Rapidis

High Density Postal Routing with ArcGIS

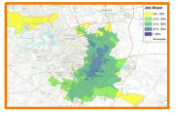
About Rapidis

Software and tools for Transportation and Logistics

simulation, modelling, analytics, scheduling and route planning

Esri Business Partner since 2003

All products and solutions are based on ArcGIS



01 Traffic Analyst provides tools for transport forecasting models and transit planning

02 Rapidis Logistics Planner for ArcGIS. 3 editions for Postal Routing, Demand Responsive Transport and Service Visits and Goods Distribution

03 Logistics Planner for ArcGIS are extensions for ArcGIS Desktop and Enterprise

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Case background

01 Distributes printed advertisements and a free newspaper

02 Visits 2.7 million households twice a week

03 More than 20.000 routes

04 Bulk distribution to local depots

05 More than 15 years of experience with Esri technology

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The challenge for a new strategy

Background:

- Organic development in several directions
- Applications made with various technologies
- High risk

New strategy:

- Rapidis to take over development and maintenance of GIS applications
- GIS applications should be consolidated on the ArcGIS platform

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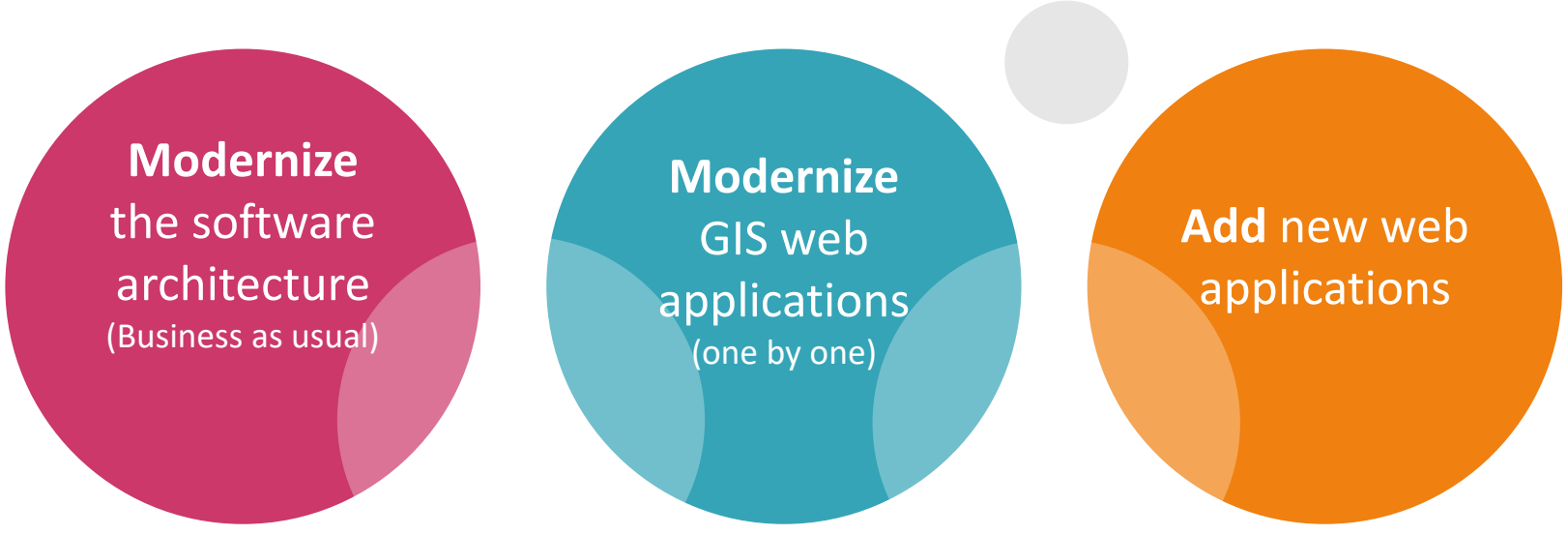
The plan



