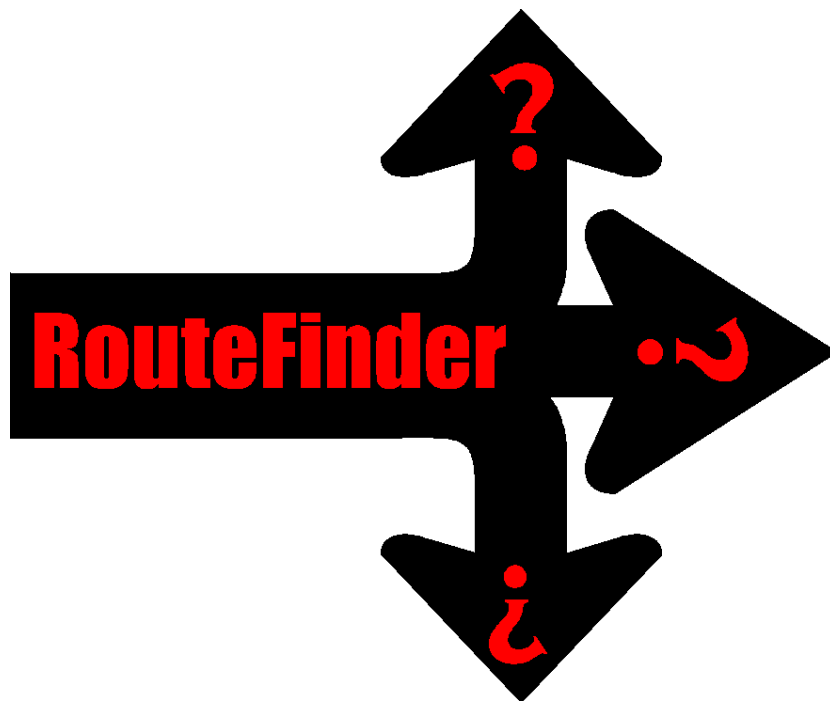


RouteFinder 3.71 For MapInfo

A Network Analysis System for
MapInfo Professional



© 2010 RouteWare and Higher Mapping Solutions

Table of Contents

Part I Introduction	5
1 Welcome	5
2 Feature Matrix	6
3 System Requirements	7
4 Installation Notes	7
5 Support	8
6 Licence Agreement	8
7 SDK	9
8 New Features in Version 3	9
9 Upgrading from Version 2	10
10 History	10
Part II Basic Functions	15
1 Starting RouteFinder	15
2 Creating a Network	15
3 Opening a Network	18
4 Network Report	19
5 Route	21
6 Clear Result	22
7 Route Options	22
8 Road Speed Options	26
Part III Standard Version	31
1 Toolbar buttons	31
Drive Time (Voronoi)	31
Drive Time (Polygon)	32
Link Isochrone	32
Multi Centre Link Isochrone	33
Closest Centre	34
Travelling Salesman	35
Update Point File	36
IsoGrid	37
2 Batch Jobs	38
Travelling Salesman from table	38
Batch TSP Routes from table	40
Select Locations	41
Distance Matrix	42
Route Pairs	44

Allocate Point to Network	45
Nearest N Centres	47
Drive Times / Closest Centre	48
Drive Time from Column	50
3 Options	50
Drive Time Options	50
Travelling Salesman Options	53
 Part IV Professional Version	 57
1 Vehicle Types	57
2 Dynamic Cut offs	57
3 Network Analysis	58
Add Node Layer	58
Detect Close Nodes	59
Detect Cul-De-Sac	60
Detect Parallel	62
Detect Subnets	63
Node-Link Check	65
Overpasses Check	66
Remove Pseudo Nodes	67
Show Unused Links	69
 Part V Street databases	 73
1 Sample Data	73
2 Your Own Data	76
3 Commercial Databases	78
 Part VI Troubleshooting	 81

Part I

Introduction

1 Introduction

1.1 Welcome

Welcome to RouteFinder, a network analysis system for MapInfo Professional.

RouteFinder comes in 3 versions:

- **Free** - With reduced functionality which will allow the user to find the shortest or fastest path and other basic functions on a network with a maximum of 3000 links
- **Standard** – With most functions available for the user with a need to perform route calculations such as travelling salesman analysis, distance matrices, isochrones etc.
- **Professional** – With all the functionality of the standard version, but allowing larger datasets to be processed. Included is a broad range of network topology checking functions.

The documentation is created so that the first chapter describes all the basic features available in the free version. Then the additional features available in the standard version is described in the next chapter etc.

1.2 Feature Matrix

	Free / demo	Standard	Professional
Link limit	3,000	500,000	16 Million
Support of both lat/long and projected coordinates	X	X	X
Shortest / quickest ^[22] path - click	X	X	X
Km or Miles as distance unit	X	X	X
Creates topological networks directly from TAB files	X	X	X
One-way streets	X	X	X
32 road classes	X	X	X
Via points - click	X	X	X
Dynamic Segmentation		X	X
Isochrones - link based ^[32]		X	X
Isochrones - polygon based ^[31]		X	X
Travelling Salesman ^[35] Algorithm - Point and Click		Max 300 rows	Max 3000 rows
Select from gazetteer ^[41] - i.e. towns - Routing		X	X
Allow Travelling Salesman ^[35] by selecting from gazetteer		X	X
Distance Matrix ^[42]		Max 300 rows	X
Batch Isochrones ^[48]		Max 300 centres	X
Multi center isochrones - link based ^[33]		Max 300 centres	X
Closest Centre ^[34]		Max 300 centres	X
Nearest N Centres ^[47]		Max 300 centres	X
Route Descriptions ^[22]		X	X
Update Point table ^[36]		X	X
Dynamic cut-offs ^[57]			X
Use of Limits ^[15]			X
Cul-de sac detection ^[60]			X
Parallel link detection ^[62]			X
Subnet detection ^[63]			X
Join links ^[67]			X
Display Nodes ^[58]			X
Detect Close nodes ^[59]			X
Node - Link Check ^[65]			X
Overpasses Check ^[66]			X

1.3 System Requirements

RouteFinder for MapInfo:

Requires MapInfo 6.5 or greater to run.

Hard disk requirement

3 MB without sample data.

6 MB with sample data.

Operating System

The application has been tested on Windows 98 and Windows 2000 SP4 and Windows XP SP3. Windows Vista and Windows 7

Access rights

The user needs to have read/write access rights to the folder with the TAB files used for routing.

Processor speed

Depending on the kind of tasks, you are performing with RouteFinder, a fast processor may be a good idea. Especially large Batch Route^[42] jobs requires some processing time, but also some of the topology checking functions do.

RAM

Depending on the size of the street networks you are going to work with, you may need additional RAM. As a rule of thumb each record in the street database requires 50 bytes of RAM. An example: A street network with 1,000,000 links will need app. 50 MB RAM to store the network.

Doing voronoi based calculations may easily require 2-3 times more RAM than mentioned above. This includes Closest Centre^[34] and Voronoi Drive Time / Distance^[31].

1.4 Installation Notes

Installation steps

You should install MapInfo before you install RouteFinder.

If a previous version of RouteFinder 2 has been installed, you can leave it in place. Just make sure you install into different directories.

Now install RouteFinder by running the setup application.

After you have installed RouteFinder, open MapInfo and you will see RouteFinder 3.70 listed on the Tools > Tool Manager.

You are now ready to use RouteFinder.

License file

When running the standard or professional version of RouteFinder, you receive a personalized license file from RouteWare.

For Windows 7 support we now allow the licence file to be stored in one of the following locations:-

- 1) The application folder
- 2) The application data folder (all users)
- 3) The user application data folder (current user)

The license file MUST never be handed over to anyone else. It is for the owner only !

RouteFinder has to be restarted to acknowledge the presence of the license file, but you do not need to install RouteFinder again or restart MapInfo.

Installed files

RouteFinder.mbx: Main mapbasic application
rwnet.dll: Used by the mbx.
RouteFinder.chm: This document
mlc_rf.ini: All string resources in RouteFinder, can be translated
routefinder.lic: License file - not in free version
defrf: Default ini file for RouteFinder settings
DAV, Aaroads, OS Meridian and Harper Collins: 4 folders with sample data

1.5 Support

You get free support via e-mail during your evaluation period and a further 30 days of support from the date of purchase.

If you require support after this period, contact us at rf-mapinfo@routeware.dk for details of our additional support contracts.

1.6 Licence Agreement

RouteFinder 3 for MapInfo Professional
© 2001-2010 by [RouteWare](#) and [Higher Mapping Solutions](#)
All rights reserved

SOFTWARE LICENSE

A single user license permits the use of RouteFinder on a single computer. Multiple user licenses will be subject to the terms and conditions granted in such license.
You may not translate, reverse engineer, decompile, disassemble, modify or patch the RouteFinder executable files or documentation in any way.
You may not use the RW Net DLL outside of RouteFinder in any way.

LIMITED WARRANTY

RouteWare warrants that all disks provided are free from defects in material and workmanship, assuming normal use, for a period of 90 days from the date of purchase.

