Using Advanced Modeling and Analytics to Plan for Supply Chain Resiliency

Center for Transportation Studies
22nd Annual Freight and Logistics Symposium:
Natural Disaster Disruption in the Freight System
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consulting & technology

What is Network Optimization Modeling?

- Mathematical approach to identify a "best" solution

- A common data analytics practice in private sector

  - Many firms use optimization to identify a network design that results in the lowest supply chain cost.

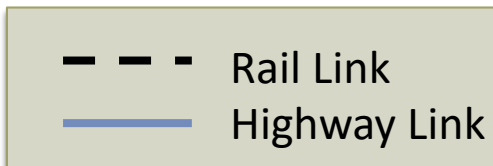 - Contingency or multi-objective optimization seeks to balance risk and cost in the supply chain

Base Case Network
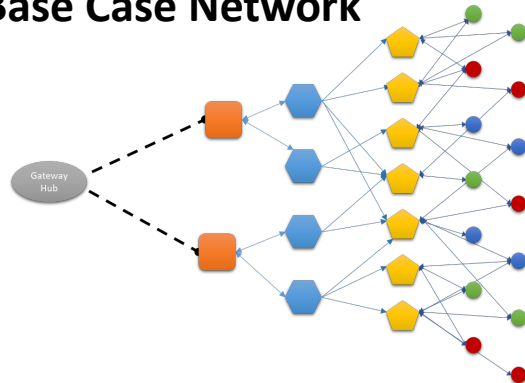
Disruption Case Network
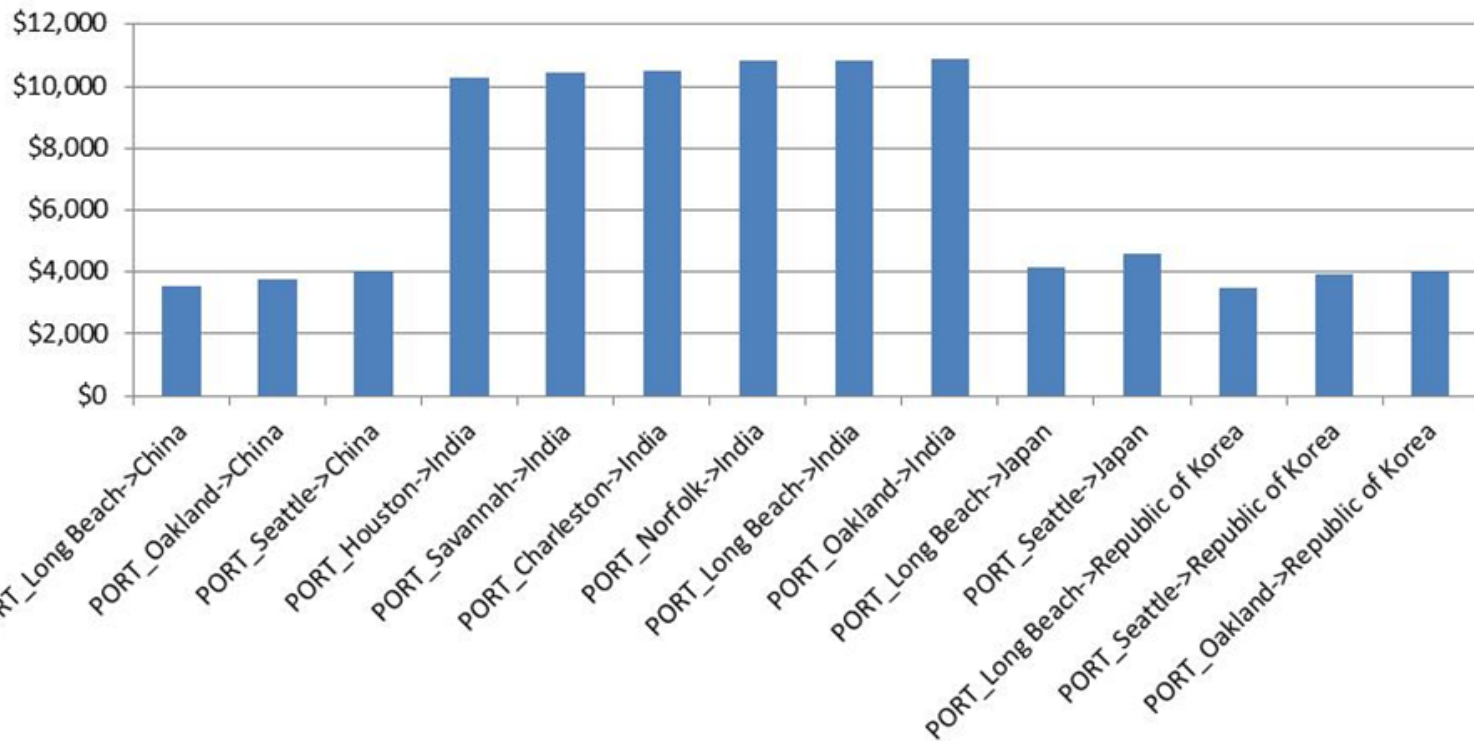
Rail Link
Highway Link
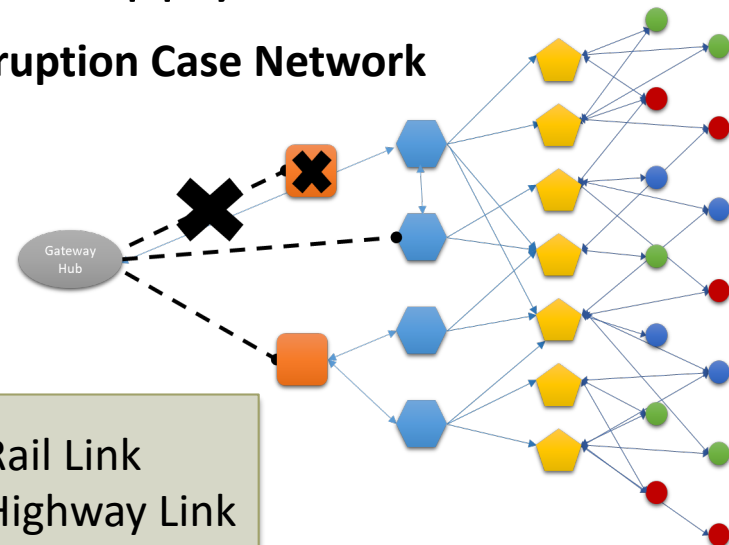
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Iowa Example

