

## THE PROBLEM



CANA recognizes the growing complexity in logistics and supply chain operations for large-scale planning efforts. Ensuring rapid and efficient material delivery across multi-modal networks while addressing constraints like time, capacity, refueling, and vehicle limitations presents significant challenges.

## THE SOLUTION



The Distribution Network Model (DNM) is an advanced logistics solution leveraging an Ant Colony Optimization (ACO) metaheuristic. It enables swift and efficient movement of materials through multi-commodity, multi-modal network flows, including those involving transshipments. By balancing constraints such as time windows, vehicle capacity, and fuel availability, DNM ensures personnel and materials can be delivered on time, with minimal delays and unmet demand.

## UNIQUE IDENTIFIERS



### DNM is fast.

Proprietary algorithms allow DNM to generate feasible logistics plans in minutes for large and complex scenarios.

### DNM has flexibility.

Supports extensive customization of constraints and objectives, including time-sensitive delivery, vehicle routing, and commodity prioritization.

### DNM has efficiency.

Employs stochastic heuristics to find the best solutions with minimal undelivered commodities and late deliveries.

### DNM has scalability.

Handles extremely large-scale problems, including global logistics problems, across various time horizons and geographic constraints.



## Value

DNM enhances decision-making by enabling rapid, high-quality logistics solutions.

Users can:

- Experiment with various input parameters to explore trade-offs.
- Inform operational and strategic planning through actionable insights.
- Solve NP-hard logistics problems efficiently and at scale.

## USERS & APPLICATIONS



1

### Defense Logistics

Optimizes supply chains for military operations, ensuring mission-critical deliveries.

2

### Humanitarian Aid

Enhances disaster relief logistics by identifying optimal supply routes and positioning for rapid response.

3

### Strategic Planning

Aids planners in testing logistics scenarios, vehicle configurations, and sourcing strategies through experiments.

## USE CASES




### Humanitarian and Disaster Relief (HADR)

- **Scenario:** Supplies delivered from multiple locations in the U.S. to multiple destinations in the Caribbean post-hurricane.
- **Results:** Rapid, efficient planning for 26 vehicles (24 aircraft, 2 ships) over a 20-day horizon.


### Force Closure (PFC)


- **Scenario:** Complex global sourcing and delivery to multiple destinations in the Pacific.
- **Results:** Successful planning for long time horizons (45 days) with high-demand signals in a contested environment.


## CONTACT


**Margaret Hauser, PhD**   
Senior Operations Research Analyst

mhauser@canallc.com 

(919) 909-2269 

**Gregory Hauser, PhD**   
Senior Operations Research Analyst

ghauser@canallc.com 

(919) 909-7651 



*CANA is a business technology solutions company  
"Powered by CANA Analytics®." Our expertise  
provides logistics systems integration, applied  
analytics services & software solutions. CANA LLC  
strives to create an environment that allows our  
Team and Clients more time to focus on the things  
that matter most.*



(703) 317-7378



[www.canallc.com](http://www.canallc.com)



7371 Atlas Walk Way  
Gainesville, Virginia 20155