RouteWare warrants that the program will perform in substantial compliance with the documentation supplied with the software product. If a significant defect in the product is found, the Purchaser may return the product for a refund. In no event will such a refund exceed the purchase price of the product.

EXCEPT AS PROVIDED ABOVE, ROUTEWARE DISCLAIMS ALL WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WITH RESPECT TO THE PRODUCT. SHOULD THE PROGRAM PROVE DEFECTIVE, THE PURCHASER ASSUMES THE RISK OF PAYING THE ENTIRE COST OF ALL NECESSARY SERVICING, REPAIR, OR CORRECTION AND ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES. IN NO EVENT WILL ROUTEWARE BE LIABLE FOR ANY DAMAGES WHATSOEVER (INCLUDING WITHOUT LIMITATION DAMAGES FOR LOSS OF BUSINESS PROFITS, BUSINESS INTERRUPTION, LOSS OF BUSINESS INFORMATION AND THE LIKE) ARISING OUT OF THE USE OR THE INABILITY TO USE THIS PRODUCT EVEN IF ROUTEWARE HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

Use of this product for any period of time constitutes your acceptance of this agreement and subjects you to its contents.

1.7 SDK

RouteFinder is built on top of RW Net, which is available as a separate SDK (software development kit). This allows for royalty free deployment in most scenarios. Please see [RouteWare](#) website for details about RW Net.

1.8 New Features in Version 3

Here is a quick summary of the new exciting features in this latest version of RouteFinder:

Dynamic Segmentation^[22]

Now the dynamic segmentation options can be used in Batch Route, Nearest N Centres and Travelling Salesman optimizations.

Nearest N Centres^[47]

This function will find the nearest N number of points from a selected start point or points. A very quick function that will use distance or time.

Multiple Speed Files^[26]

More than one speed file can be created, so that it is now very easy to switch between peak and off peak road speed or even walking speeds!

Route Pairs^[44]

This will use two tables and then generate a route from row 1 of first table to row 1 of the second table and so on.

Smoothing Isochrone^[50]

Although there are some limitations of this option, it can present some nicer looking isochrones rather than the spiky polygons produced by previous versions of RouteFinder.

Extended Data Check^[19]

This will check for object errors at network creation time and then present a report on possible errors with the network that may need further investigation.

Drive Time Accuracy^[50]

Drive Time polygons can now use dynamic node adding to produce even more accurate isochrones.

Updating a Point File with Time and Distance^[36]

It is now very easy to attach a time and distance to a point data set. This might be used to see how far pupils are from a school.

Unlimited Centres^[6]

You are no longer limited to a number of points for most batch functions in the Professional version. In the Standard version the limit has been raised for most functions.

Professional Version only:

Node-Link Check^[65]

You can now check that the links break at the nodes to make a topological network.

Overpass Detection^[66]

This function will check for links that intersect each other without a node being present. This may

indicate errors in topology.

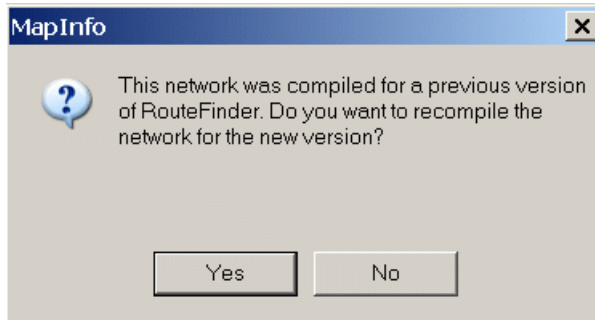
Vehicle Limits (3.6+)⁵⁷

This function will route based on dimensions and weight of a vehicle

1.9 Upgrading from Version 2

When upgrading from version 2, you will need to recompile your street network since the binary file format has been updated (or rather extended). This is due to new functionality in version 3.

If you try to open a version 2 network then you will receive the following warning:



If you select "Yes" then the network creation will be started otherwise please select network > Create Network from Table menu option.

Click here¹⁵ on creating a network for more information.

It is possible that some errors may be encountered in the upgrade process. If this happens then follow these steps:

1. Close RouteFinder and MapInfo.
2. Manually delete the following files from the directory containing the road network

Attribute.bin
Coord.bin
Coord2.bin
Dist.bin
Link.bin
Node.bin
RouteFinder.ini

You can leave link.spd if it exists, but if you do delete it then you will need to set up your road speeds again. The link.spd file will be updated to version 3 format after having been used.

3. Restart MapInfo and then open the table and then recreate the network.

1.10 History

Version 3.71 1st December 2010

Bug fix to route pairs function (route object creation and direction)
Update to error codes
Fix for points far outside of the network.
Bug fix to isochrone creation with a Bing Map background

Version 3.70 14th June 2010

New Batch Travelling Salesman Function.

RouteFinder temporary files are written to the current user temporary folder. This will allow multiple users to share the same network files for most functions.

The ProgramErrors.log file is now written to the User Application Data folder ("C:\Documents and Settings\XXXXX\Application Data\RouteFinder3_MapInfo" where XXXXX is the user logged on to the machine")

Changes to licence file location for Windows 7 support

Version 3.62 1st July 2009

Bug fix to the nearest N Centres with exact and off-road options

Results table column widths are based on input table column widths

Version 3.61 10th December 2008

Switch for loading coordinates of geometry into memory in RouteFinder.ini

Set Coordcache=0 if physical ram is a problem on the computer better isochrone generation

Version 3.60 23th October 2008

New Network Creation features - Now you can pick fields for Z-Levels and vehicle limits

Routing based on vehicle limits

TSP batch now puts the calculated order into the base table

Bug fix to the mode selection

Bug fix to non voronoi Isochrone generation

Faster Isochrone Generation

Version 3.50 4th April 2008

Bug fix to mode option on startup

Link based isochrone dynamically segmented at start

bug fix to line direction on routes displayed

Version 3.41 20th September 2006

Bug fix to Route Pairs function

Version 3.40 15th August 2006

Support for multi modal networks

New routine for allocating points to the nearest link on the network

Distance matrix - generate routes option put back in

Bug fix to distance matrix (commas can now be in the ID field)

Bug fix to distance unit not being reported correctly in isochrone generation

Better descriptions on batch drive time option

Capita EMS functions improvement.

Version 3.32 10th January 2006

Bug fix for batch multi centre isochrones

Version 3.31 25th November 2005

Bug fixed in Nearest function

Version 3.30, 22nd October 2005

Route pairs routine speed enhancement

Interactive route added for the Capita EMS system

Version 3.20, 14th June 2005

New Capita EMS Link code added (you need a separate module to activate)

Bug fix to route pairs progress bar

Bug fix to Isochrone set up dialog

Bug fix to progress bar not activating when second network is used within the same session
Bug fix to menu not displaying properly in short distance mode
Bug Fix to matrix builder

Version 3.10, 8th Feb 2005

New function - Drive time from a column in a table.
Bug fix to Drive time options dialog
Bug fix to Road Speeds dialog
Bug fix to Route pairs function

Version 3.03, 4th Jan 2005

Bug fix to matrix builder

Version 3.02, 4-Dec-2004

Bug Fix to matrix builder
Fix to Batch TSP Function

Version 3.01, 4-Nov-2004

Minor bug fixes
Unofficial support for Z-levels. Ask RouteWare if you need information on how to use this.

Version 3.00, 5-Oct-2004:

Major release

Version 2.02, 3-Feb-2003:

Bug fix release (required new license file)

Version 2.01, 29-Nov-2002:

Bug fix release

Version 2.00, 12-Oct-2002:

Major release (free upgrade)

Version 1.02, 15-Jun-2001:

Bug fix release

Version 1.00, 5-Apr-2001:

First release

Part II

Basic Functions

2 Basic Functions

2.1 Starting RouteFinder

From the Start Menus

- 1) Click on the start button
- 2) Navigate to Programs > RouteFinder
- 3) Select RouteFinder from the list of items

RouteFinder will start MapInfo Professional and then start RouteFinder.

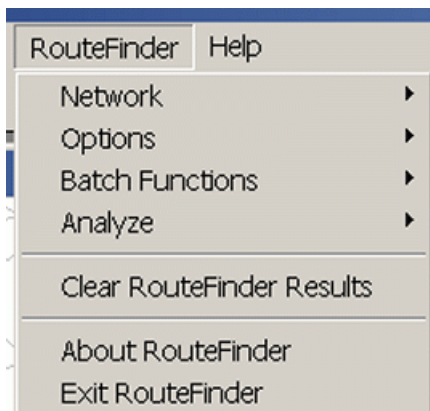
From within MapInfo

- 1) Select Run Mapbasic program from the file menu in MapInfo Professional.
- 2) Navigate to the RouteFinder.mbx
- 3) Select the mbx and press OK

Using the Tool Manager

- 1) Navigate to Tools > Tool Manager
- 2) Scroll down the list until you find RouteFinder 3.00
- 3) Select Load and press OK
- 4) You can also check the autoload option and this will start RouteFinder every time MapInfo is started

The menu bar should now have an item called RouteFinder displayed and should look like the screen below:



2.2 Creating a Network

In order to create a network to use for routing with RouteFinder, these steps should have been prepared first:

1) Input file

You need to have a TAB file, that can be either normal native format, DBF based, Access based or a MapInfo street table (linked). It should (mainly) contain polylines and must not be marked as read-only or some operations will not be possible. You can read more about the topological requirements here [\[76\]](#).

