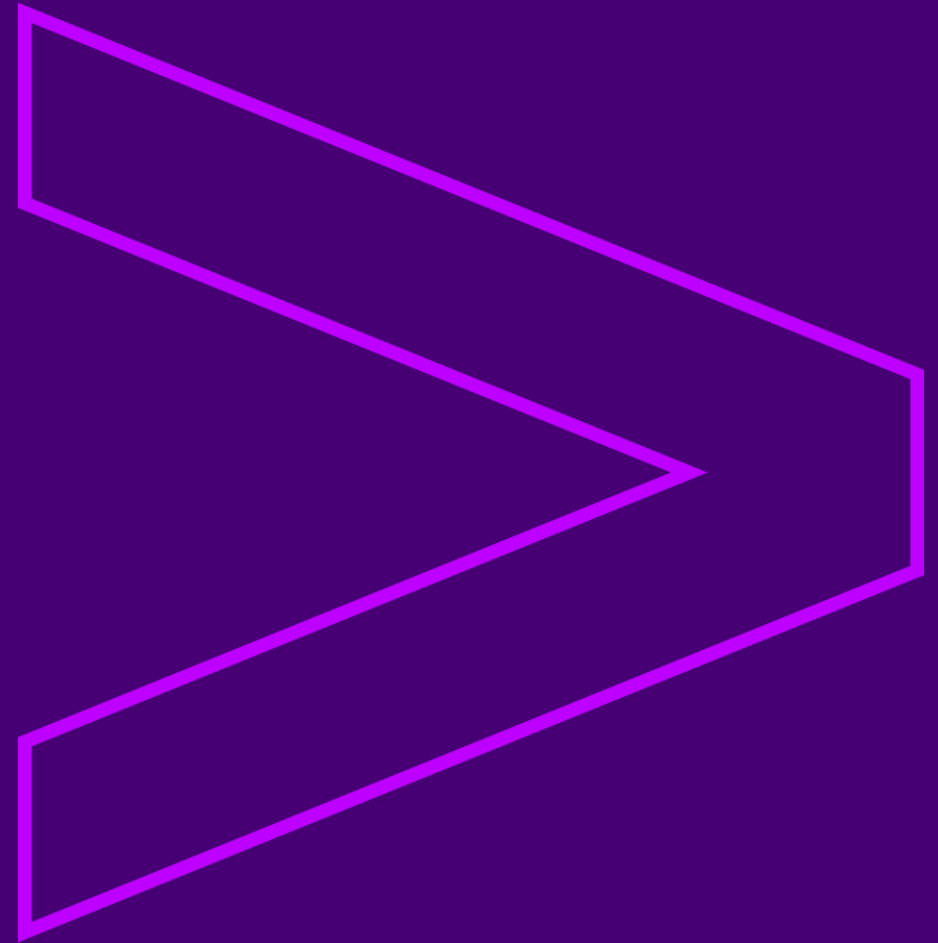


SUPPLY CHAIN DIGITAL TWIN

AnyLogic Conference 2021

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ONCE UPON A TIME...



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AI Is Everyone's Business

IN OUR ARGENTINA AI DIVISION WE SPECIALIZE IN SUPPLY CHAIN & OPS ANALYTICS

Intelligent Planning



Demand Forecasting



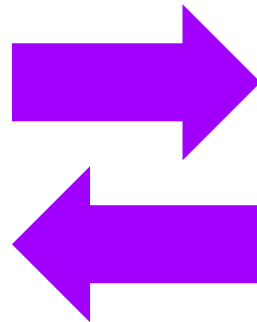
Inventory Optimization



Network Optimization



Routing Optimization

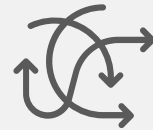


Digital Twins

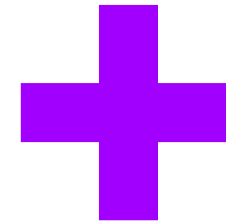
Complex Systems

Uncertainty

Expensive Decisions



What If Scenarios



Intelligent Execution

Intelligent Decision-making

Uncertainty

Act Now

Reinforcement Learning



Supply Chain



Warehousing,
Robotics &
Automation



Manufacturing



THE GOOD STUFF



CLIENT WANTED TO PREDICT THEIR **SUPPLY CHAIN BEHAVIOR** AND ENABLE AN **INTELLIGENT EXECUTION**

Our client is an exercise equipment company based in United States. The **main products are stationary bicycles.**

During the COVID-19 outbreak, customer's **sales increased dramatically**, taking the supply chain to its limits. This resulted in **long delivery times to customers.**

Main questions to be answered:

PLANNING



What is the expected **Order To Delivery** time for any given new order within the planning horizon?



