

Thank you !

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Amazon



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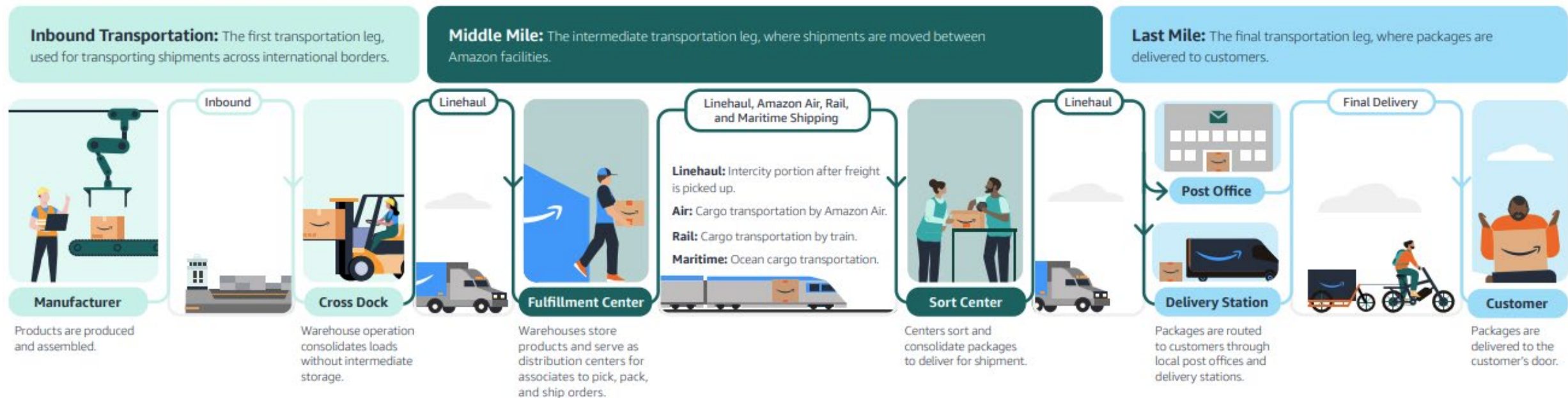
Introduction

Vision:

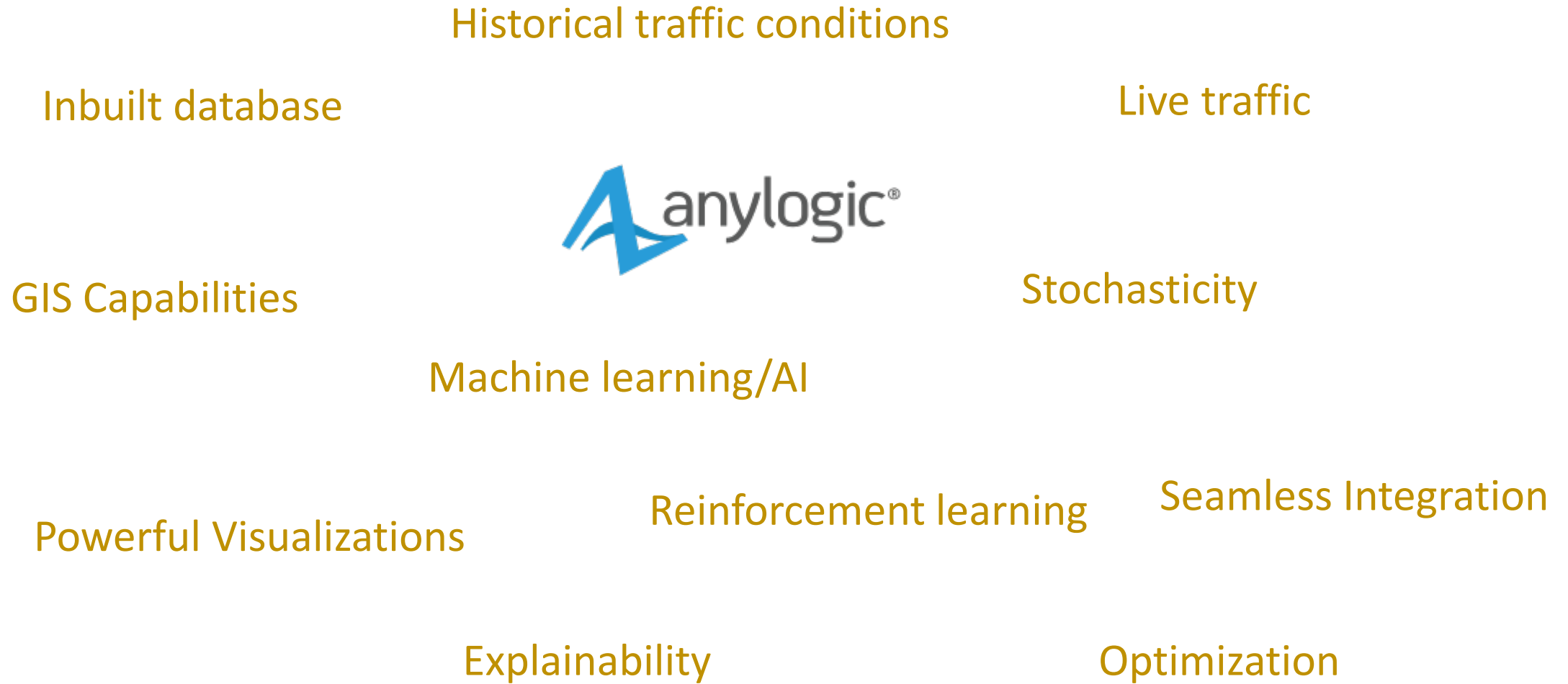
To build a modeling tool that is designed to solve complex planning and execution of network level problems which improves the overall network efficiency without compromising the speed.