2) Road class

At least one integer field in the TAB file should be prepared for use as the road class field. Please see below for a description of the road class attribute.

3) Street name

There doesn't have to be a street name field, but it is needed if you want to create driving directions. The street name should of course be a string field, but you are free to choose a field name. A secondary street name field can also be declared in case you have both street names and route names. See Route Options^[22] for details.

4) Result field

Some functions require that the results are written directly to a field in the attribute file. This field has the name RF_RESULT and you should avoid having a field with the same name for a different purpose. The field will be generated by RouteFinder when needed or you can add it yourself. It should be of type decimal (11,3).

Road class attribute

This field will define the different classes of roads. The basic classes of road should be between 0 and 31. To define a one way street add 512. Add 1024 to create a one-way street that has been digitised in the wrong direction.

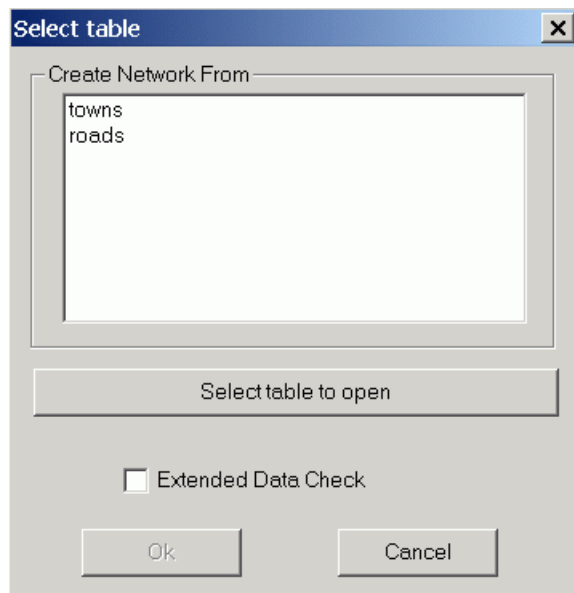
Each road class from 0 to 31 can be assigned a different speed through the Road Speed^[26] options after the network has been created and loaded into RAM.

An example: If the first link in the network is a class 1 road (e.g. a motorway), which can only be travelled in the direction of digitizing, the attribute will be $1 + 512 = 513$.

If you don't have any information about road classes, just add an integer field with all zero's. This means the same speed is used all over the network and all links can be travelled in both directions.

Actual creation of network

When the steps above has been taken care of, you are ready to create a network. From the RouteFinder menu select the "Network" option and then "Create network from table" option. The following dialog is displayed:



Select the required table from the list displayed

If the table required is not currently open then use the open table button to select the required

table.

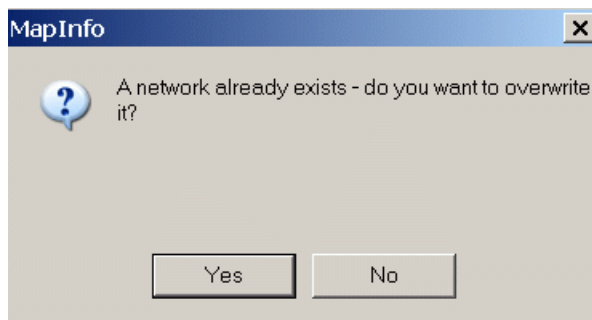
Extended Data Check

The extended data check^[19] will check for the correct object types and for possible network problems during the network creation routine.

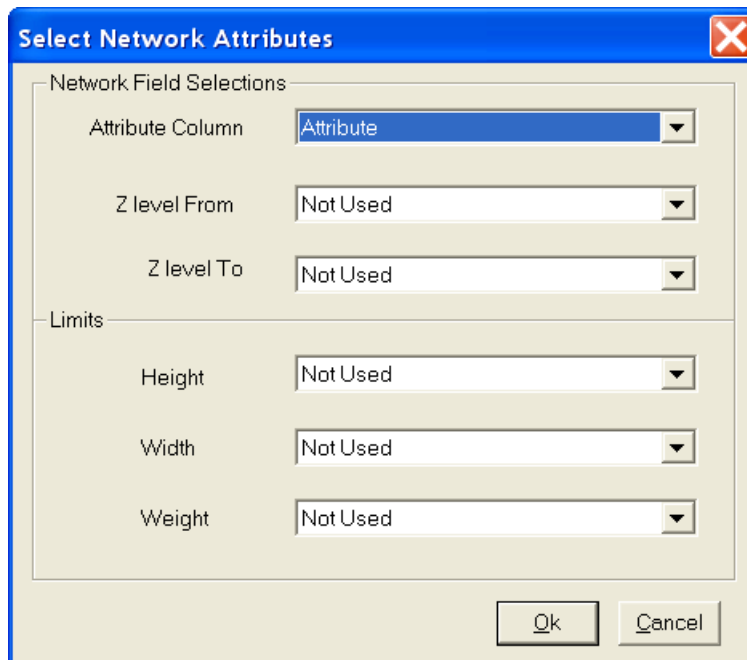
You will be asked if you want to see this file once the process has completed.

A default speed file will be created if one has not been previously generated. You can use RouteFinder > Preferences > Set Roads Speeds to adjust the required speeds for each class of road. You can also create other speed files^[26] to represent walking speeds, buses or any other transportation mode.

If a network for the selected table already exists then you will be prompted to confirm overwriting of the network files.



When the user clicks on the OK button from the select table dialog, the user will be asked to select the attribute column. This column should be defined as a numeric type in the table.



Select the attribute column to use by selecting it from the drop down list.

If the network has Z-Levels (Grade separations defining Over bridges and under passes) then you can use the next two drop down boxes to select the column for these values.

From version 3.60 it is now possible to define height, width and weight restrictions these are store in a smallint column in the table and effect the link associated with that row.

Height restrictions are defined in tenths of a metre in 0.1 steps (i.e 73 = 7.3 meters)

Width restrictions are defined in tenths of a metre in 0.1 steps (i.e 5.2 = 5.2 meters)

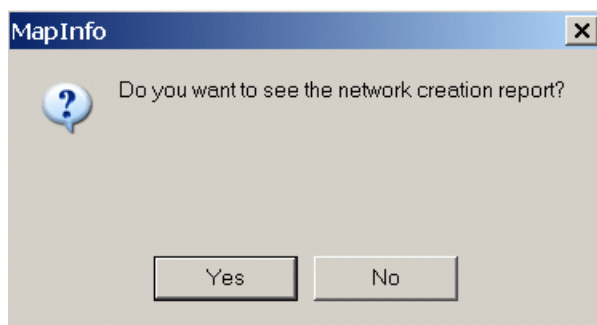
Weight restriction are define in half a tonne steps (i.e 19 = 9.5 tonnes)

These values are stores in their own column and more than one restriction can be defined on each link.

After pressing OK the network is created on disk.

If for any reason the network fails to create using this method the user will be offered the option of repeating the process using a MIF File export. In such a situation RouteWare will also like to have a sample of the original TAB file for inspection and possible problem solving. You can email us at RouteFinder-mapinfo@routeware.dk.

Finally you can choose to view the Network report^[19]:

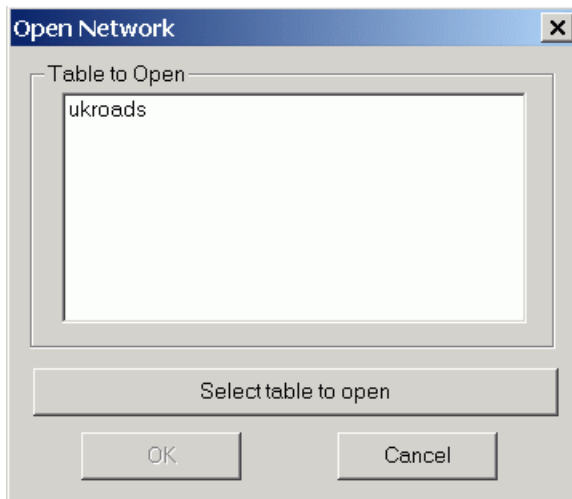


2.3 Opening a Network

If you have a table open that already has a network available when RouteFinder is started, then the network files are automatically loaded.

If no network is open then you can load one by using the following instructions: -

1. From the RouteFinder menu, select the "Network" option and then "Open Road Network" option.



2. This will display a dialog, which lists the open tables. If you have no tables open the you can click on "Select table to open" and choose an appropriate network table.

3. When you press OK the table on which the network is based on is opened (unless it is already open). And then it is mapped or added to a currently open map window.

NB: If no network exists for this table then you will be given the option of creating one at this point.