What **throughput** should we expect through any given location within the 12-month planning horizon?



What is the expected **inventory** at any location?

EXECUTION



What **inventory levels** should I plan to **fulfill** and from **where**?



Given latest delay status of orders, should I **reroute** inventory arriving within 5 days to the port to different DCs?

WE PROPOSED A **NON-TRADITIONAL APPROACH** THROUGH THE DEVELOPMENT OF A **DIGITAL TWIN**

FOCUS AREAS

1

Predict Order to Delivery

2

Develop smart Inventory Allocation solution

WHY A DIGITAL TWIN?



Provide Explainability



Embrace Uncertainty & Risk



Enable What Ifs

	Scope		
Product & region	3 Products	10 SKUs	US Regions
Supply chain network	4 Manufacturing Sites	11 DCs	~150 Last Mile Locations

THE INITIATIVE BROUGHT 43% IMPROVEMENT IN ACCURACY AND 5\$YM IN ANNUAL SAVINGS

FOCUS AREAS

1

Predict Order to Delivery

8 weeks →

- OTD Forecast Accuracy: **+57%**
- Manual Effort Reduced To: **30 minutes weekly**
- Lead Time ETA Accuracy: **+90%** (from 40% to 76%)

2

Develop smart Inventory Allocation solution

+5 weeks →

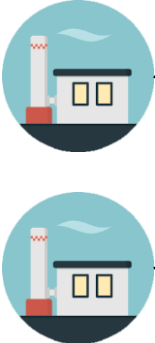
- Logistics Cost Reduction: **-20%** or **\$5M in annual savings**

