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Background Inbound Transportation Network Cold-chain logistics refers to the transportation and handling of temperature Amazon Cold Chain Network Project Scope requirements that set this process apart. Shipper Go Hub Go Store Customer **Problem Statement** DC (Hub) Amazon Fresh Shipper Shipper Prime Now Inbound Optimization Methodology Objective Optimization Input Variables & Engine Constraints Calculate the routing plan • Pickup Zip Code from shipper to HUB • Delivery Zip Code Calculate the routing plan • Pickup Time Window Assumptions from HUB to receiving site • Delivery Time Window • Extra Truck Estimation • Temperature zone Funcion if no feasible • Unit counts

controlled products and it involves unique Amazon's current Freight Inbound (AFI) Network for Cold Chain delivery is dependent on third party shippers and managed by suppliers. This is not cost effective and prevents them from managing their inbound cold supply chain. Create an **AUTOMATED OPTIMIZATION TOOL** for inbound cold-chain transportation network that process the input variables, and generates the most cost efficient execution plan for inbound deliveries based on constraints. One DC (Hub), multiple shippers and receiving sites

- Static cost coefficients
- Single temperature zone per truck
- Uniform item dimensions across temperature zone
- Unlimited crossdock capacity
- Ideal transportation (No stops/traffic/accidents)



Truck Analysis :

The tool is able to find the optimal # of 16' & 53' trucks which saves delivery cost by over **40 - 60%**.

Utilization Analysis could be a good reference for resource allocation.

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• # of Available Trucks

Deliverable

solution



User Interface that allows for upload of a CSV File that contains shipping demand information and outputs the optimized routing schedule.



Display the initial demand on a map (order density)

Inbound Transportation Routing Logic



Executable Plan

- Optimize delivery route
- Calculate number of each type of truck
- needed • Find Total cost for each
- order
- Recommend alternative routing plan

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Amazon Lean Transporters 🕏			Home Ro	uting Tool Input	Routing Tool Outpu	t Project Background	Team De	liverables	Analysis			
		Routin	g Tool	Output								
To see the optimized output	schedule, enter the	name of the file	below. The fi	le name must matc	h the name of the	file in the S3 bucket exa	etly.					
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record_id 0	arrive_earliest 2020-09-18 00:00:00	arrive_latest 2020-09- 18 00:00:00	pickup_zip 98032	depart_earliest 2020-09-20 20:53:00.000	depart_latest 2020-09-21 20:53:00.000	arrival_if_leave_now 2020-09-21 00:00:13.340	destination_zip 98642	truck_id	truck_type	unit_count 0	temperature Banana	cost 179
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Display optimized shipping routes

It is accessible to us and easy to validate. It can deal with temperature constraints and the parameters used are applicable to the model we made.

Our

Optimize we

One temperation Specific time pick-up and

No addition on specific trucks shoul

One truck pe





Validation Process

Compared our results against the results from RoOT (Route Optimization Tool) developed by VillageReach and the ISE Department at University of Washington.

Why RoOT?

Model Comparison

Model	RoOT
eekly plans	Optimize one-day delivery
rature per truck	Multi-temperature per truck
e windows for drop-off.	No time window constraint within the one-day interval.
al constraint number of Id be used	One constraint is trying to enforce all the available trucks to be used
er route	One truck for multiple routes

 9 Scenarios using different input datasets and having different numbers of available trucks

• Due to the difference in the constraint, our model's results are better (shorter time) than the RoOT model

Impact

With the tool that we created:

• Users will have better sense of their plans and transportation process. • Amazon will make better decisions about their cold

chain transportation. Ensure products are delivered on-time and within

their temperature range. • Reduce costs by 40 - 60%, which will allow

affordable access.