2.4 Network Report

If you click on the Extended data check during the network creation process then the following details are produced about you network. The report will be opened with your default text file editor:

Header detailing DLL version and the date the network creation was run

```
*****
Report for creation of network with RW Net 2.22
Internal version date: 10-SEP-2004

Today: 16-Sep-2004 21:01:03
*****
```

The coordinate unit of the table used to create the network

```
Coordinate unit: Latitude/Longitude
```

The next line reports if a zlevels.txt file was found and used in the creation process (if Zlevels.txt or elevation.txt exists then Zlevels are uses)

You get a line similar to this if zlevels are being used

```
Using Z-level modification:
C:\Temp\elevation.txt
```

and if the file is not found then you get

File for Z-level modification not found:
C:\Temp\elevation.txt

The two files used to create the network are listed here

Input files:
C:\temp\AA\AARoads.map
C:\temp\AA\AARoads.id

The coordinate system of the table used to create the network

Coordinate system:
CoordSys Earth Projection 1, 104

The next section details any problems found in the network during the creation process. This is only problems for single records! Scroll down for all possible codes that can be found at this point. If you have the professional version you can use the network analysis tools⁵⁸ to identify and correct problems involving more than one record at a time.

```
+++ Error-report +++  
(6) Object 52249 has duplicate vertices (may mean self-intersecting)  
(2) Object 364 is not a polyline - skipped  
+++ Error-report +++
```

The maximum valency is reported and an explanation on what the network representation type. Valency is the number of links at a node.

Maximum valency: 5
Explanation: Normal detailed street data

The total length of all the streets and the average link length in the network

Total length of streets: 81896.7406220701 km
Average per link: 0.267298353461701 km
267.298353461701 meter

The number of links and nodes in the network

Links in database: 306387
Nodes created: 227152

The return code should be 0 if it was a successful creation

Return code: 0

Possible codes that could be found in the Error-report section

- 1: Object is marked for deletion / not geocoded
- 2: Object is not a polyline
- 3: Object has >1 parts
- 4: Object has zero length
- 5: Object is a loop link
- 6: Object has duplicate vertices (may mean self-intersecting)
- 7: Object is self-intersecting
- 8: Object has a very sharp turn (less than 45 degrees from a U-turn)
- 9: Object has only 0 or 1 vertex

2.5 Route



Click to add starting point. The word "Start" will appear on the map.

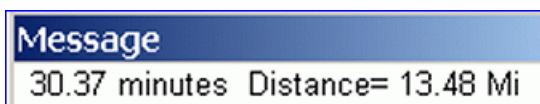
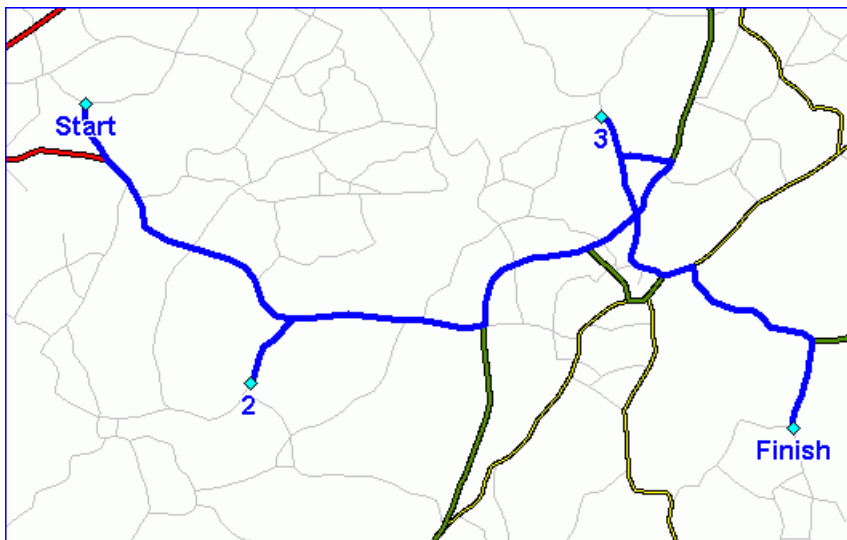
Use the Ctrl-Click to add via's. The number of the via will then appear on the map.

Shift-Click to add the last point. The word "Finish" will appear on the map.

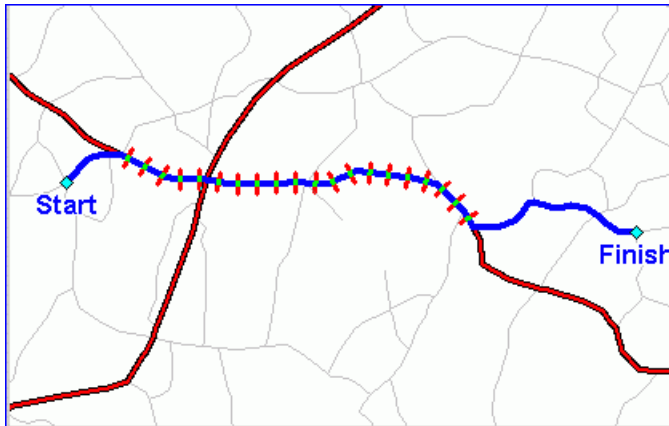
The route is then calculated and displayed on the map. Using the "Route Options^[22]" on the preferences menu item can change the style of the line used to display the route

The time and distance is displayed in the message window

An example route is shown below.



If you have turned on route descriptions^[22], you will also get a list generated, where you can click on each part of the route description and see it highlighted on the map:



RouteDirections Browser			
Description	Distance	Time	Direction
<input type="checkbox"/> Start along Unclassified Road for	0.5 Mi	1.51 mins	Slight turn to right
<input checked="" type="checkbox"/> A272 for	2.98 Mi	8.95 mins	Turn Left
<input type="checkbox"/> Unclassified Road for	1.42 Mi	4.26 mins	Stage
<input type="checkbox"/> Total Distance	4.91 Mi	14.72 mins	Finish

To create routes based on points already recorded in a table, refer to either [Select Locations](#)⁴¹ or [Batch Route](#)⁴²

2.6 Clear Result



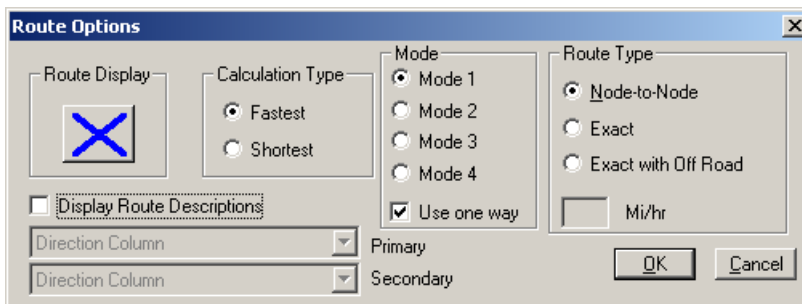
This function will close all temporary results generated by RouteFinder (not just routes - also isochrones etc.). Use it, when you want to start creating new routes as the normal mode keeps adding generated routes to the previous ones.

You can also right click in the map window and select "Clear RouteFinder Results" as well as selecting it from the RouteFinder menu

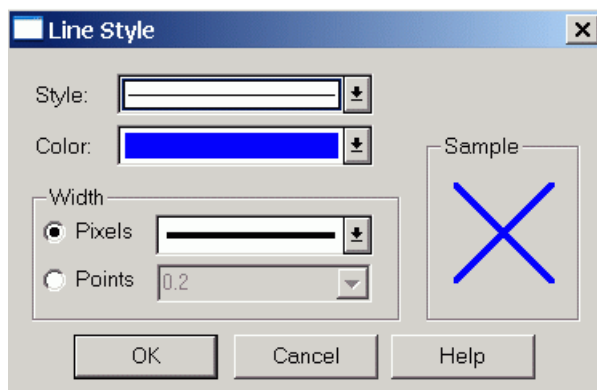
2.7 Route Options

Go to **RouteFinder > Options > Route Options**.

The following dialog is displayed:



The route display button will allow the user to select the line style used to display calculated routes on the map.



From here the user can choose the style, colour and thickness of the line used to display routes. This dialog may vary from version to version of MapInfo Professional

Shortest / Fastest

The calculation type will determine whether upon calculating a route, the shortest or fastest path is generated. This also affects the Drive Time Polygons and all other calculations. In "Fastest" Mode the polygons represent actual drive time, whilst in "Shortest" mode the polygons will represent Drive Distances. The menus are changed to show which mode you are currently working in.

Mode Option

This will let you run the same network in different ways. For instance you may decide in mode 1 all links are accessible, mode 2 might be Cars, mode 3 HGV and mode 4 for pedestrians. In order to define this modes you would add the following values to the attribute value on a link.

- Add 32 if mode 1 isn't allowed on this link.
- Add 64 if mode 2 isn't allowed on this link.
- Add 128 if mode 3 isn't allowed on this link.
- Add 256 if mode 4 isn't allowed on this link.

