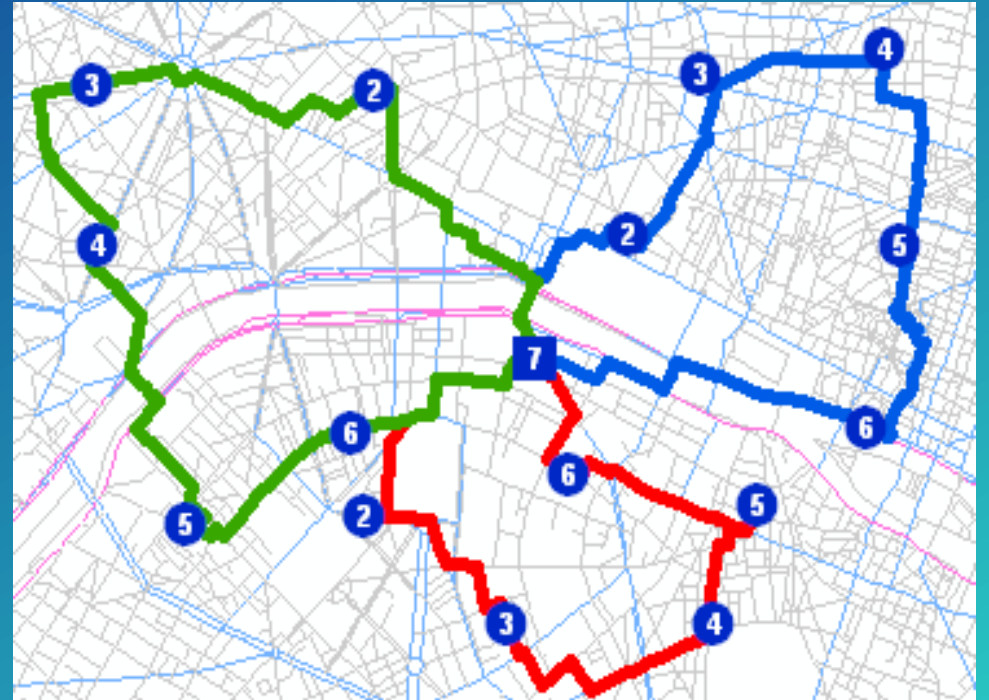# Fleet Routing with the VRP Solver

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Outline

- Vehicle Routing Problem
- Basic Modeling Options
- Demos
  - Multiple-Capacity Routing
  - Incremental Assignment
  - Multiple-Day Routing

Fleet Routing with the VRP Solver

Vehicle Routing Problem
What is it?

Given the business rules, assign several stops to many routes and sequence them in the least-cost way

1. Account for constraints

2. Assign orders to routes and sequence them

3. Minimize operating costs

Fleet Routing with the VRP Solver

Vehicle Routing Problem

How can I use it?

	ArcMap	ArcGIS Pro	ArcGIS.com	Route Planner	Custom App
Ready-To-Use VRP Service	?	?	?	?	?
User Published VRP Service	?	Coming Soon	N/A	?	?
Solve VRP Geoprocessing Tool	?	? New in 1.4	N/A	N/A	?
Network Analyst VRP Layer	?	Future	N/A	N/A	?

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Basic Modeling Options
Problem Inputs

- Orders
- Depots
- Routes
- Breaks
- Specialties
- Zones
- Seed Points
- Renewals
- Order Pairs
- Barriers

