Creating High Density Routes with the VRP Solver
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High Density Routing Problems

- Meter Reading
- Waste Collection
- Snow Plowing
- Street Sweeping
- Fire hydrant inspections
- Coin collection from parking meters

Creating High Density Routes with the VRP Solver
What makes a good solution for residential routing

- Minimize distance and/or time
- Well-clustered routes
- Traverse street just once
- No U turns when driving large vehicles
Vehicle Routing Problem

Problem Inputs

- Orders
- Depots
- Routes
- Seed Points
- Solver Override

Creating High Density Routes with the VRP Solver
Optimize for Local Orders

- Provides better route clustering, sequencing of orders within a route and solver performance
- Must meet a very specific set of VRP property requirements **
- \{"OptimizeForLocalOrders" : "1"\}

- ** Full requirements are at the end of the slide deck and a paper copy can be picked up from the Network Analyst Expo
Setting up the VRP Layer Demo
Routes/Inspectors/Vehicles:
- Start and return to the central office
- Maximum hours for work day

- Street address
- Service time
Consolidated VRP Layer:
- Consolidate the stops on each street using ‘Feature to point’ GP tool
- Curb approach ‘No U-turn’
- Dynamic route seed points
- Solver override: “OptimizeForLocalOrders” = “1”
- Solve VRP
Result from VRP solve:
- Save RouteName for each consolidated stop
- For each route - Solve Route with the original stops with the Route solver with Reorder Stops To Find Optimal Route
- Solves Travelling Salesman Problem (TSP)
The new changes ensure a good sequencing with a near optimal solution on travel cost.
Solver override makes sure the routes are well clustered.
Are these routes good?
- Sequencing
- Clustering

Total Time:
Green: 44.7 minutes
Blue: 40.6 minutes
Are these routes good?
- Sequence
- Clustering
Are these routes good?

- Sequence
- Clustering
Garbage Pickup

Are these routes good?
- Sequence
- No u turn
- Right side curb approach

Total Time:
Green: 76.18 minutes
Blue: 70.45 minutes
Garbage Pickup

Are these routes good?
- Sequence
- Right side curb approach
Are these routes good?
- Sequence
- No u turn
- Right side curb approach
Resources

Try it!


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### Network Analyst Presentations

**Tuesday, July 9**

- **8A**
  - Network Analyst: An Introduction - Room 30B

- **9A**
  - Network Analyst: Using the Python API - Room 16B
  - Publish Your Own Network Analysis Services with ArcGIS Enterprise - Demo Theater 10

- **10A**
  - Network Analyst: Creating High Density Routes with the VRP Solver - Demo Theater 10

- **11A**
  - Network Analyst: Creating Network Datasets - Room 30B

- **12P**
  - Network Analyst: Optimize Your Fleet of Vehicles with the VRP Solver - Room 30B

**Wednesday, July 10**

- **8A**
  - Network Analyst: Automating Workflows with Geoprocessing - Room 30D

- **9A**
  - Network Analyst: Automating Workflows with Geoprocessing - Room 30D

- **10A**
  - Network Analyst: Solving Transportation Analysis Problems with Public Transit Data - Room 30B

- **11A**
  - Network Analyst: Solving Transportation Analysis Problems with Public Transit Data - Room 30B

- **12P**
  - Network Analyst: Creating Network Datasets - Room 30B

**Thursday, July 11**

- **8A**
  - Network Analyst: Automating Workflows with Geoprocessing - Room 30A

- **9A**
  - Building Routing Applications with ArcGIS Enterprise - Demo Theater 07

- **10A**
  - ArcGIS Online: Routing and Network Analysis using Web Services - Room 33C

- **11A**
  - ArcGIS Online: Routing and Network Analysis using Web Services - Room 33C

- **12P**
  - Network Analyst: Using the Python API - Room 30A
Optimize for Local Orders

- Benefits: The Optimize for Local Orders solver override will help improve the route clustering, sequencing of orders within a route, and the solver performance (on average faster solve times).

- Setting the Parameter: {"OptimizeForLocalOrders" : "1"}
Optimize for Local Orders

• Required VRP parameters for using Optimize for Local Orders
  - All routes are homogeneous, i.e., they all have the same settings except for Name
  - The routes start and stop at the same depot
  - Routes do not have MaxTotalTravelTime or MaxTotalDistance constraints
  - There must be enough routes to service all the orders
  - Only a single Depot
  - Orders do not have time windows
  - Orders quantities are one-dimensional and only DeliveryQuantities
  - Orders cannot have inbound arrival times or outbound departure times
  - All orders must have an assignment rule of Override (3)
  - No Breaks, Renewals, Specialties, OrderPairs, or Route Zones
  - Must have dynamic seed points for all routes when using the ArcMap Layer or have “Spatially Cluster Routes” set to true when using a the Solve VRP GP tool or service

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