The COOL Stuff

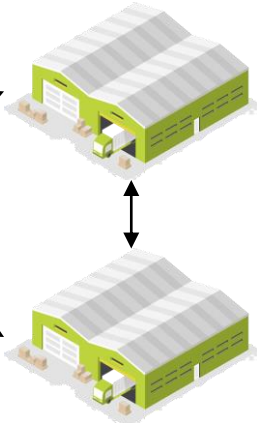


NETWORK

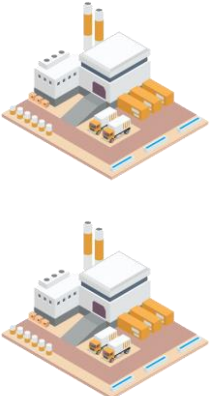
VENDORS



DCS



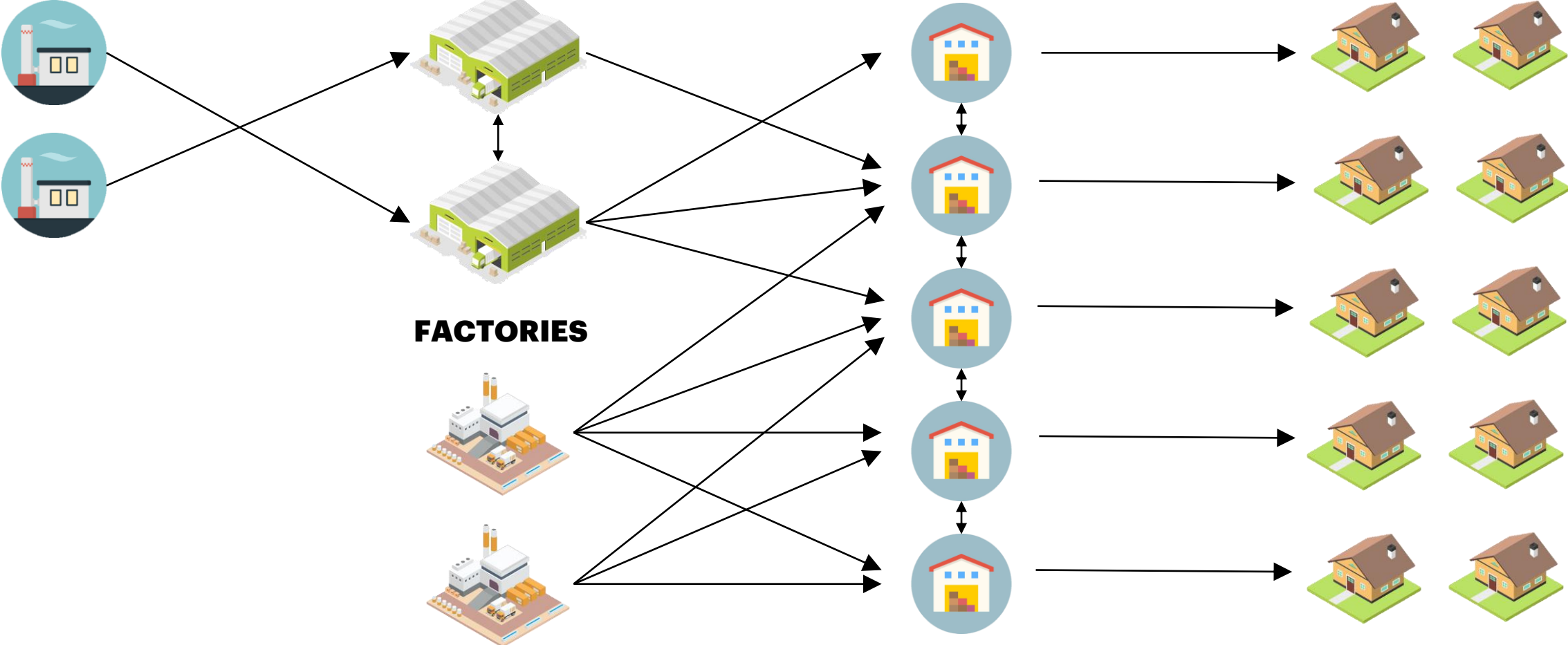
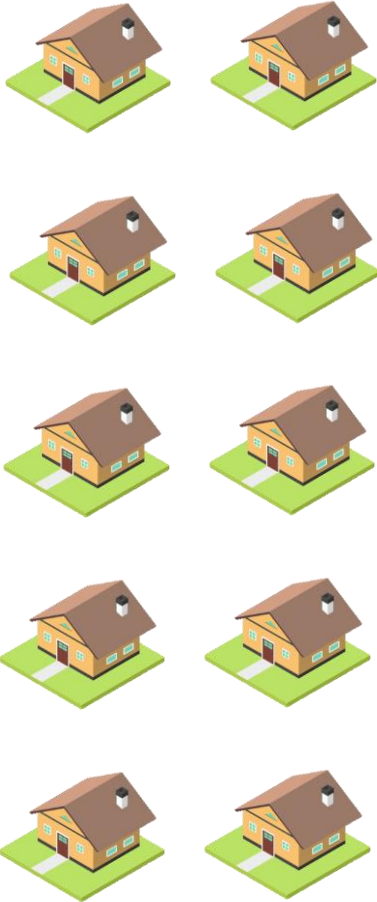
FACTORIES



FINAL MILE SITES



MEMBERS



THE MODEL

The discrete event model replicates the entire supply chain considering all nodes from vendors through final mile locations that deliver to customers.