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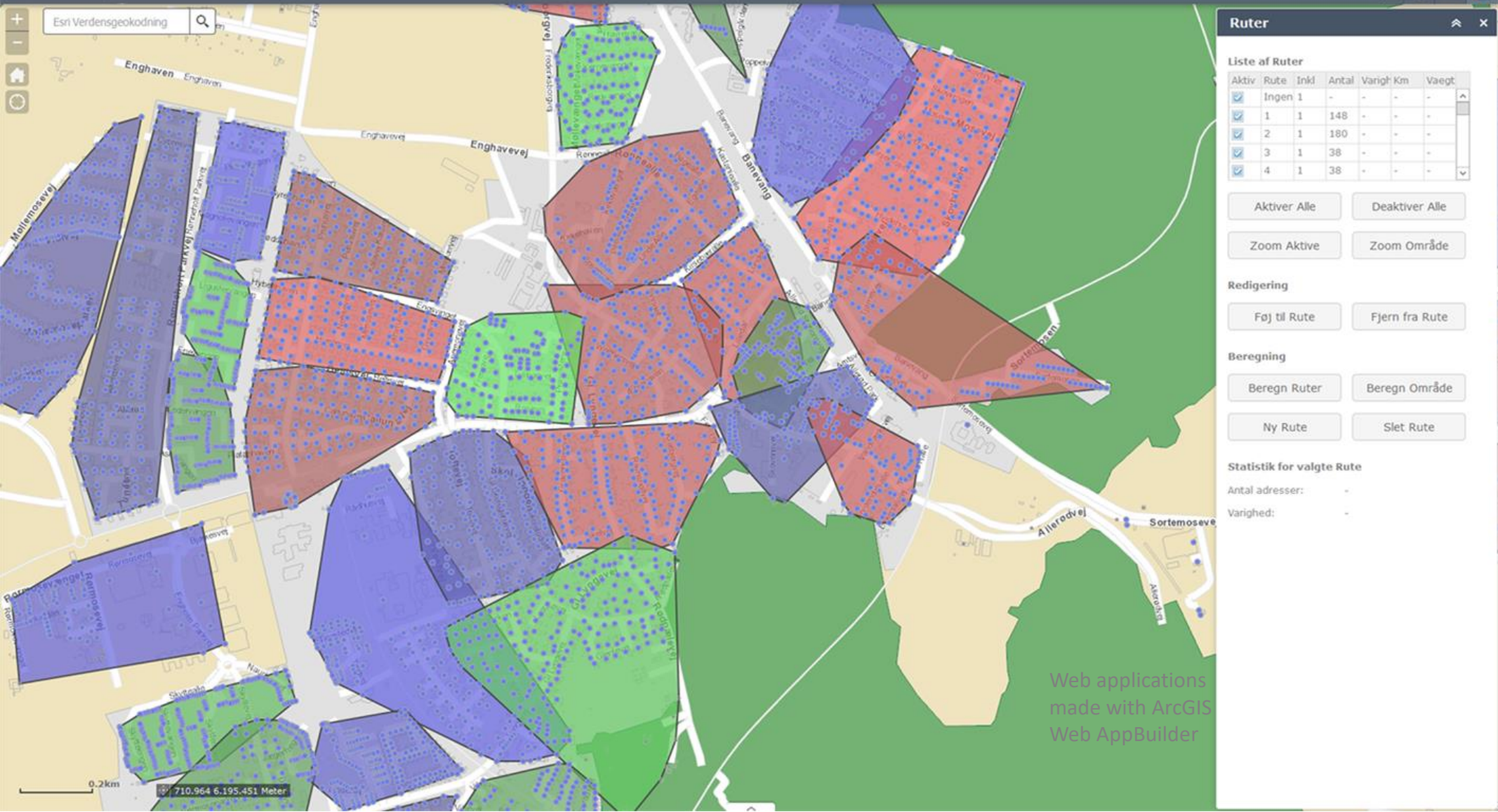
Divide area into routes, *automatically calculates how a selected area best is divided into routes. Allows for manual editing*



Ruter

Liste af Ruter

Aktiv	Rute	Inkl	Antal	Varigh	Km	Vægt
☑	Ingen	1	-	-	-	-
☑	1	1	148	-	-	-
☑	2	1	180	-	-	-
☑	3	1	38	-	-	-
☑	4	1	38	-	-	-

