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
Vehicle Routing Problem
How can I use it?

<table>
<thead>
<tr>
<th>Feature</th>
<th>ArcMap</th>
<th>ArcGIS Pro</th>
<th>ArcGIS.com</th>
<th>Route Planner</th>
<th>Custom App</th>
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<tbody>
<tr>
<td>User Published VRP Service</td>
<td>?</td>
<td>Coming Soon</td>
<td>N/A</td>
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<td>Solve VRP Geoprocessing Tool</td>
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<td>Network Analyst VRP Layer</td>
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<td>Future</td>
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Fleet Routing with the VRP Solver
Basic Modeling Options

Problem Inputs

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

Unassigned Orders

Least-Cost Solution

Fleet Routing with the VRP Solver
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
Home Appliance Delivery Demo

Fleet Routing with the VRP Solver
Home Appliance Delivery Demo

Re-cap

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

Fleet Routing with the VRP Solver
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
Health Inspection Demo

Fleet Routing with the VRP Solver
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
Resources

Try it!


• **Vehicle routing problem properties:**

• **Community:** [https://geonet.esri.com/community/gis/analysis/network-analyst](https://geonet.esri.com/community/gis/analysis/network-analyst)