Transportation optimization

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Webinar Agenda

• Transportation challenges
• Routes Optimization
  – Milk Runs
  – Experiment settings
• Transportation System Simulation
  – Service level influence
  – Fleet size
  – Capacity utilization
• Summary
• Q&A session
Transportation Challenges

• How to organize the transportation system? How should it work?
• What are the optimal routes?
• Which resources do we need to run transportation system?
  – Fleet, capacity, drivers, shifts...
• How to improve the efficiency of existing transportation system?
• What is the service level we will be able to provide to the customers?
• What is the cost of transportation system? How to cut it?
• How the transportation system influence the rest of the supply chain?
• What if we introduce innovation in the transportation system?
• How the real world stochastic effect the transportation?
• ...

Routes Optimization
Routes optimization (Milk Runs)

- Identifying routes that can increase truck utilization and reduce logistics costs
- Restrictions:
  - No restrictions
  - Fleet restrictions
    - Fleet size
    - Vehicle capacity
  - Time windows

80m³ x 4

Distribution center

Customer

4:00PM – 9:00 PM

64m³

Customer

4:00PM – 9:00 PM

25m³

Customer

7:00AM – 9:00 AM

61m³

Customer

9:00AM – 6:00 PM

Customer

1:00 AM – 1:00 PM

Customer

11:00AM – 3:00 PM

Customer

10:00AM – 1:00 PM

Customer

8:00AM – 1:00 PM

Customer

Shipping time: 06:00AM

78m³

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Transportation Optimization (TO) Experiment

- Finds an optimal set of routes (milk runs)
  - Independent solution for each Site and Vehicle type
  - If vehicle type is not specified – default one is used

Vehicle types

<table>
<thead>
<tr>
<th>#</th>
<th>Name</th>
<th>Capacity</th>
<th>Capacity Unit</th>
<th>Speed</th>
<th>Speed Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Reefer 1</td>
<td>35</td>
<td>m³</td>
<td>Triangular(40:80:50)</td>
<td>km/h</td>
</tr>
<tr>
<td>2</td>
<td>Reefer 2</td>
<td>27</td>
<td>m³</td>
<td>Triangular(40:80:50)</td>
<td>km/h</td>
</tr>
<tr>
<td>3</td>
<td>Reefer 3</td>
<td>15</td>
<td>m³</td>
<td>Triangular(40:80:50)</td>
<td>km/h</td>
</tr>
</tbody>
</table>

Site 1, Reefer 1 → Set of routes 1
Site 1, Reefer 2 → Set of routes 2
Site 1, Reefer 3 → Set of routes 3
Site 2, Reefer 1 → Set of routes 4
Site 2, Reefer 2 → Set of routes 5
Site 2, Reefer 3 → Set of routes 6
Transportation Optimization (TO) Experiment

• Finds an optimal set of routes (milk runs)
  – Independent solution for each Site and Vehicle type
  – If vehicle type is not specified – default one is used

• Solves a problem considering the road network or the distance between objects

• Additional (Scenario) constraints:
  – Vehicle type capacity
  – Customer time windows
  – Site earliest shipping time
  – Full truck load coefficient
• User restrictions
  – Max amount of customers on a route
  – Max segment length between objects
  – Returning segment length
TO Experiment Settings: Shipment

- Observation period: 1 month (30 days)
- Shipments are delivered every 10 days
  - Observation period is divided into 3 intervals
- Demand is aggregated for each of intervals
- Each 10 days shipment with aggregated customers demand is delivered
- Experiment will find independent solutions for each Site, Vehicle type and Shipment
• Distribution center
• Clients
• Vehicle capacity: 80 m³
• Fleet size: 4
• Time windows
• Shipment time
Transportation System Simulation

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Transportation System Modeling

Analytical model

Optimization

Transportation system
- Time (mean)
- Demand
- Vehicles (mean speed, volume)
- Timings (delivery, processing, ...)
- Transportation logic/processes
- Randomness

Optimal routes considering:
- Vehicle types
- Capacity
- Time windows

Supply Chain - ACTUAL

Simulation model

Simulation

Transportation system
- Time (dynamics)
- Demand
- Vehicles (speed, volume)
- Timings (delivery, processing, ...)
- Transportation logic/processes
- Randomness

Fleet utilization
- Vehicle type utilization
- Fleet size
- Transportation costs
- Service level

Results
Summary

• Analytical methods are well equipped to handle large scale transportation optimization problems
  – Routes optimization considering time windows, capacity, fleet size

• Dynamic simulation captures all the specifics of transportation enabling you to measure all the characteristics
  – Fleet size, service level, capacity, utilization, shifts ...

• Analytical and simulation methods complement each other for precise end-to-end supply chain transportation analysis

• anyLogistix combines both methods, allowing you to easily switch from one to another
Upcoming events

April 17-18, 2019 – The AnyLogic Conference - Austin, TX, USA
April 30, 2019 – anyLogistix webinar "Supply Chain Risk Analysis"
May 29-31, 2019 – APAC, seminar and training, Seoul, South Korea
June 11-14, 2019 – anyLogistix seminar and training, Birmingham, UK
June 18, 2019 – Digital Supply Chain Design, Bangalore, India
June 18-20 – anyLogistix training, Bangalore, India