Aktiver Alle | Deaktiver Alle

Zoom Aktive | Zoom Område

Redigering

Føj til Rute | Fjern fra Rute

Beregning

Beregn Ruter | Beregn Område

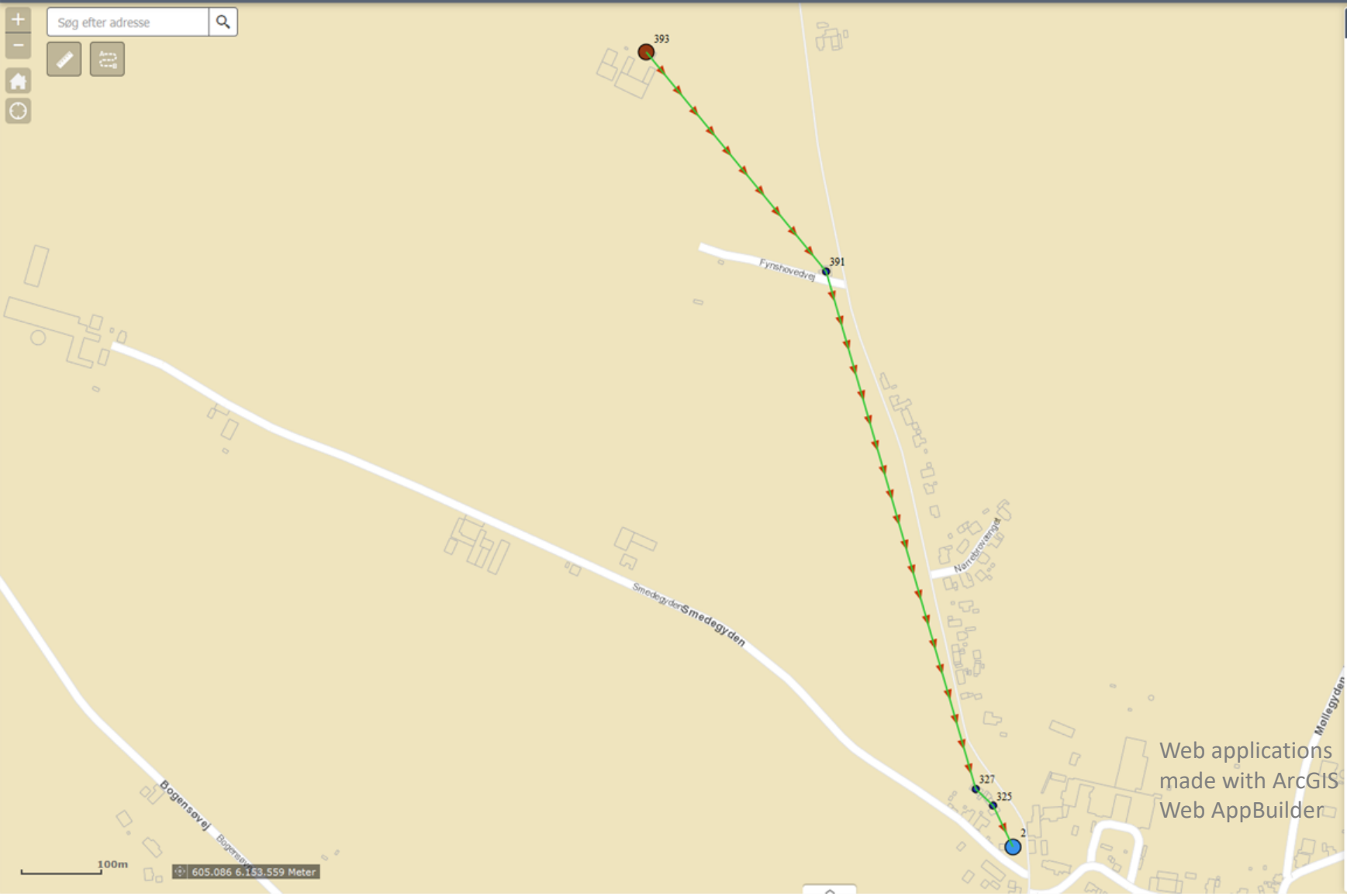
Ny Rute | Slet Rute

Statistik for valgte Rute

Antal adresser: -

Varighed: -

Sequence optimization, *each individual route is optimized for best sequence. Allows for manual editing*



Rediger Rute

Rute 300 i postnr 5380

Aktiv	Adresse	Laas
☐	Fynshovedvej 393	☐
☐	Fynshovedvej 391	☐
☐	Fynshovedvej 327	☐
☐	Fynshovedvej 325	☐
☐	Smedegyden 2	☐

