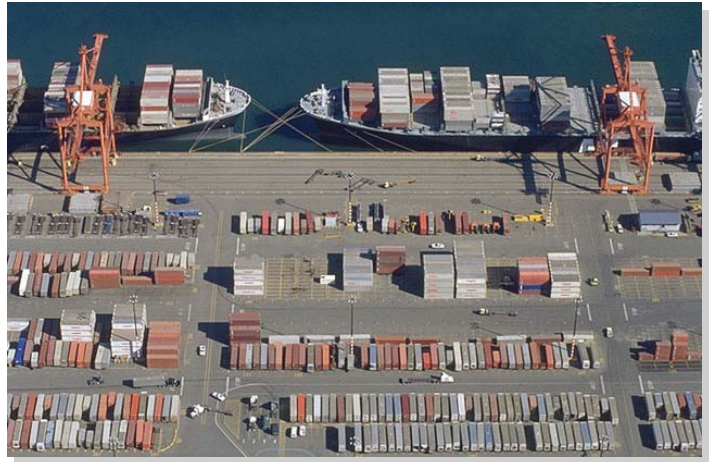
**The National Infrastructure Simulation and Analysis Center**, a program under the Department of Homeland Security's (DHS) Infrastructure Protection/ Risk Management Division (IP/RMD), provides advanced modeling and simulation capabilities for the analysis of critical infrastructures, their interdependencies, vulnerabilities, and complexities. These capabilities help improve the robustness of our nation's critical infrastructures by aiding decision makers in the areas of policy analysis, investment and mitigation planning, education and training, and near real-time assistance to crisis response organizations.

NISAC is a partnership between Sandia National Laboratories (SNL) and Los Alamos National Laboratory (LANL), integrating the two laboratories' expertise in infrastructure disruption/vulnerability modeling and simulation.

## Maritime Security

A focus area for NISAC is the importance of international trade and maritime infrastructure to our nation's economic health.

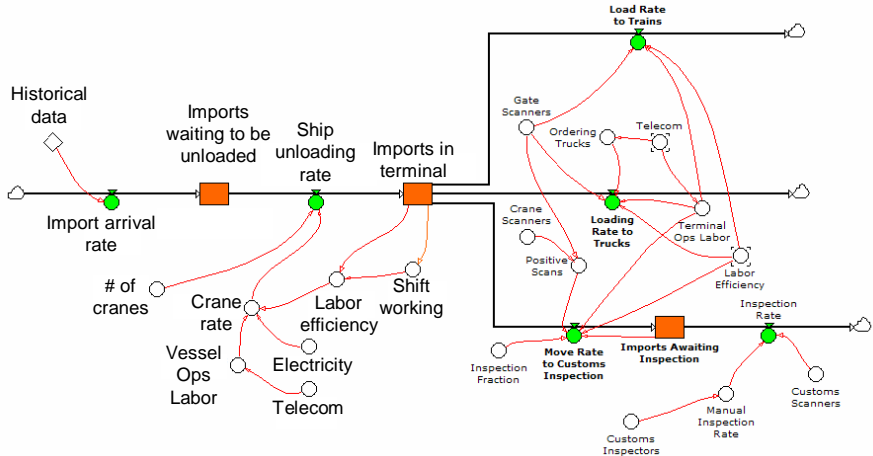
NISAC has developed a *Port Operations Simulator* to evaluate the potential short-term effects of shipping container and port security policies on port operations. A companion, *Economic Simulator* looks at the long-term effects of increased security costs on the economic health of a port. The simulators provide an opportunity to uncover potential problems in port-related national security and international trade policies before implementation and to begin to discover viable solutions for these problems before they occur.



International trade and the maritime infrastructure are vital to economic health

## Port Operations

The *Port Operations Simulator* analyzes the flow of shipping containers (import and export) through a container terminal at a port, examining the impact of additional security measures on the flow of goods through the port (e.g., increased inspections, scanners at various locations, or new security policies). It also examines the effect of failure of port-related infrastructures (e.g., electrical power, telecommunications).