You can add your own description to each mode by editing the RouteFinder.ini and editing the sections marked Mode1-4

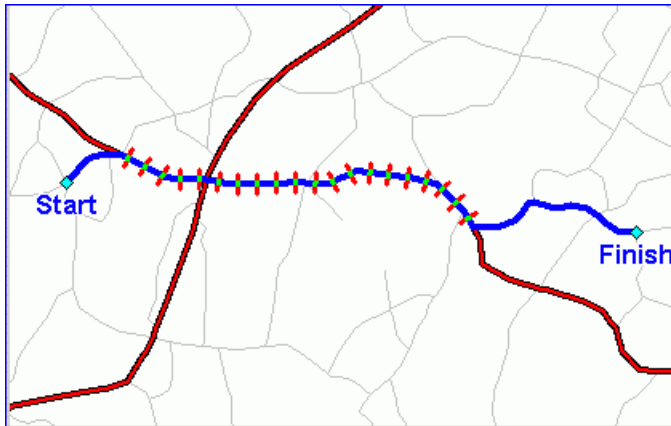
Use One Way

With this option checked one way street restrictions are obeyed. When unchecked then the network effectively becomes a walking network where you can go both ways on a one way street or any direction around a roundabout.

Route Type

This is used to control the dynamic segmentation options. These are as follows:

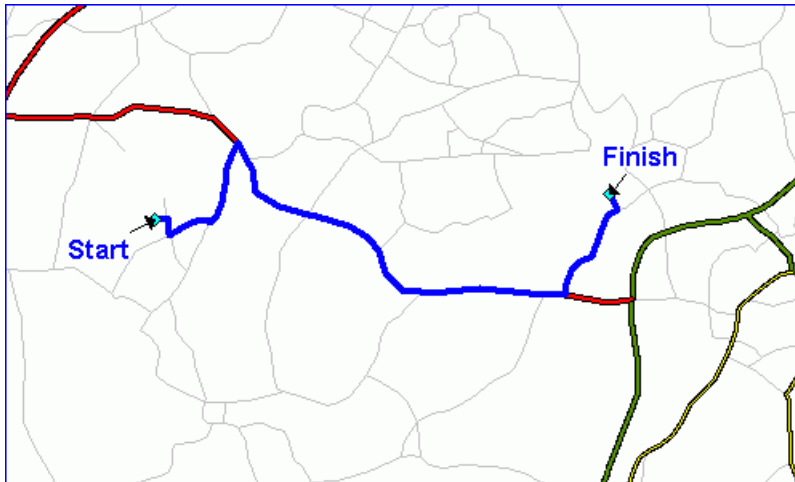
Node-To-Node – This is the default setting. The route will start and end at the nearest node to where the user clicks. A node is either a start- or end node of a polyline.



Exact (dynamic segmentation) – The route is calculated from the nearest part of a link from where the user clicked. The resulting route will take into account the amount of time and distance to travel the partial segment of the link.



Exact with Off road – This is the same as the above option except it will also add a link from the point where the user clicked to the nearest part of the network. To use this option you will need to put in an off road speed. This is used to estimate the amount of time it takes to get from the start and end points to the network. The resulting route will take into account the amount of time and distance to travel the partial segment of the link. But the actual route will be the same as for the Exact mode.



Route Descriptions

The route descriptions are switched on or off from and the column(s) containing the relevant route description is selected from the drop down list. You have the option of defining a primary and a secondary direction field. This can typically be used this way:

Primary = Street name

Secondary = <none>

or

Primary = Route name

Secondary = Street name

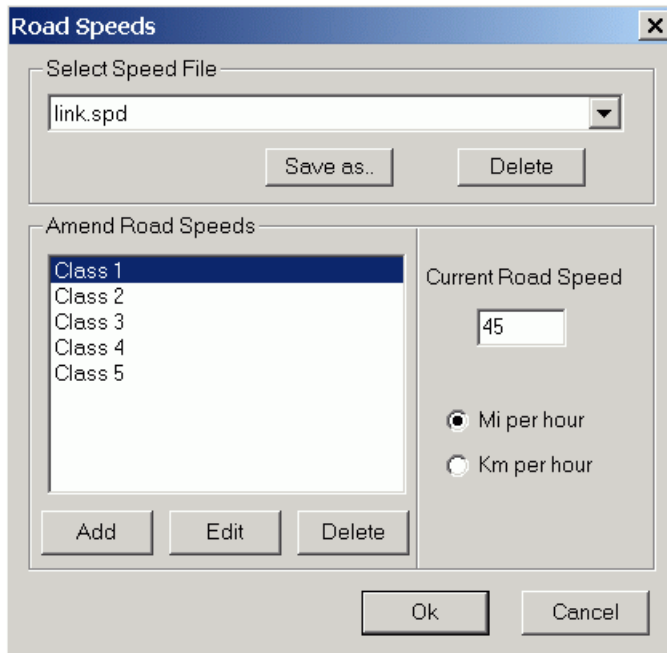
So, if the primary field is blank, the secondary will be used instead.

When a route or Travelling salesman has been generated a window will appear with the directions and it will also be possible to click on each part of the route description and see it highlighted on the map.

RouteDirections Browser				
	Description	Distance	Time	Direction
<input type="checkbox"/>	Start along Unclassified for	0.66 Mi	2.63 mins	Turn Right
<input type="checkbox"/>	A52 for	0.48 Mi	0.75 mins	Sharp Right
<input type="checkbox"/>	M1 for	5.26 Mi	6.57 mins	Sharp Left
<input type="checkbox"/>	A453 for	4.16 Mi	10.6 mins	Slight turn to Left
<input type="checkbox"/>	Unclassified for	0.31 Mi	1.23 mins	Stage
<input type="checkbox"/>	Total Distance	10.85 Mi	21.78 mins	Finish

2.8 Road Speed Options

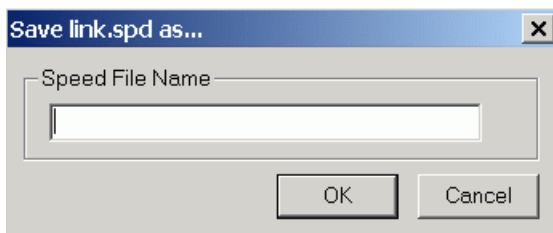
Go to RouteFinder > Options > Road Speeds



The speeds for different classes of road are defined in the link.spd file that will be in the same directory as the network files. This is a simple text file that can be edited, but care will be required to do this.

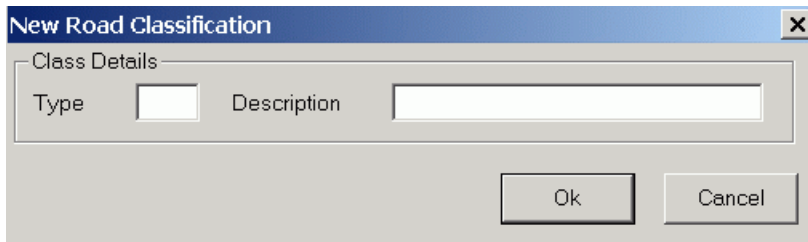
Select Speed File

You can now have multiple speed files that hold different speed for the same network. This means you can now have a speed file for peak, off peak even walking speeds. If you click on "Save as the following dialog is displayed:



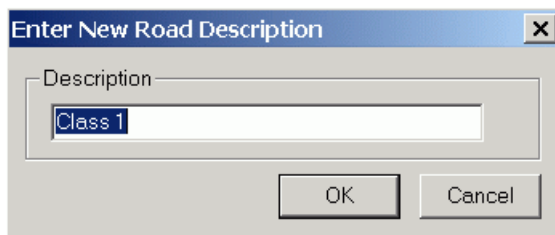
Adding a road class

When the user clicks on the "Add" button they will be prompted to enter the type of class (a number from 0 to 31) and a description for this class. This is shown below:



Editing a description

Selecting the relevant item from the list and then clicking on the edit button can change the description displayed in the list box. The user is then prompted for the new description.



Deleting a road class

Selecting the relevant item from the list and then clicking on the Delete button will remove that class from the list box.

Changing the road speed

- i) Selecting the relevant class from the list.
- ii) Input the new speed in the "Current Road Speed".
- iii) When you select another class the speed is updated

Distance measurements

The distances returned by the routing operations and the speed units are set by selecting either "Mi per hour" or "Km per hour".