ORDER

- Order creation date
- Product
- Node
- Order delivery date



NODE

- Location
- Type (Vendor, DC, FM)
- Inventory
- Processing times

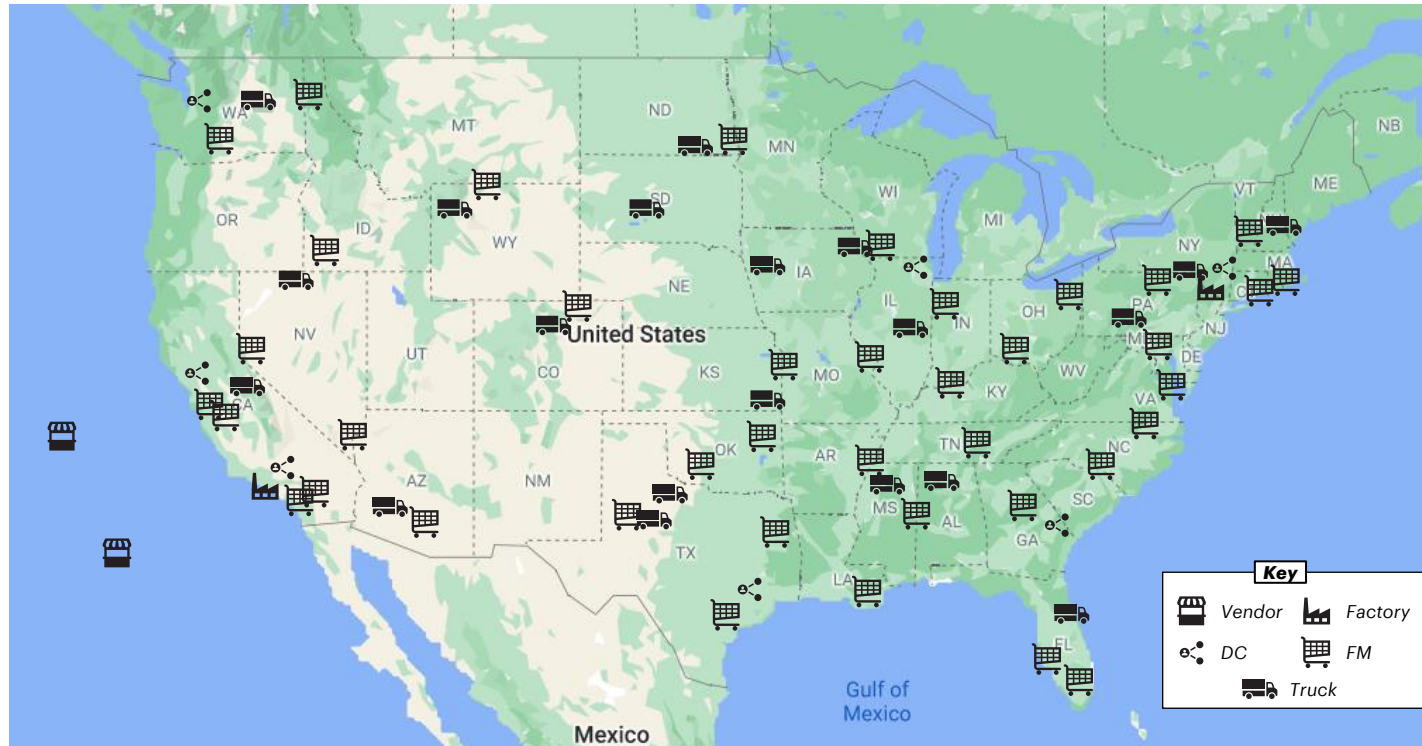


TRUCK

- Capacity
- Leadtime

KEY INPUTS

- Location Master (Manufacturing, DC's, Final Mile)
- Location IB/OB Max. Capacity
- Inventory Position & Order Backlog
- Days of Supply Targets
- Lead times between nodes
- Demand Forecast
- Production Forecast