- The Iowa Freight Network Optimization Model (IFROM) was used to test several disruption scenarios:
  - Loss of the I-80 bridge over the Mississippi
  - Closure of I-80 between Grinnell and Malcom

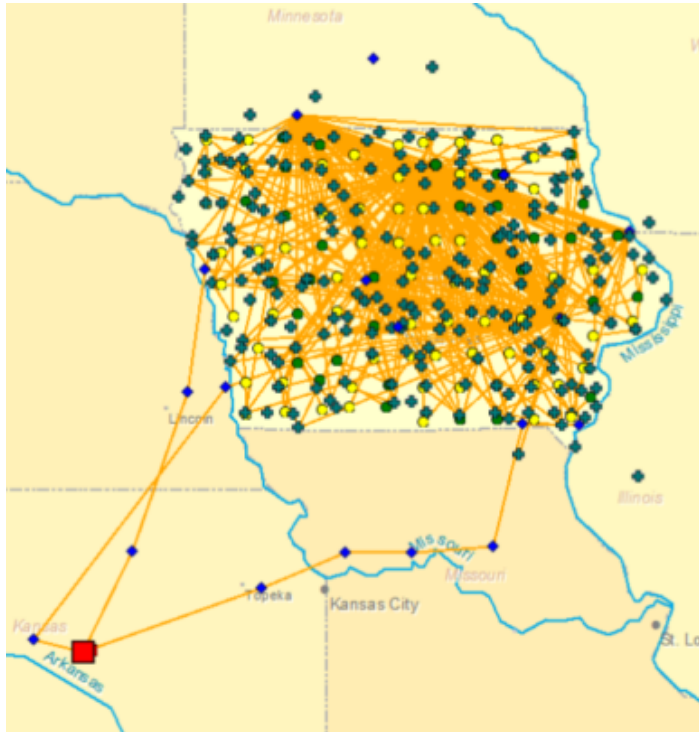| Scenario	# of Trucks Diverted	Additional Route Miles	Cost per mile	Annual Additional Cost	Probability of Closure*	Annual Risk
I-80 Bridge	2,784	6.97	$2.12	$15.33 M	0.13 days per month	$66,000
I-80 Closure	5,210	8.2	$2.12	$33.58 M	0.09 days per month	$100,000

* Closure probability was based on historical highway records

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Contingency Planning for Exports

Gateway Benchmark Costs for Moving Iowa Exports to Asian Markets

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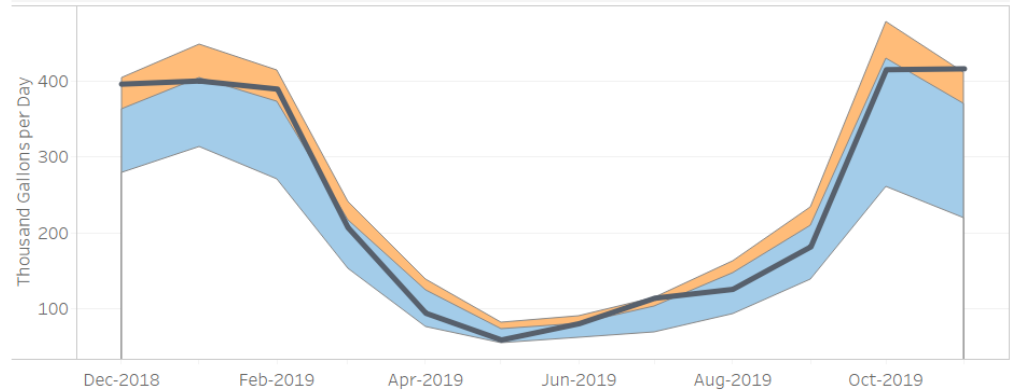# Iowa Propane Model

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National Research Activities

- NCHRP 20-125: Strategies for Incorporating Resilience in to Transportation Networks
  - Objective is to develop a toolkit to improve the resiliency of the multi-modal freight network at various geographic levels.
- Standing committee on Logistics of Disaster Recovery and Business Continuity

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