Part III

Standard Version

3 Standard Version

3.1 Toolbar buttons

3.1.1 Drive Time (Voronoi)

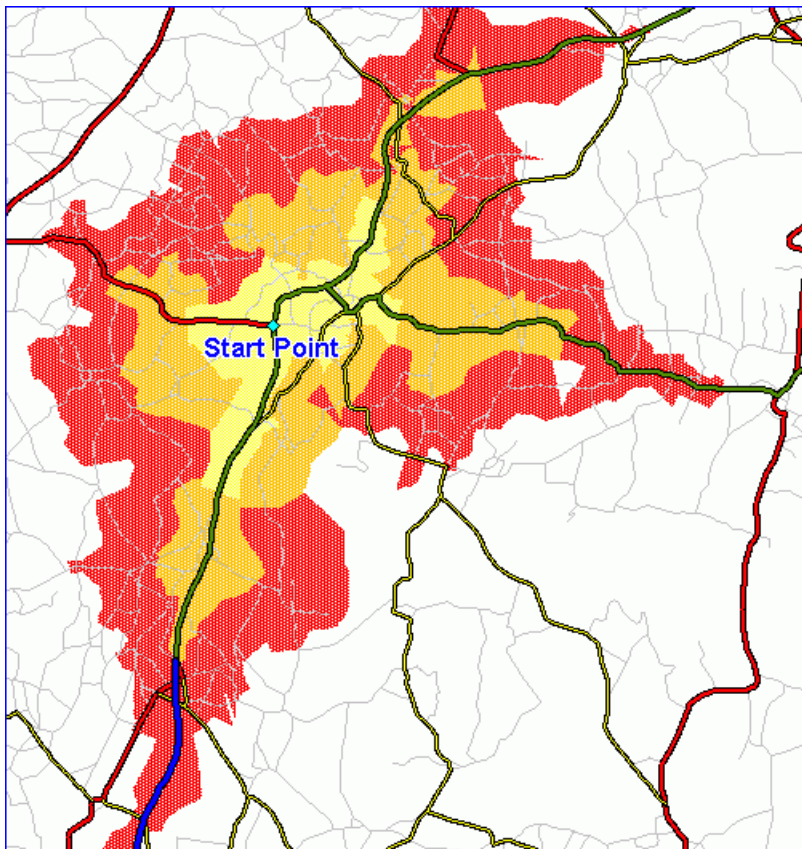


There are 2 methods available for doing drive time polygons (isochrones). This is the most accurate of the 2, but also most demanding on processor time and RAM requirements. It is based on creation of voronoi boundaries around network nodes.

To do a single isochrone you simply click on the map. To do more than one isochrone just hold the "ctrl" key while clicking with the mouse button. To produce the isochrones hold the "shift" key down while clicking for the last Isochrone.

You define the polygon setting through the Drive Time Options⁵⁰ menu.

An example is shown below:



3.1.2 Drive Time (Polygon)

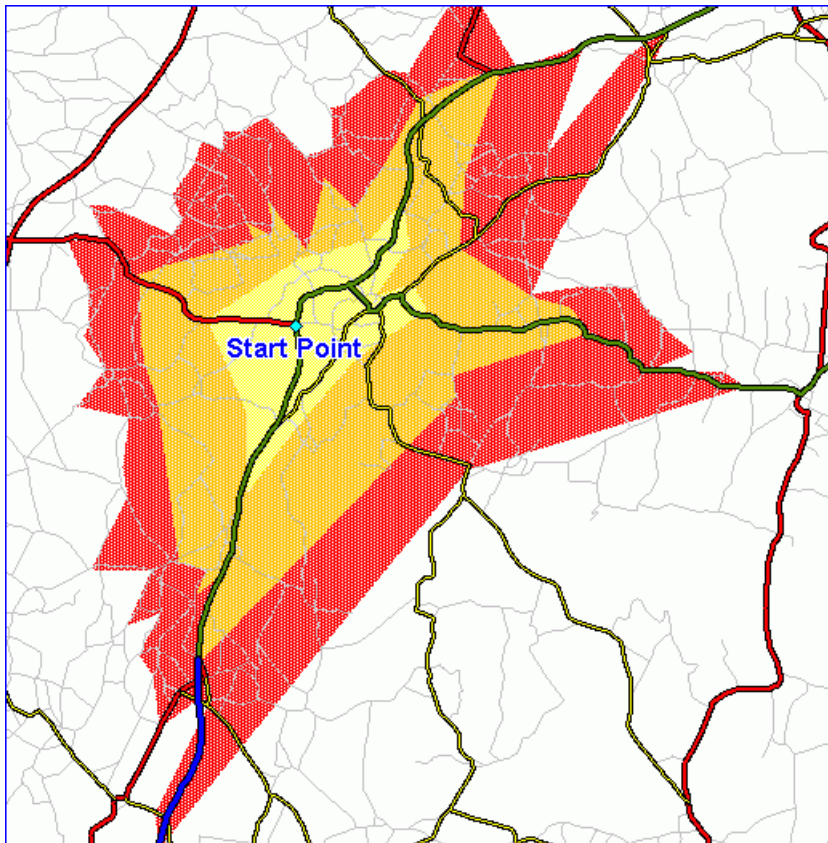


This is the fastest method for doing drive time polygons and less demanding on processing power. The drawback is it doesn't produce as accurate results as method I³² and it can't create a single output layer for multiple centers.

To do a single isochrone you simply click on the map. To do more than one isochrone just hold the "ctrl" key while clicking with the mouse button. To produce the isochrones hold the "shift" key down while clicking for the last isochrone.

You define the polygon setting through the Drive Time Options⁵⁰ menu, where the spikyness of the isochrones can also be changed.

An example is shown below:



3.1.3 Link Isochrone

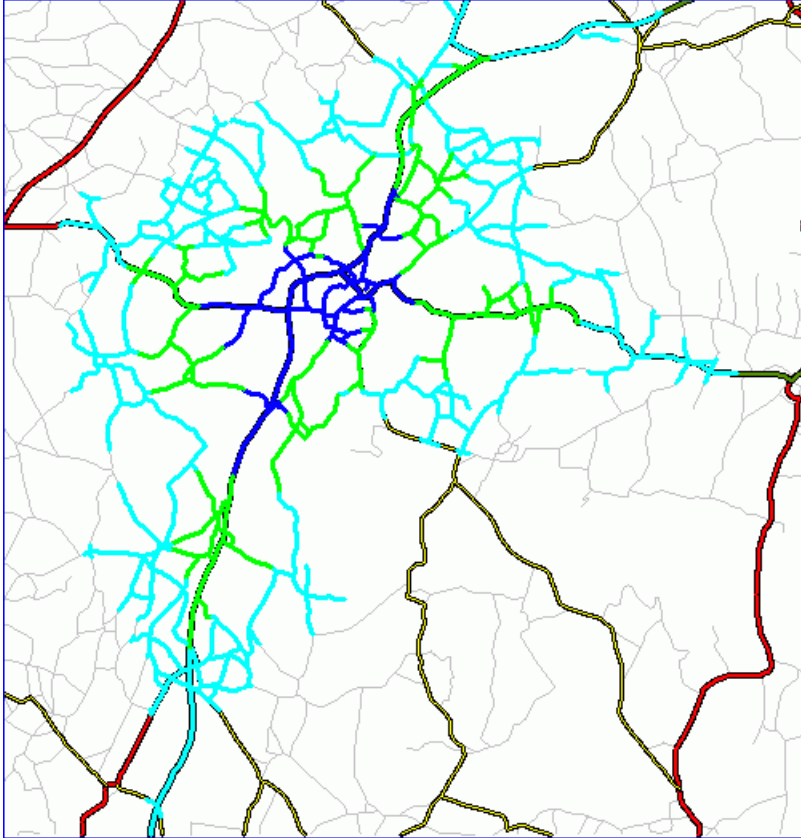


This function will create a new table, that shows drive times or drive distances from a point on the map.

After selecting this tool you need to click on the map that represents the start location.

Link based isochrones always has their origin at a node, but the actual drive-time steps are using dynamic segmentation.

An example link isochrone is shown below:



The result will be stored in a layer called "IsoLink"

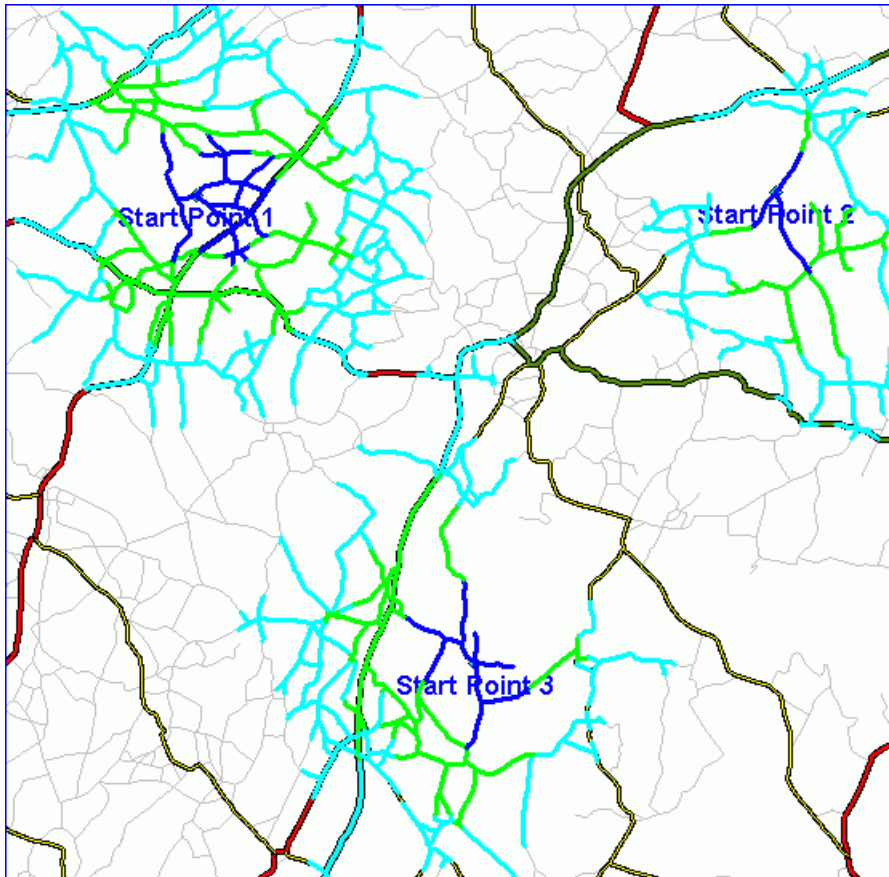
3.1.4 Multi Centre Link Isochrone



This is the same function as Link IsoChrono³² except it can handle multiple centres at a time:

Click to add starting point.
Ctrl-Click to add more points.
Shift-Click to add the last point.