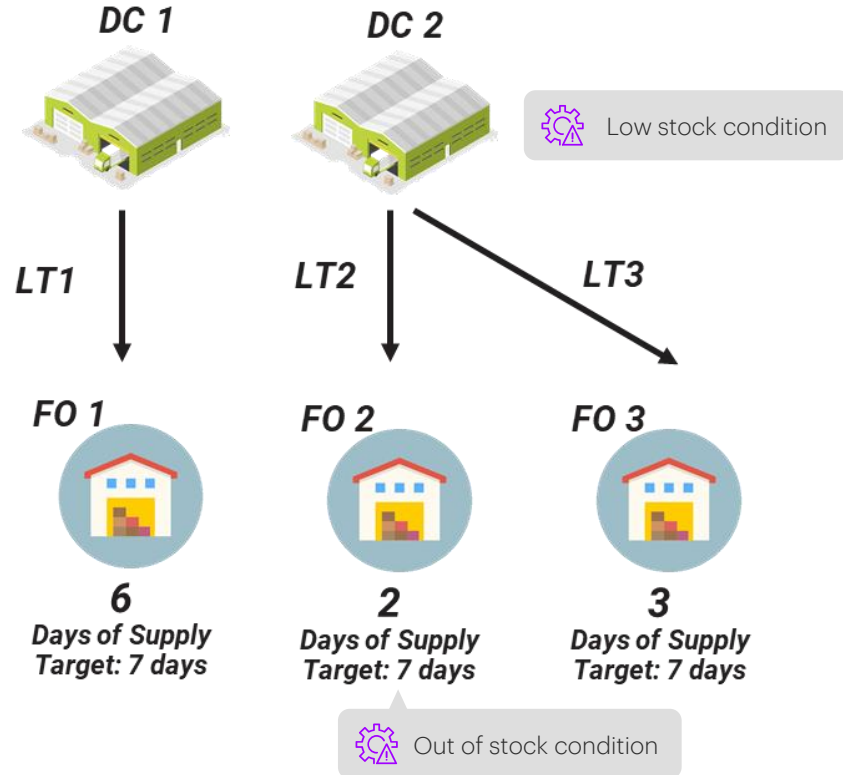


KEY OUTPUTS

- Forecast OTD, at Order Create Date by Final Mile Site
- Order Backlog, by Final Mile Site
- Inventory Position, by network node
- Resource utilization / Van requirements