Aktivering af adresser

- Aktiver Alle
- Deaktiver Alle
- Vælg i Kort
- Skift Valgte

Redigering af Rækkefølge

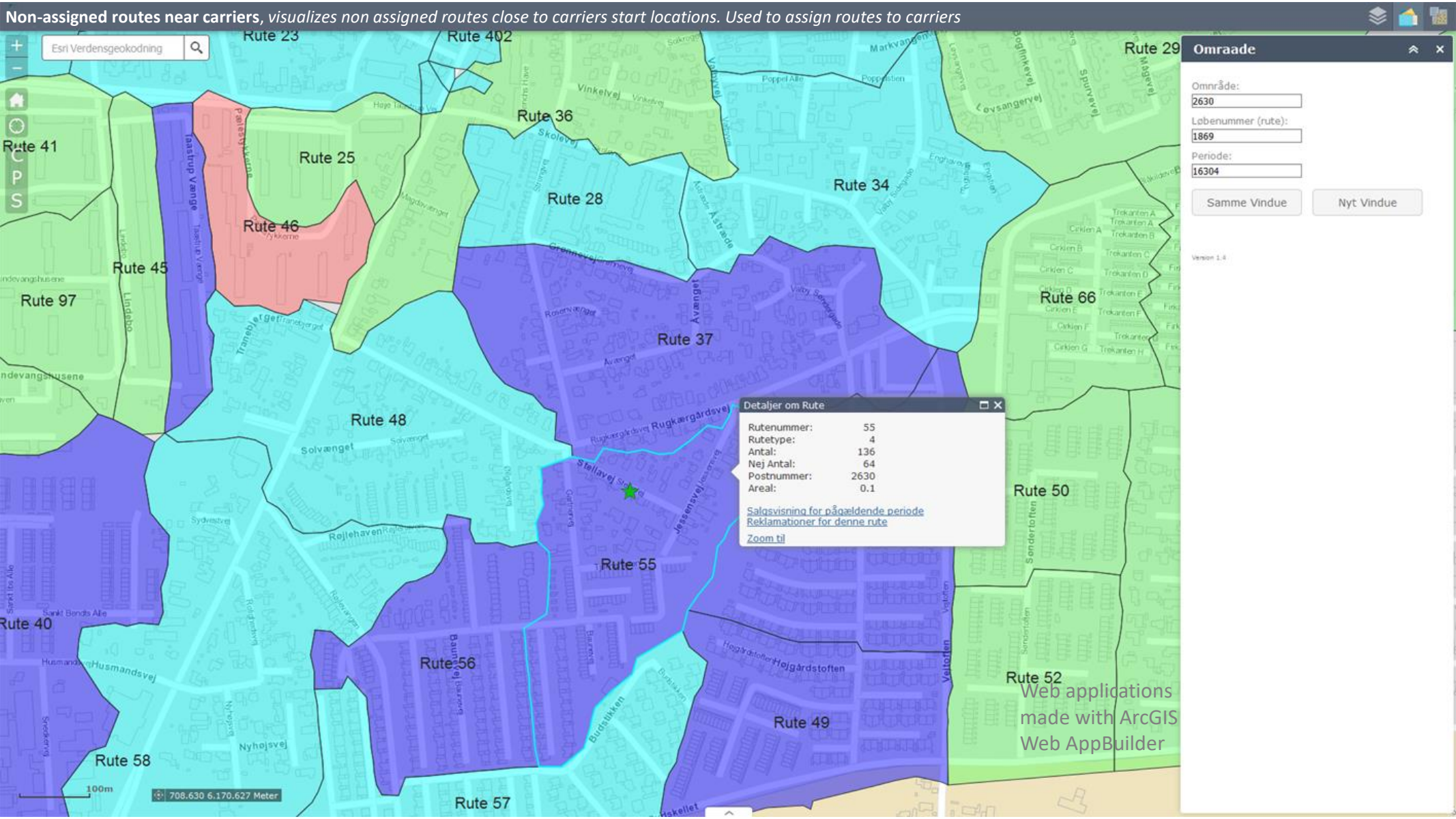
- Vend Alle
- Vend Aktive
- Lås Valgte
- Frigør Valgte
- Optimer
- Ny Start
- Guideline
- Gem Ændri...