Mission:

The art of combining various modeling approaches like simulation, Machine learning/AI, optimization to create a real-time decision assist and strategy evaluation platform.

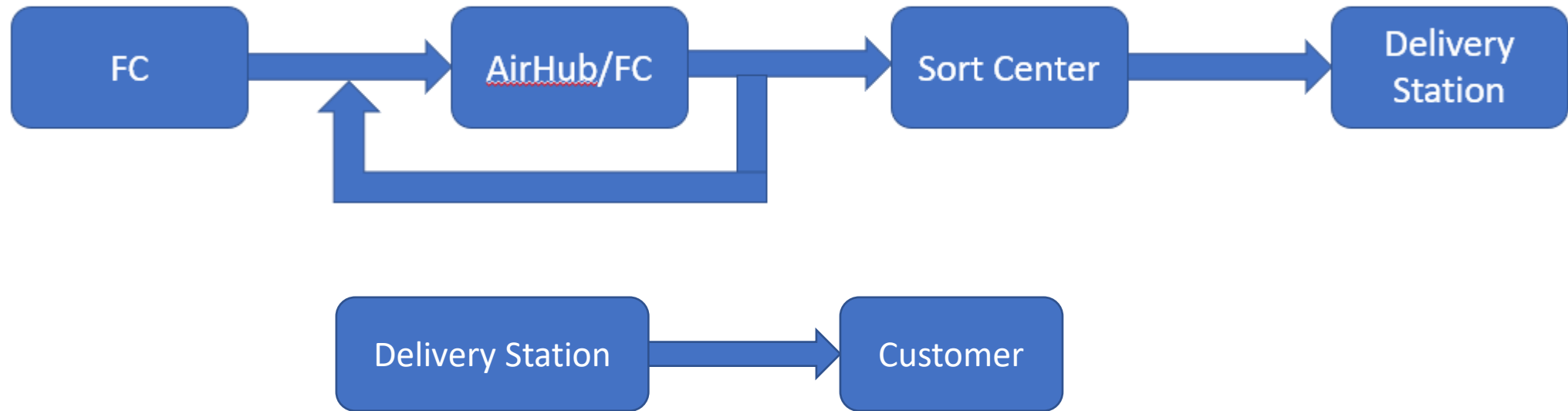


Why Anylogic ?



