Department of Homeland Security's Information Analysis and Infrastructure Protection
National Infrastructure Simulation and Analysis Center (NISAC)

NISAC Agent-Based Laboratory for Economics (N-ABLE™)

The National Infrastructure Simulation and Analysis Center (NISAC) is a program of the Department of Homeland Security's (DHS) Infrastructure Protection/ Risk Management Division (IP/RMD), providing advanced modeling and simulation capabilities for the analysis of critical infrastructures and their interdependencies and vulnerabilities. These capabilities help secure our nation's critical infrastructure by aiding decision makers in infrastructure policy analysis, investment and mitigation planning, education and training, and crisis response.

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

National Economic Security

Toward developing a better understanding of the impacts of these vulnerabilities and disruptions on national economic security, the Center has developed N-ABLE™, a large-scale microeconomic simulation tool that captures complex supply chain and market dynamics of businesses in the U.S. economy.

N-ABLE™ models the economy at the level of the individual firm; each N-ABLE™ firm is complete with individual buyers, production supervisors, sellers, and strategic planners who collectively navigate through economic disruption and recovery. N-ABLE™'s simulations of thousands to hundreds of thousands of firms provide the fidelity necessary to understand and implement the best infrastructure policies.
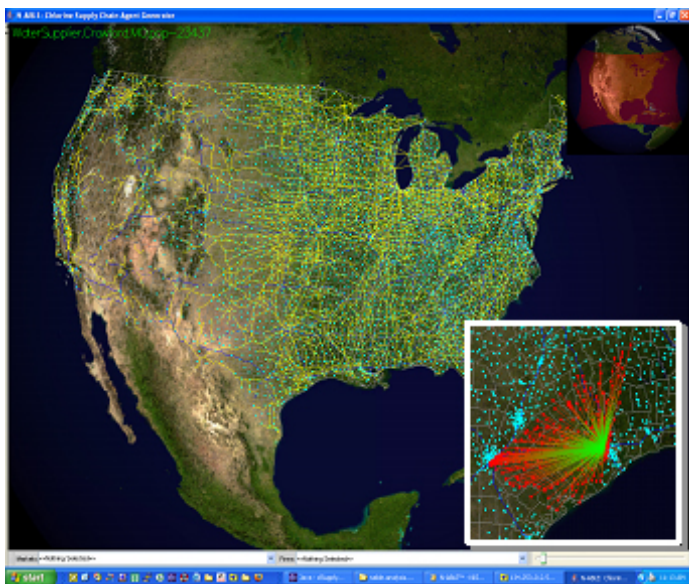
*N-ABLE™ models the microeconomic impacts of natural and man-made disruptions on U.S. businesses*

A "Laboratory" for Policy Analysis

N-ABLE™ has been used to answer economic policy-related questions such as:

- Which industries and economic regions are affected most by an infrastructure disruption?
- How do infrastructure constraints or industry constraints prolong economic recovery?
- Are small firms hurt more than large firms? Which are most influential on economic stability?
- What are the most effective loss prevention and mitigation strategies for individual firms?

N-ABLE™ is currently being used to analyze the economic impacts of:

- Electric power and rail transportation disruptions on chemical supply chains;
- Transportation disruptions on the international operations of a "Fortune 150" company;
- Changes in power demand contracts on electric power system stability; and
- Optimized military supply chains.