Andre Opgaver

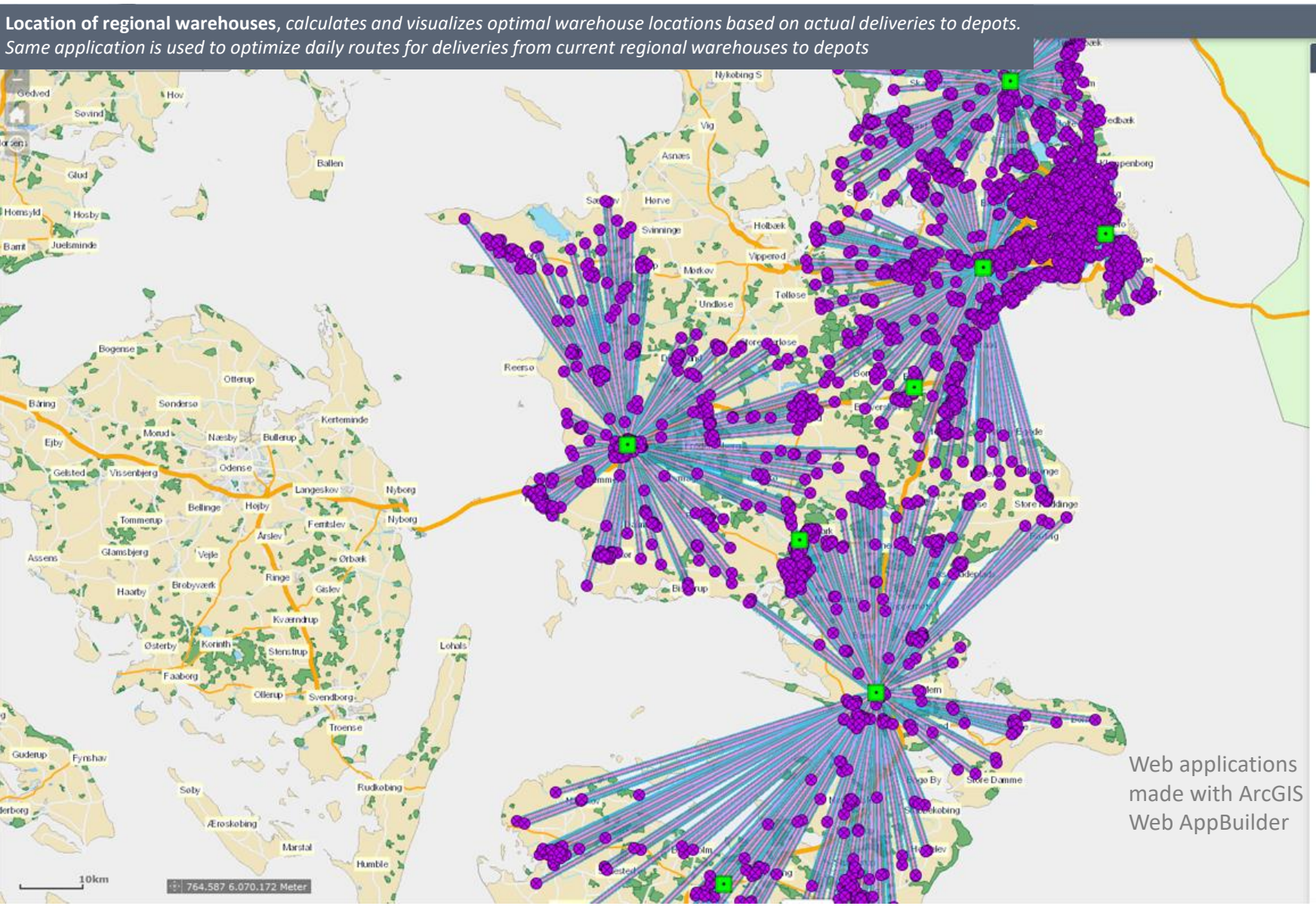
- Zoom Rute
- Flyt Til

☐ Flyt Huspunkter ☐ Flyt Vejpunkter

Non-assigned routes near carriers, *visualizes non assigned routes close to carriers start locations. Used to assign routes to carriers*



Location of regional warehouses, *calculates and visualizes optimal warehouse locations based on actual deliveries to depots.*
Same application is used to optimize daily routes for deliveries from current regional warehouses to depots



Web applications
made with ArcGIS
Web AppBuilder

Mulige Lager Placeringer

Lokationer

ID	Titel
38003	Gammel Frederiksborgvej
38007	Vridsløsevej
38008	Mågevej

Nyt Forslag | Mange Forslag

Slet Område | Slet Alle

Resultat

ID	Titel	Antal	Km	Vaegt
38003	38003F1	462	8800.3	5680273
38004	38004F2	704	5989.4	7363532
38005	38005F3	639	10981.5	1452249
38006	38006F4	473	15721.7	4048016

Analyse

Antal lagre der skal vælges:

5

Start Analyse | Vis Log

Slet Resultat

Brug Resultat | Brug Lagre

Benefits

- Consolidation on a single software platform
- Easily supportable applications
- Market leading software from dependable partner
- Modern services based architecture
- Platform allows for easy implementation of new productivity applications
    - Equal size/work time for all routes
    - Routes are efficient and safe
    - Reduced overall number of routes
    - Reduced planning time
    - Quick reaction to changing conditions

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Tools used

- ArcMap
- ArcGIS Server
- Web AppBuilder
- Portal for ArcGIS
- ArcGIS Network Analyst
- ArcGIS JavaScript API
- Rapidis Logistics Planner for ArcGIS Postal edition
- Rapidis Logistics Planner for ArcGIS VRP edition

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Routing: Postal – Dense – High Density

When

- Cover all/most addresses in an area
- Postal delivery
- Newspaper delivery

Objectives

- Efficient routes: Time, KM, CO2
- Minimize number of routes
- Routes with no overlap
- Safe routes

What to expect

- Less work time per route
- Fewer routes
- Routes with equal work time
- Adapt to changes; even daily
- Evaluate several scenarios

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Different from other logistic problems

Size of the problem

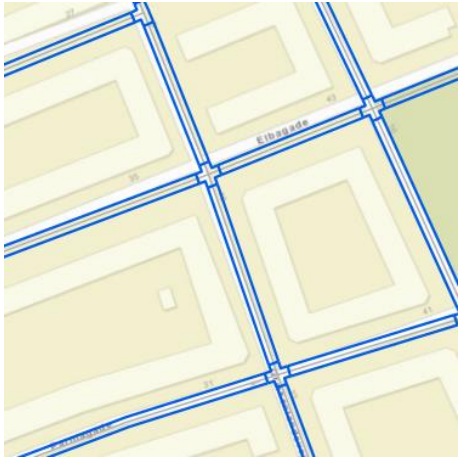
- More locations than VRP
- Capacity depends on configuration

Travel speed

- Walking
- Biking or Scooter
- Car

The Networks

- A sidewalk network is created for walking/biking
- This is an automated process
- Standard network for routes by car



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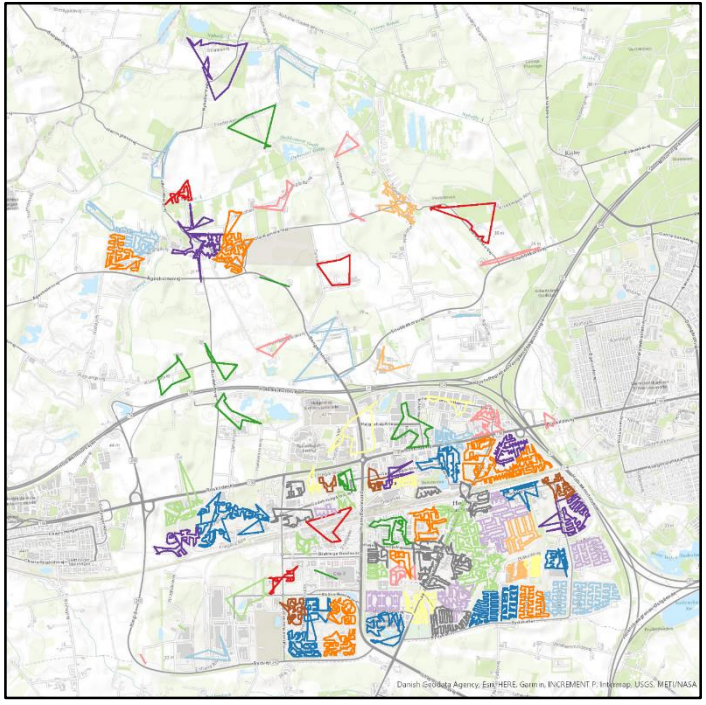
Modes