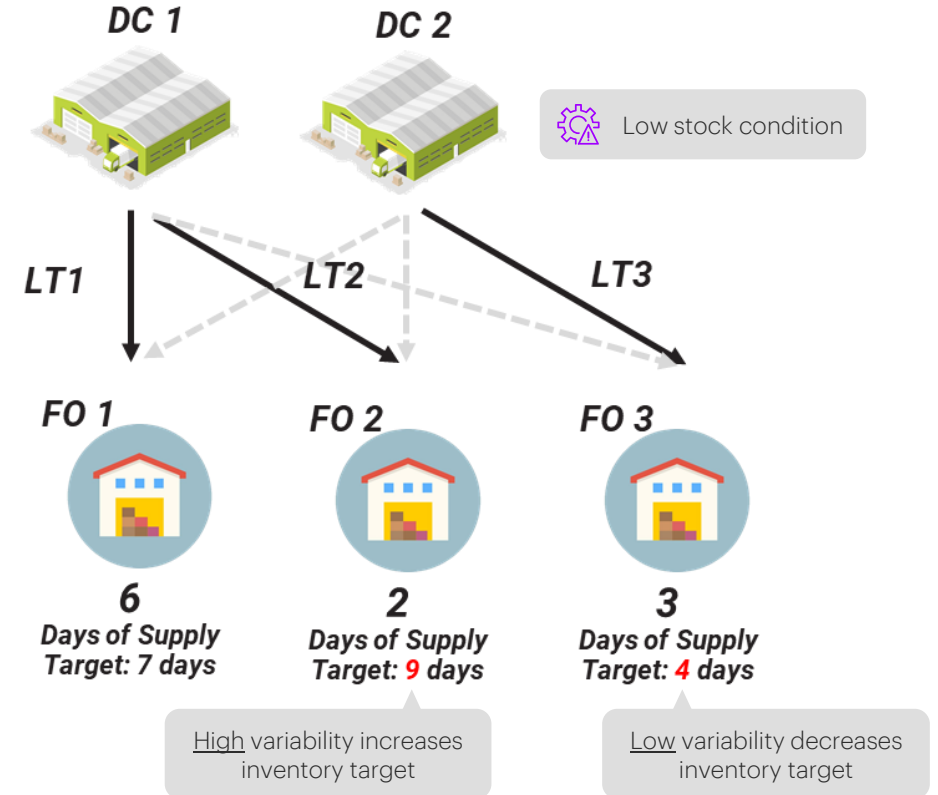
ALLOCATION MODEL

CURRENT STATE



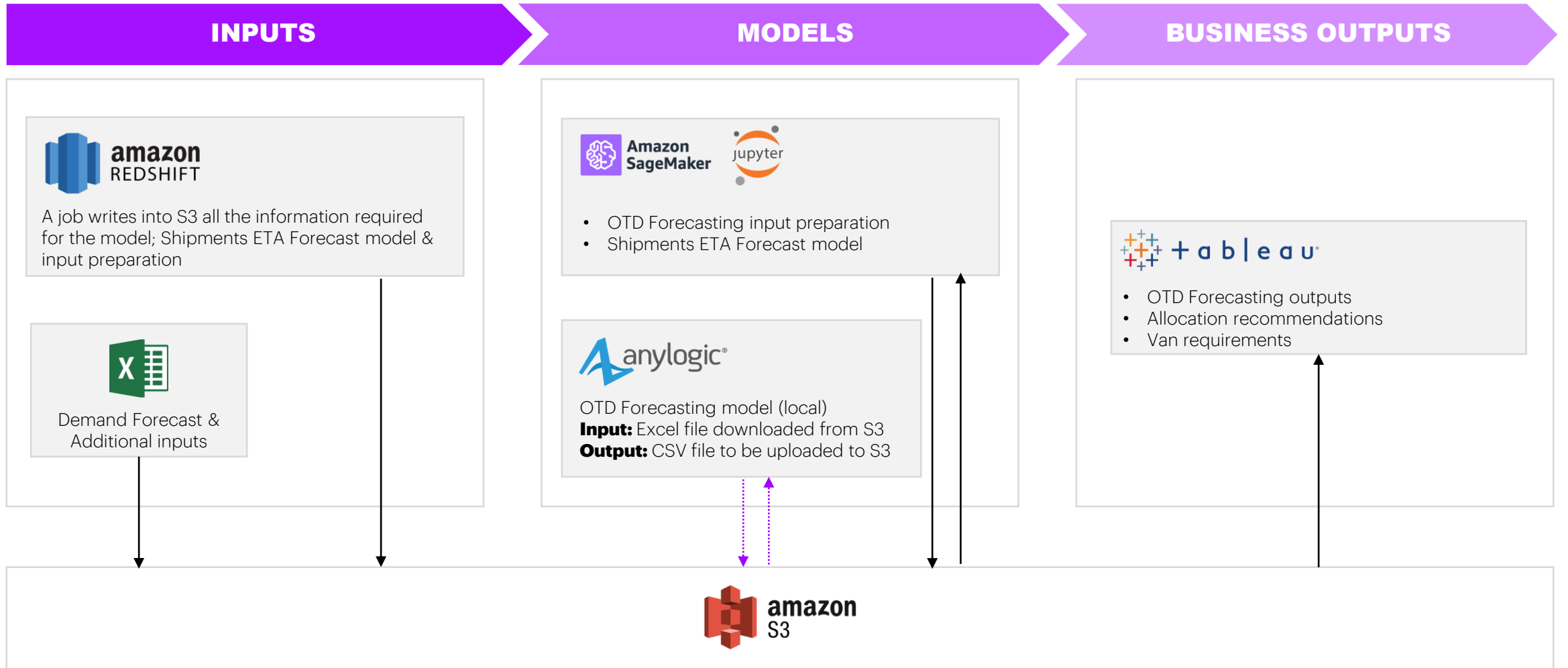
- Static view of required inventory at each final mile node and parent replenishment DC's
- In-optimal outcome resulting in a stockout for FO2

OPTIMIZED BY HEURISTIC



- Evaluates **required inventory** at each final mile node separately, reducing the need at FO3
- Re-assigns parent replenishment DC as needed, replenishing FO2 from DC1

INFORMATION FLOW



→ Manual
→ Automated

The REAL Stuff



PARTICIPATION FROM THE BUSINESS WAS KEY TO SUCCESS BUT WE STILL HAD OUR CHALLENGES



Engagement from the business

The digital twin has a direct impact on various areas of the company. Some of the teams were more resistant to implementing new ways of working



Missing data

In several cases we came across missing or incomplete information. We had to make certain assumptions to complete the data.



Missing & Undefined logics

Certain logics were not standardized or unclear. The digital twin allowed us to complement these cases with assumptions.



PROJECT

WE HAVE SET **DIGITAL TWIN AT THE CORE OF THE SUPPLY CHAIN AND WE NOW HAVE THE POSSIBILITY OF SPAWNING **MULTIPLE USE CASES AND DECISIONS** FROM IT**

- **DYNAMICALLY MAP DELIVERY ZONES**
- **CAPACITY PLANNING**
- **PRODUCTION PLANNING**
- **WORKFORCE PLANNING**
- **REVERSE LOGISTICS PLANNING**
- **PEAK STRATEGY & PLANNING**
- **TRANSPORT OPTIMIZATION**
- **INBOUND / OUTBOUND REDESIGN**



**Thanks for
your time!**