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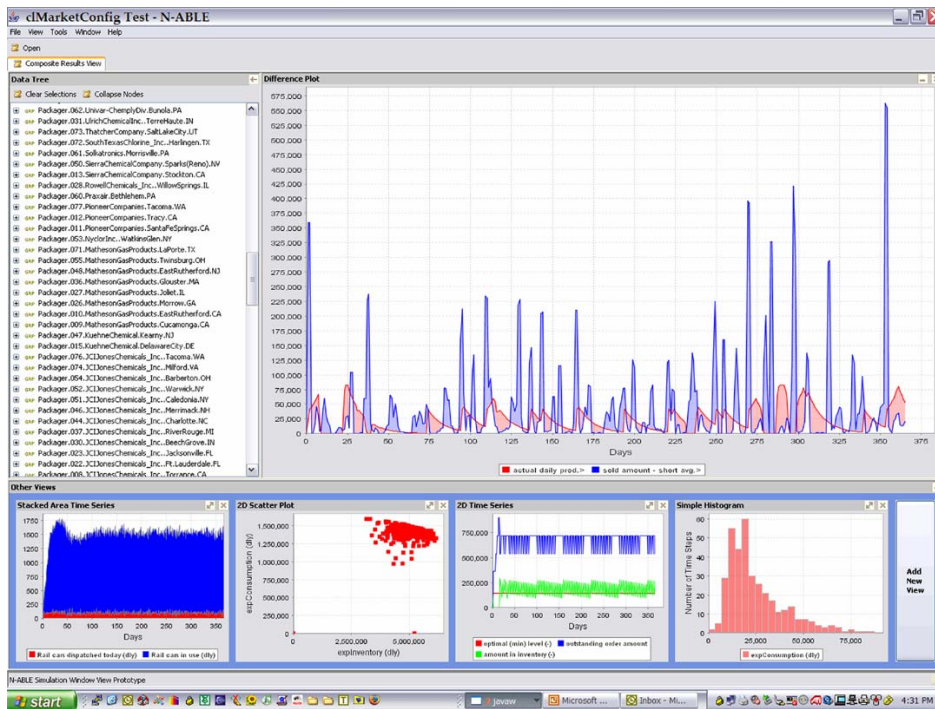
N-ABLE 2.0 simulation interface

Most recently, NISAC completed an N-ABLE™ analysis of a national chemical supply chain involving 3,000 firms, or an estimated 10,000 firm-level business decision makers (e.g., buyers, sellers, production supervisors).

Collaborating with industry and other subject matter experts, simulations were conducted of disruptions to the transportation infrastructure and regional electric power system.

Results indicated that if shippers could, in times of need, expedite orders at a cost to them, the supply chain would significantly benefit from (1) reduced in-transit chemical which can be targeted by terrorists, (2) reduced time to recover from disruption, and (3) lower on-site inventory levels.
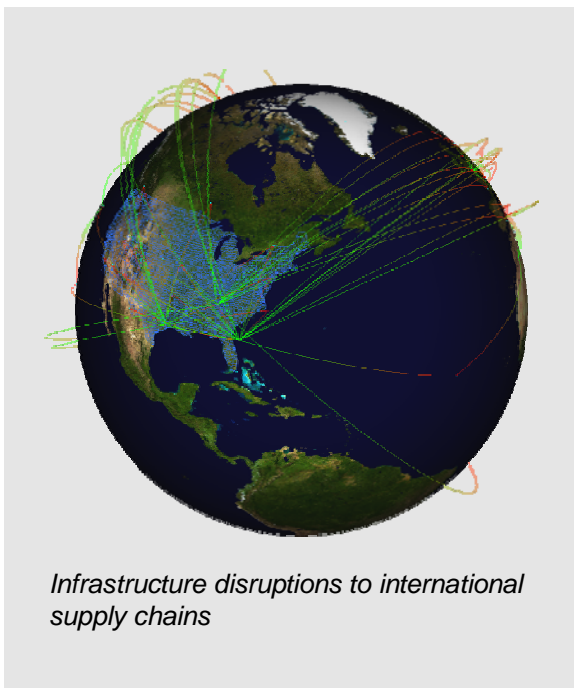
Infrastructure disruptions to international supply chains

Real-Time Collaborative Analysis

N-ABLE™ provides a rich simulation environment for nationwide, collaborative analysis. As NISAC analysts develop and conduct simulations, subject matter experts and stakeholders stationed across the country can view and share results in real time, conduct additional simulations and collectively synthesize and document analysis results.

Extended Features

N-ABLE™ is based on an extensible data-driven software architecture that allows for rapid development of new types of firms, households, and infrastructure; real-time distributed simulation with third-party transportation, electric power, and other network models; and "human in the loop" simulations, where analysts can participate in a simulation as some or all of the agents.

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