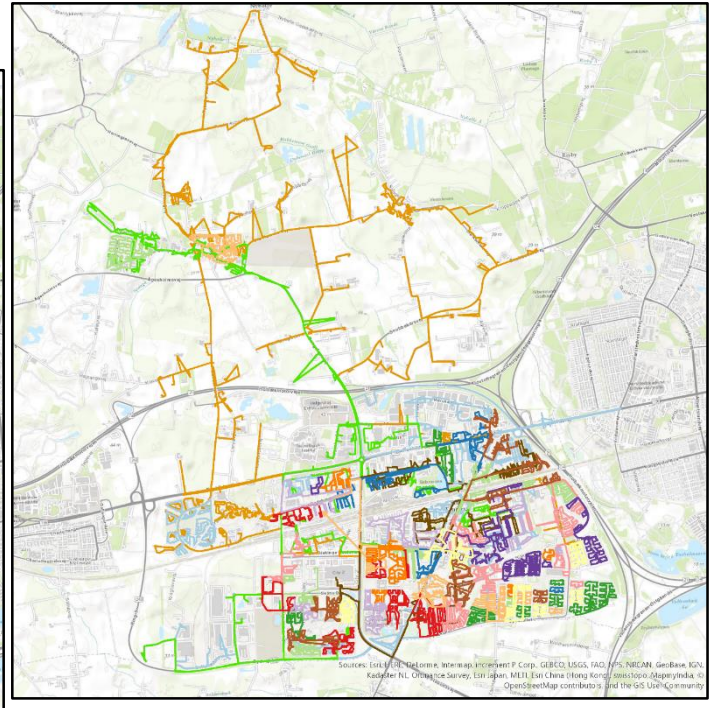
Walking, no Driving



Postal solution was primarily designed for planning routes serviced by walking, bicycles and scooters.

These routes are planned in a sidewalk network. Allows fine-grained control over street crossings.

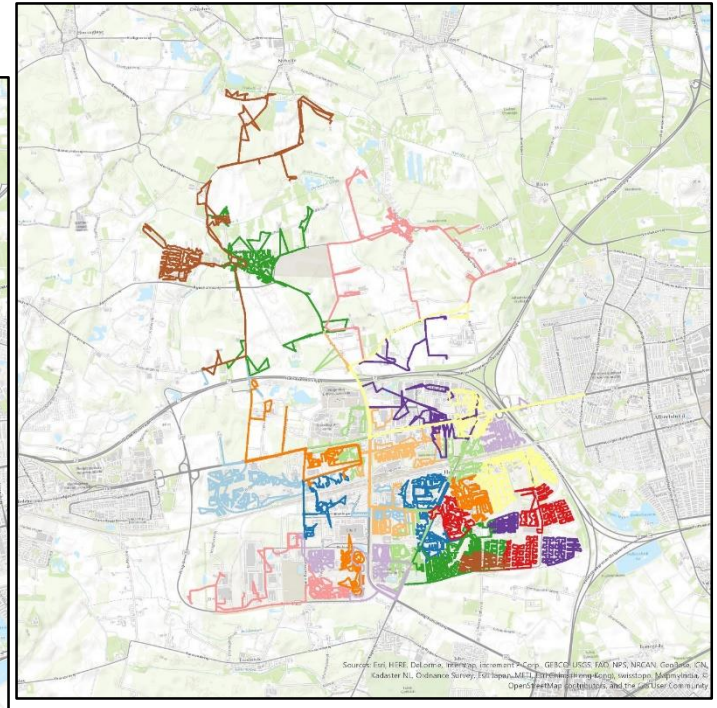
Walking and **Driving**



New: Support for road vehicles.

The optimization can now choose for each route if it should use a sidewalk based mode or a road mode.

Driving, no walking



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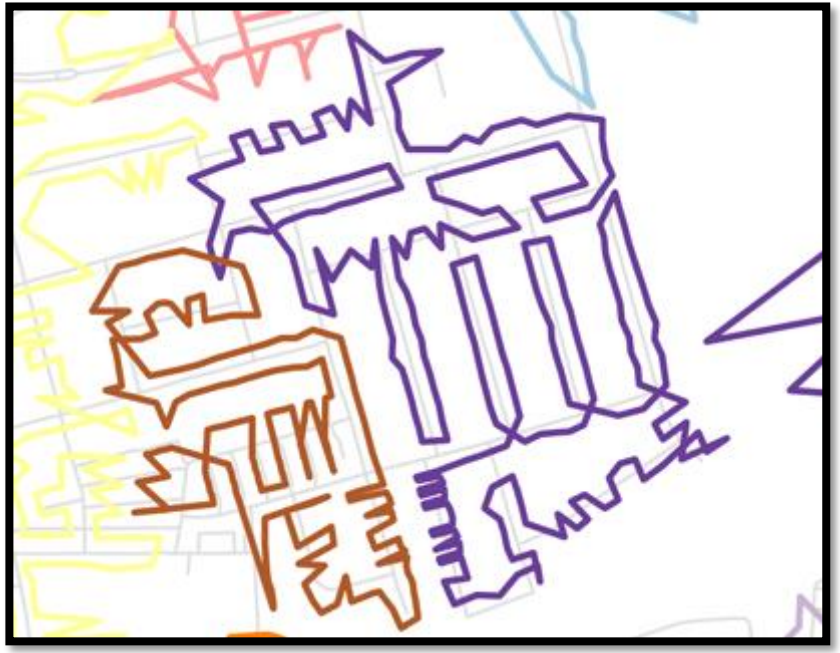
Same input – Different parameter settings

Penalties for crossing is set to higher levels

Crossing penalties for minor roads are reduced to encourage ”zig-zag” routes where minor streets are only traversed once, serving addresses on both sides of the street.