Current Models

We currently have the following middle/last mile models that helps us compare the current and hypothetical scenarios on a network level.



Current Models – Focus areas

NFS built capabilities in modeling 3 major areas,

1. Facility location problem for Grocery stores
2. Network topology and Placement strategy evaluation
3. Last mile route planning

Simulation models	Data Requirement	Solution Methodology	Run time
Facility location problem	In-built database, on-demand data pull for GIS data	Deep Reinforcement learning	Training – 24 hours Run time – 1.5 seconds
Network topology and Placement strategy evaluation	Data layer in redshift, on-demand data and in-built database	Heuristic Algorithms	Approximately 2 hours
Last mile route planning	In-built database, on-demand data pull for GIS data	Optimization engine	20 seconds per route

Facility location problem

Goal: To perform greenfield and brownfield analysis to optimally locate the Amazon grocery stores to fulfill the yearly demand
Objective: To minimize the overall travel time and meet the SLA of less than an hour



Network topology and Placement strategy evaluation

Goal: To conceptualize and evaluate network level strategy of placing high velocity products closer to the customer.

Overview:

Divide the entire network into multiple regional clusters

Categorize the products into high velocity and low velocity based on local demand

Categorize the FCs into high velocity and low velocity to fulfill the respective demand

Motivation:

- In Southern California region, during the peak week of 2021 the demand is fulfilled from far away region is contributing to more miles traveled in the network.
- Similar pattern is observed during the peak week for other regions like Texas, New York
- On an average distance the traveled by a package from close by FC to DS is significantly lesser than the distance traveled by the package from far away FC to DS.

Why do we have such long-haul fulfillments ?

Is there a better network level strategy ?

How can we leverage network topology and placement decisions to improve efficiency ?

Network topology and Placement strategy evaluation



Amazon Presents

Network topology and Placement strategy evaluation

Middle mile - Fulfillment Center to DeliveryStation

Last mile – Route Optimization

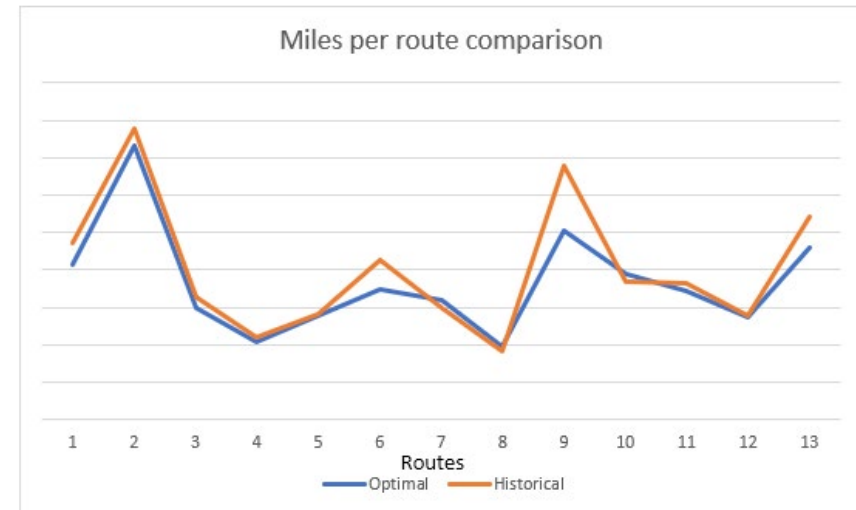
Goal: To improve the efficiency of a Delivery station i.e. reducing the miles driven per route, per package thereby minimizing the transit time of package delivery.

Overview: To simulate a day of volume for a Delivery station for pure residential routes for the current and optimal scenarios. We tried to see if there is any improvement opportunities in our current planning without adding more resources

Take away: The optimal solution with same amount of resources improves the Miles per route to about 9%

Next Steps:

- Try meta-heuristic to solve the CVRPTW
- Extend the model for commercial + residential deliveries
- Solve the clustering problem Package -> Van assignment
- Predict the number of routes



Questions and Thoughts