An example of this is shown below:



3.1.5 Closest Centre

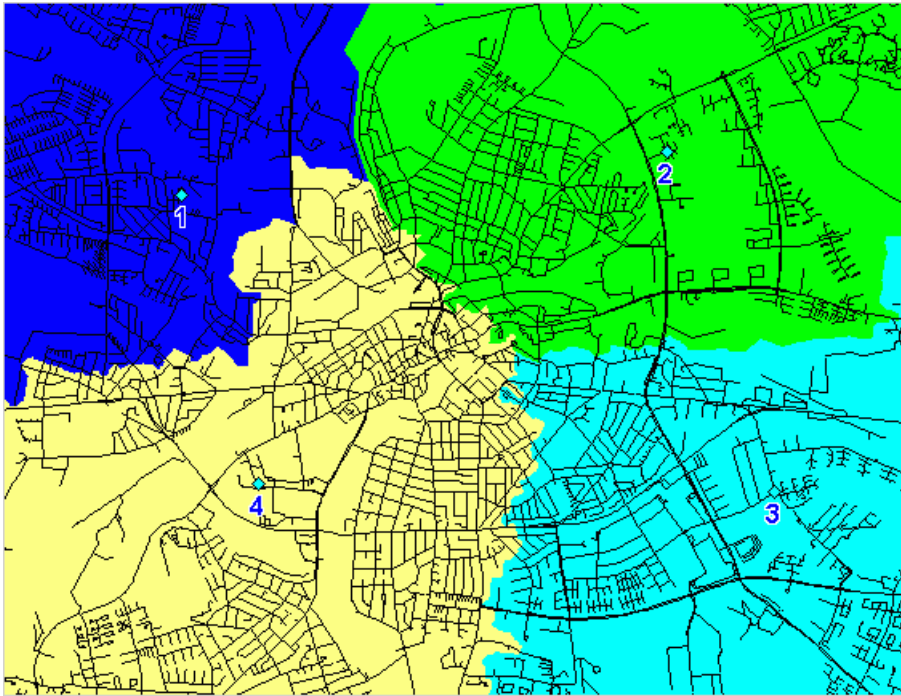


This function can be used to show polygons representing the parts of the road network that is closest to a number of designated outlets (aka. service areas). It can be used as a first pass territory planning system.

Click to add starting point. A small diamond represents the point. If the clipping^[50] options have been set then this layer will also be clipped using the selected layer.

Use the Ctrl-Click to add more points

Then Shift-Click to add the last point.



The result will be stored in a layer called "Closest"

3.1.6 Travelling Salesman



This function will show the optimised route between a series of points. For different modes of operations, see here^[53].

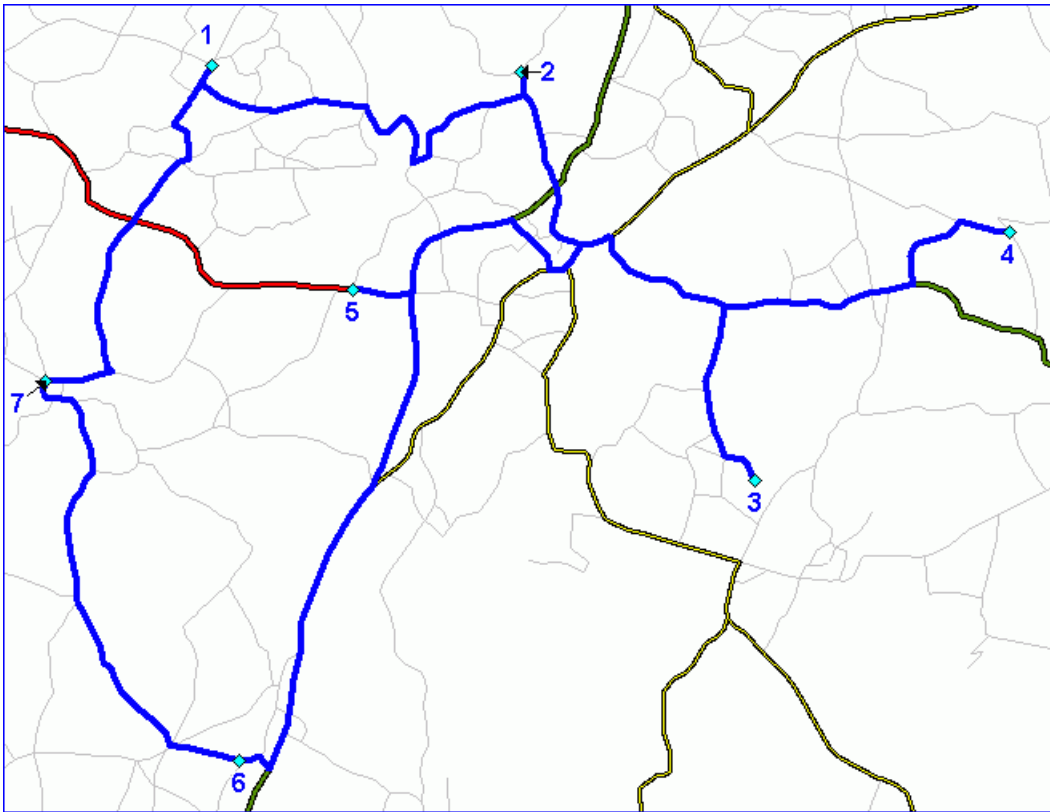
The points are entered interactively in the same way as in function Route^[21].

Click to add starting point. Use the Ctrl-Click to add more points.

The word "Start" will appear on the map. A small diamond represents the points.

Then Shift-Click to add the last point. Then the optimal route is calculated through all the points. There may be errors if you select two points at the same location. We are looking to improve this in future versions of RouteFinder.

The points are labelled to show the order in which to visit them. An example of this is shown below.



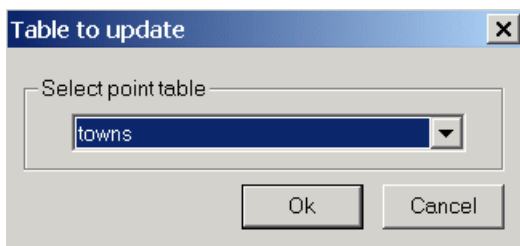
3.1.7 Update Point File



This function can be used to perform a quick update a point table with distances and times to a point on a map.

After selecting this tool you need to click on the map that represents the start location.

The following dialog is displayed showing all the open tables:



From the drop down box select the tables that you want to add the time and distance.

Once the process is completed the table will have RF_Time and RF_Dist added.

	Name	Latitude	Longitude	RF_TIME	RF_DIST
<input type="checkbox"/>	Haslemere	051 05 17.93N	000 42 39.94W	28.21	15.3
<input type="checkbox"/>	Hindhead	051 06 49.35N	000 43 50.43W	21.07	13.68
<input type="checkbox"/>	Liphook	051 04 37.28N	000 47 57.67W	17.75	10.01
<input type="checkbox"/>	Bordon	051 06 44.21N	000 51 12.41W	20.88	10.21
<input type="checkbox"/>	Selborne	051 05 50.85N	000 56 27.90W	26.35	11.66
<input type="checkbox"/>	East Lavant	050 52 08.44N	000 46 28.98W	47.11	21.22
<input type="checkbox"/>	Waterbeach	050 51 59.98N	000 43 54.17W	48	21.52
<input type="checkbox"/>	Bepton	050 57 30.25N	000 46 26.67W	23.61	12.93
<input type="checkbox"/>	Cocking	050 56 55.03N	000 45 02.00W	26.1	14.22
<input type="checkbox"/>	East Dean	050 54 24.05N	000 42 53.92W	38.7	18.42
<input type="checkbox"/>	Singleton	050 54 41.61N	000 44 59.94W	34	16.85
<input type="checkbox"/>	Midhurst	050 59 03.77N	000 44 20.07W	18.67	11.74
<input type="checkbox"/>	Easebourne	051 00 00.49N	000 42 56.44W	20.31	12.75

This will work in the Node to Node and Exact modes.

3.1.8 IsoGrid

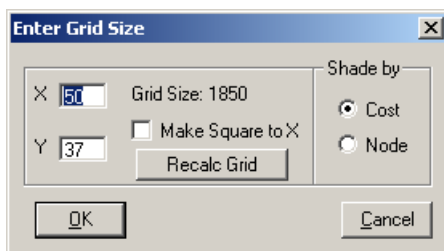


This option will create a grid-based isochrone.

Click to add starting point. The number of the point will appear on the map.

Use the Ctrl-Click to add more points. The number of the point will appear on the map.