There are two types of crossing penalties, which in this case have both been reduced: A penalty for crossing streets at intersections and a penalty for crossing streets outside intersections.

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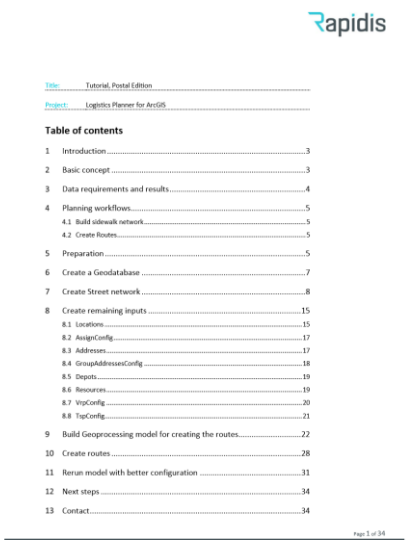
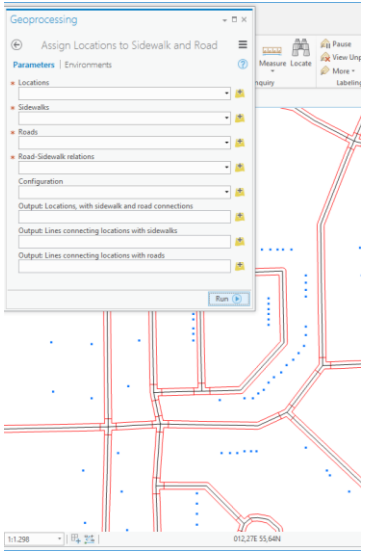
Materials available

Product Flyer

Tutorial 34 pages



ArcMap Demo



Trial extension

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linkedinid

Appendix, Technology

- Route optimization tools are Geoprocessing tools
- 9 tools in total
  - 7 pure Python tools
  - 2 tools use a combination of Python, C++ and C#
- Customer optimization workflows implemented using these tools, ArcGIS tools and – if necessary – custom Python scripts.
  - Usually tied together with ArcGIS Model Builder
  - Very high flexibility
  - Very easy customization
- Finished workflow is published to ArcGIS Server as a REST Geoprocessing service
  - Service API is an Esri technology – not Rapidis
  - Built-in scale-out infrastructure
  - Many service clients (on next slide)
- Service output can also be accessed from database clients.
  - Optimization tools will usually write results to a database
  - Open data model. Easy integration.

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Appendix

ArcGIS Geoprocessing REST Service clients

- ArcGIS JavaScript API
  - Use in websites
  - Build WebApps with WebAppBuilder
  - Integrate in Portal for ArcGIS
  - Such apps shown in demo in a minute
- ArcGIS Runtime SDK
  - Build custom desktop applications
  - Build mobile apps
- ArcGIS REST API
  - Use from any client that knows REST
- (new) ArcGIS Python API and (old) Arcpy Python API
- Many standard ArcGIS Apps:
  - Workforce, Navigator, Dashboard, Collector, etc.

Appendix, inside the optimization tools

- All tools use Arcpy for data access
- All ArcGIS Supported storage and databases are supported
- Tools perform validation of data schema – if requested
- Transport networks stored in ArcGIS Network Datasets
  - Few requirements, will work with most (if not all) commercial networks
- Cost matrices built with ArcGIS Network Analyst. Gives us access to:
  - Very robust network platform
  - No practical limits on network database size
  - Sophisticated modelling:
    - Curb approach
    - Prevent or penalize left turns
    - Many forms of restrictions (turns, one-way, soft/hard, large vehicles, etc.)
    - U-turns
    - Time-of-day / congestion / traffic – if necessary
- Postal-specific optimizations (VRP and TSP) built on top of cost matrices
  - Scale-up: Postal VRP tool has a parallel architecture, which makes efficient use of server CPUs and CPU cores

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