Simplified port operations model diagram showing container flow

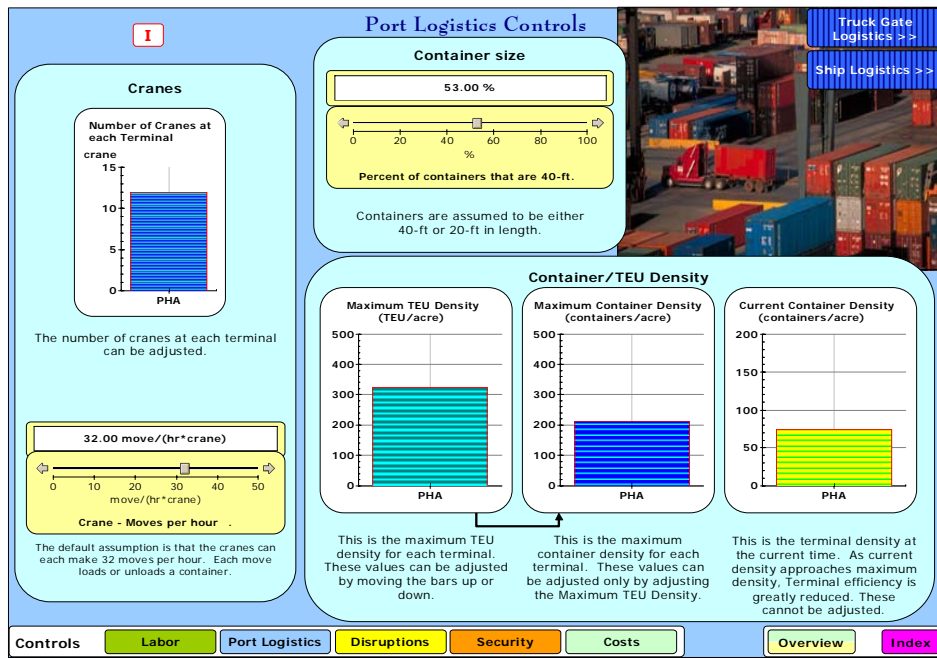


The *Port Operations* and *Economic Simulators* originally were tailored to two ports in the Pacific Northwest – Portland and Seattle – to test the utility of the simulators in evaluating the potential consequences of security policies. More recently, the short term simulator has been modified for the Port of Houston.

The Houston Port Operations model provides users with the added ability to run five *pre-defined disruption scenarios* (loss of electric power, breakdown in telecommunications, port security threat/shutdown, labor disruption, and a MARSEC Level III alert) to see port response to the disruption under user selected conditions. As the predefined disruption model runs, users can manipulate various controls to determine how best to respond and recover from the disruption.

The NISAC simulators can be modified to apply to other ports.

NISAC depends heavily on collaboration with infrastructure sector experts at the national, regional, and local levels for data and information about infrastructure processes and operations. This collaboration helps NISAC provide more accurate and complete information to decision makers.



*Logistics controls allow users to set values for the port being modeled, the ships and the gates*

An important part of the NISAC development and testing process is its application at hands-on workshops. These workshops demonstrate the capabilities and utility of NISAC’s tools and analyses, elicit feedback from participants, and expand NISAC collaborations. These workshops allow participants to gain a systems perspective on how infrastructures and their interdependencies influence the impact of disruptive events and how those impacts may change under different environmental, regulatory and policy conditions. NISAC, in turn, benefits from the knowledge and experience of experts working in maritime-related government and industry. The NISAC models are continually refined based on the results of these workshops.

In developing these simulators, NISAC analysts worked with numerous individuals to design and parameterize the port models, including the Pacific Northwest Economic Region, the Regional Maritime Security Coalition, the US Coast Guard, Bonneville Power, the Ports of Seattle and Portland, the Port of Houston, the University of Washington, Lucent Technologies, Transportation Strategies International and Creative Learning Environments. Their advice and feedback has greatly enhanced the realism and effectiveness of the Port Operations and Economics Simulators.



**Contacts:**

Jon MacLaren  
 DHS-IP  
 (202) 282-8719; e-mail:  
 jon.m.maclaren@dhs.gov

Theresa Brown  
 Sandia National Laboratories,  
 (505) 844-5247; email:  
 tjbrown@sandia.gov