Transportation Network Routing Models

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ORNL has a staff with extensive experience in network modeling for freight and vehicle traffic on the highway, rail, and waterway networks in the United States. The modeling capability includes the ability to do intermodal routing analysis. The Oak Ridge National Highway Network contains approximately 500,000 miles of roadway in the US, Canada, and Mexico, including virtually all federal highways, rural arterials, and urban principal arterials in the US. Geographic accuracy is generally 100 m. It includes a large attribute set relevant to routing. The CTA Railroad Network is a representation of the North American railroad system that contains every active railroad route in the US, Canada, and Mexico. Corporate structure, a key to the simulation of routing, is explicitly temporal, allowing historical studies and comparisons. Supporting data on interlines and corporate ancestry allows the construction of routable networks for a specific target date. ORNL also uses the Corps of Engineers national waterway network to model movements of waterborne commerce. This includes navigable inland and coastal waterways, locks, ports, world-wide seaways, and the Commodity Flow Survey.

ORNL's extensive work for the U.S. Commodity Flow Survey and the Freight Analysis Framework allows us to model estimated freight flows throughout the network. Routing can be done by time, distance, or estimated cost.

ORNL's Capabilities

- Highway, rail, and waterway routing based on distance, time, or estimated cost.
- Ability to block geographic regions; highway, rail, or waterway segments; or highway, rail, or waterway intersections for alternative routing analysis.
- Model the flow of specific categories of freight over the highway, rail, or waterway.

Questions ORNL Can Help Answer

- What is the most efficient routing between two locations in the United States?
- What is a reasonable set of alternative routes if a segment of the transportation network is blocked?
- What are the comparison of costs for routing freight by highway, rail, or waterway?
- What additional travel times result from increasing traffic congestion along routes
- What are the effects of changes in transportation costs, demands, or policies?

ORNL's Comparative Advantage

- Experienced staff focused on solving the customer's problems
- Use of state of the art routing software coupled with optimization tools and detailed routing networks.
- Leverage our experience to provide increased value to the customer.
- Knowledgeable staff who provide unbiased analysis and recommendations

Experience

GeoFreight is a GIS based decision support tool that enables transportation planners to carry out activities in intermodal freight planning and policy making. It uses a routing model to assign data on freight flows to highway and rail segments in the U.S. transportation network. The volume of

freight flows are displayed on a map of the transportation system. It can be used to identify potential bottlenecks, measure the volume of use for specific transportation segments or areas, and examine domestic and international flows.
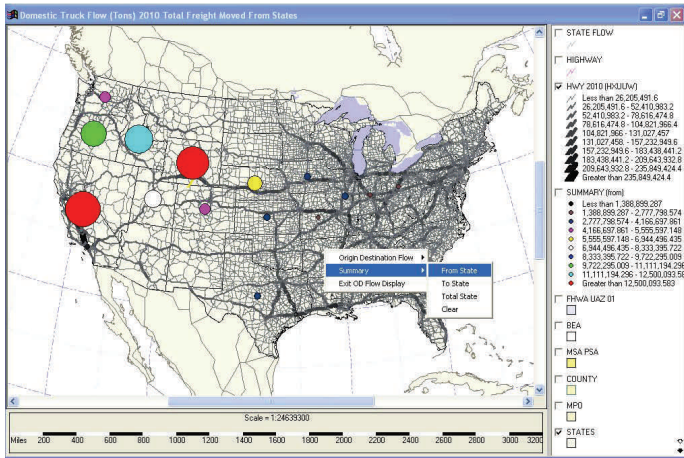

Origin Destination Flows *map. The user is able to examine the tons of freight that pass through the selected area from all states that use the impacted route.*

ORNL has done numerous studies for different government agencies on commodity freight flows. An example of this is a recent study for the Department of Homeland Security on the food supply chain. We used the ORNL freight flow analysis data to map flows of different commodities and determine the vulnerabilities in the supply chain.
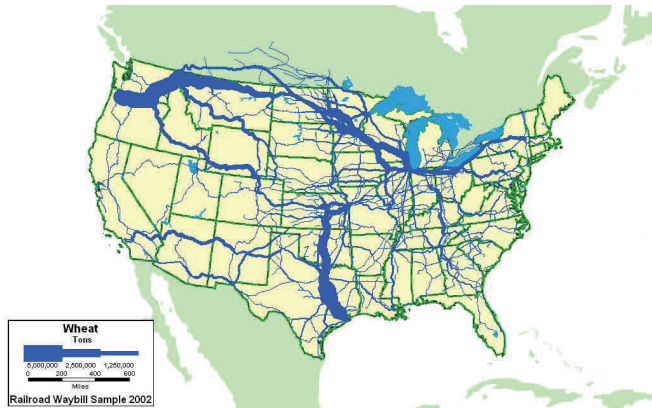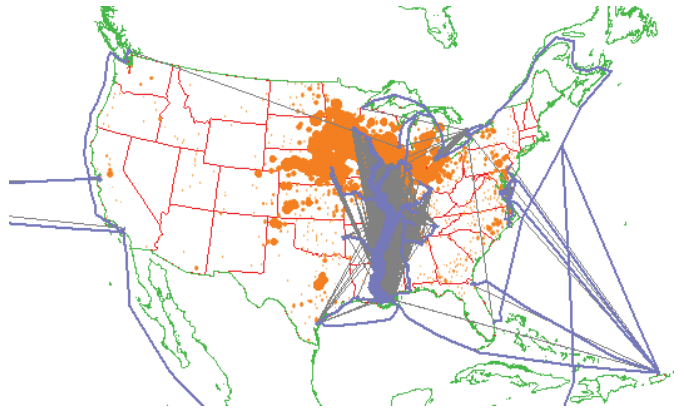

U.S. wheat shipments by rail.

ORNL has developed the MOBCON model for the National Guard Bureau to assist them in planning the routing and timing for their convoy movements in the United Sates.
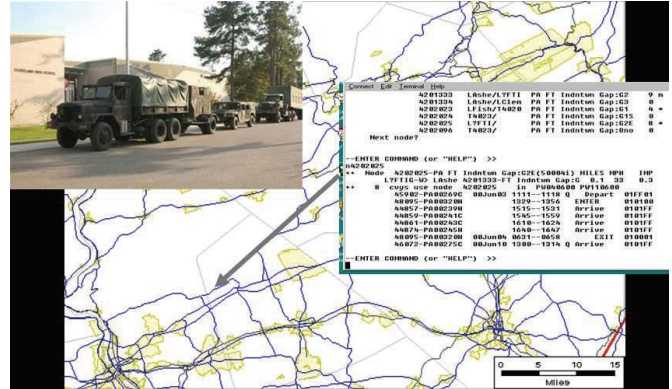
MOBCON Routing Model

Working with the US Army Corps of Engineers and the US Department of Agriculture, ORNL has developed a procedure for routing county-to-county commodity flows across the entire U.S. rail and waterway transportation networks and for estimating the truck drayage components of truck-rail and truck-water shipments.

Corn production by county and associated waterway shipments.