Unassigned Orders
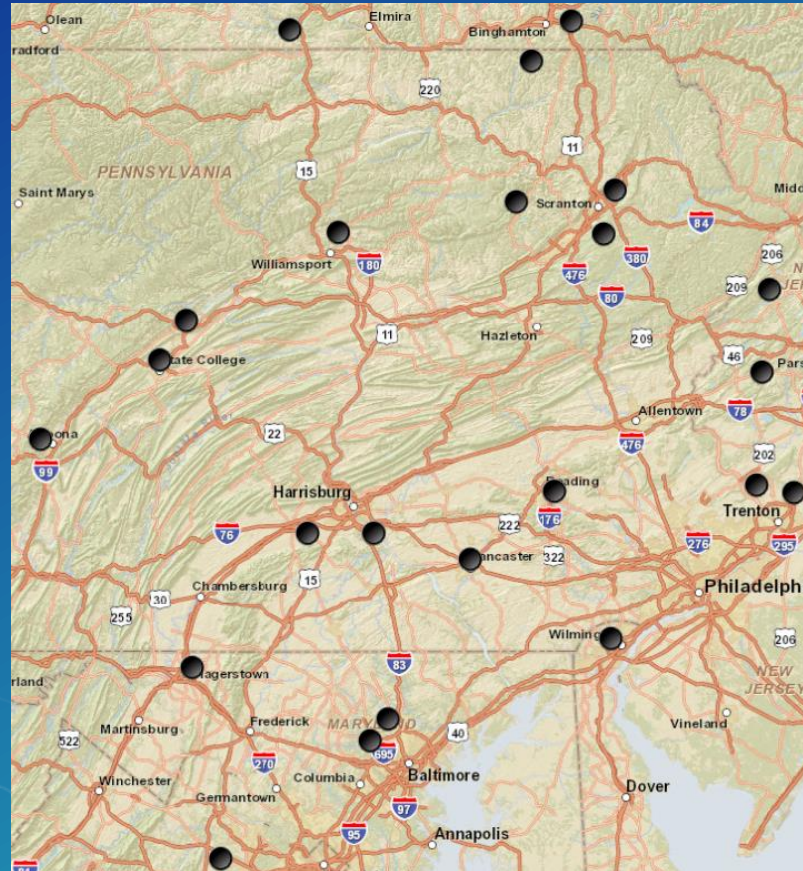
Least-Cost Solution

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Home Appliance Delivery Demo
Multiple Capacity Routing

- Delivery, Pick-up, and exchange of large appliances

- Cost per hour and cost per mile

- Constraints:
  - Truck capacity: volume and weight
  - Truck cannot make U-turns
  - Truck must park on correct side of the street for residential customers
  - 10-hour workday and lunch breaks
  - 2-hour or 4-hour appointment times

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Home Appliance Delivery Demo
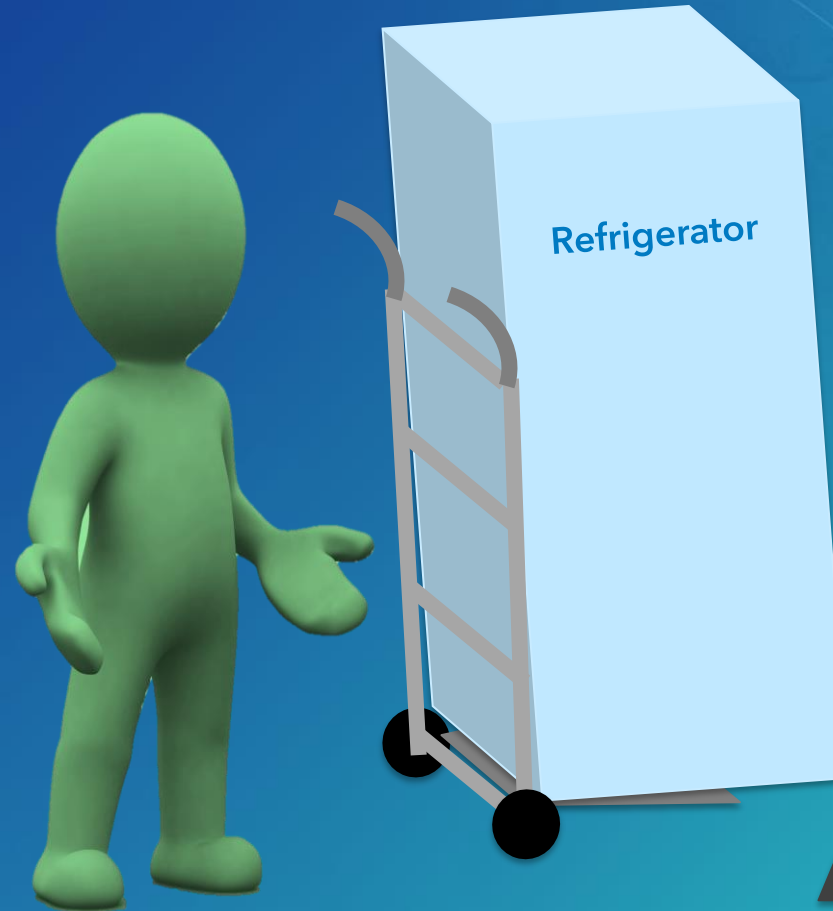
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Home Appliance Delivery Demo
Re-cap

- Pickup and Delivery
- Multiple Capacities
- U-turns and Curb Approach
- Time Windows
- Breaks
- Balancing Work Loads

Refrigerator

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Health Inspection Demo
Incremental Assignment and Multiple-Day Routing

- Inspect clinics and hospitals

- Certain clinics and hospitals are overdue for their yearly inspection and so must be visited this week

- Inspections spread across one week

- Clinics/hospitals open only during certain days or times
  - Any afternoon
  - Monday only
  - Monday, Wednesday or Friday
  - Tuesday or Thursday except during lunch hour

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Health Inspection Demo

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Health Inspection Demo
Re-cap

- Required/Additional Stops
- Multiple Days

Modeling VRP Summary
What to take away

- Flexible modeling

- Lots of optional inputs to match your business needs

- Progressively increase complexity

- May involve post-processing or solving a series of VRP instances

Fleet Routing with the VRP Solver

Resources
Try it!

- Tutorial: http://desktop.arcgis.com/en/arcmap/latest/extensions/network-analyst/about-the-network-analyst-tutorial-exercises.htm

- Vehicle routing problem properties:
  http://desktop.arcgis.com/en/arcmap/latest/extensions/network-analyst/vehicle-routing-problem.htm

- Community: https://geonet.esri.com/community/gis/analysis/network-analyst

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