Then Shift-Click to add the last point. The number of the point will appear on the map. The following dialog appears: -



By default parameters are calculated to display a square grid cells.

The number of grid cells is displayed to guide the user on how long it might take to generate the grid. The higher the number the longer it will take.

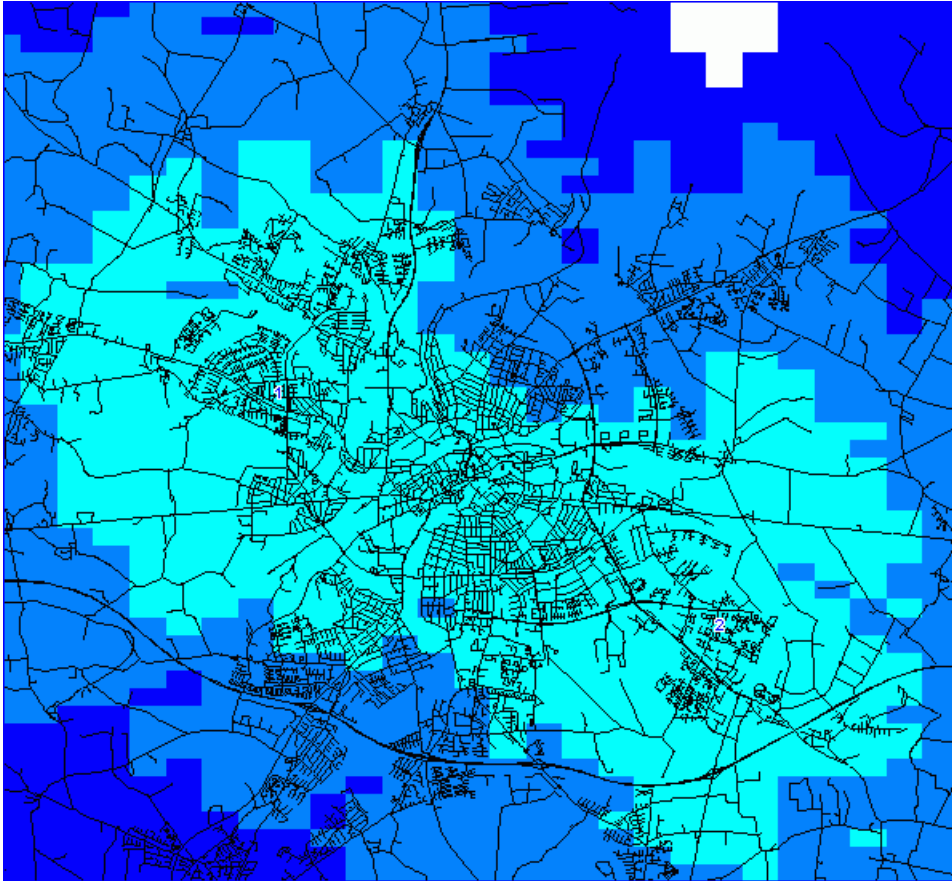
You can change the number of cells by typing in the X and Y boxes. You can enter a new value in X and then use the "Make square to X" option to automatically calculate the Y value to create square grid cells.

Use the "Recalc Grid" option to work out the number of grid cells in the new grid.

There are two options available for shading. This is selected by RouteFinder > Options > Change IsoGrid Shading.

Cost – this will use the time or the distance as the basis for the isochrone.
Node – this will use the distance as the basis for the isochrone.

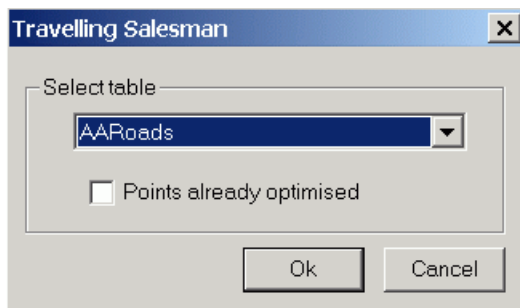
An example of cost shading shown here:



3.2 Batch Jobs

3.2.1 Travelling Salesman from table

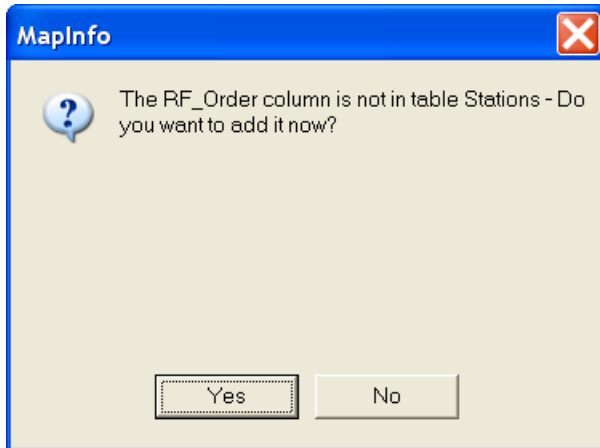
Go to RouteFinder > Batch Functions > TSP From Table



For this function the table selected is optimized and the result is displayed on the map. The order in the table is used as the start and end points. See the explanation of the options in the Travelling

salesman³⁵ button option. If you select the "Points already optimised" option then a route will be generated based on the order of the points in the table.

If your table does not have a column to store the result then you will see this prompt:-



If you click "Yes" then the column is added as in integer column.

The result of the TSP is stored in this column

	RF_Order
(p4r)	1
College (Fai	10
School	12
	6
ol	11
ool	4
ondary Scho	19

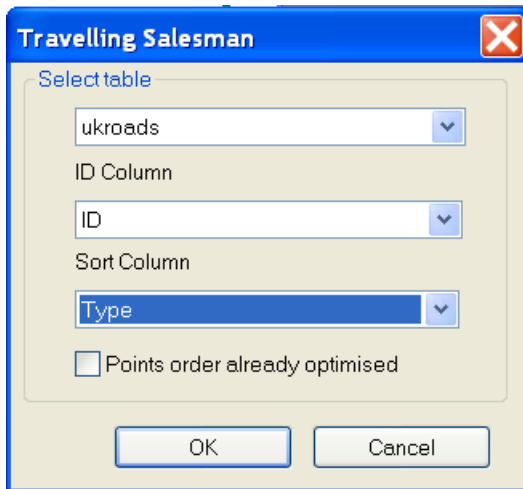
How to create a table suitable for TSP Batch

If you need to define your start and/or the end points then you should build a new table from the one that you want to optimize. Here is one way in, which this could be achieved:

1. Select the point you want to start with from the map or from a browser.
2. Use File > Save Copy as.. and save the selection to a new table.
3. Open the new table.
4. Next Select all the records from the target table and use the shift key and click to de-select the start and/ or end points.
5. Use Table > Append Rows to Table to add the selection to your new table.
6. Select the point you want to end with (if required) and use the Append Rows to table to add to your new table. Save your new table and you are then ready to do the optimization with the table you have built.

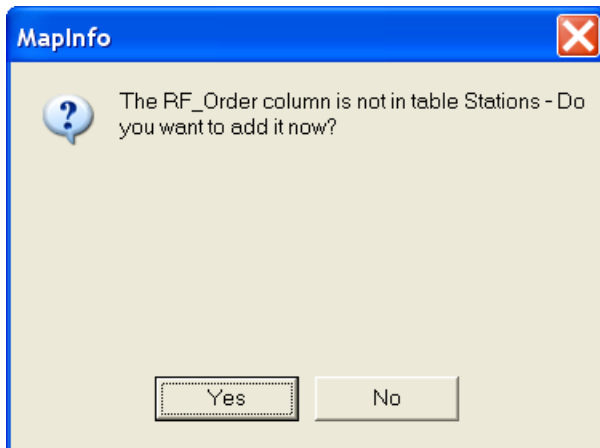
3.2.2 Batch TSP Routes from table

Goto RouteFinder > Batch Functions > Batch TSP Route from table



This option will take a table of points and produce optimized routes based on an ID column in the selected table. The program will select out each ID and use the first and or last points in the selection as the start and end points. You can optionally select a further column to order the points so you can force the use of the start and end points. See the explanation of the options in the Travelling salesman ^[35] button option. If you select the "Points already optimised" option then a route will be generated based on the order of the points in the selected set of ID's.

If your table does not have a column to store the result then you will see this prompt:-

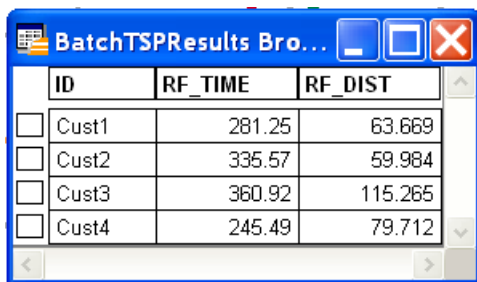


If you click "Yes" then the column is added as an integer column.

The result of the TSP is stored in this column in the original table

	RF_Order
(p4r)	1
College (Fai	10
School	12
	6
ol	11
ool	4
ondary Scho	19

When the process is completed a new table is created called "BatchTSPResults" and the results displayed in a browser.



	ID	RF_TIME	RF_DIST
<input type="checkbox"/>	Cust1	281.25	63.669
<input type="checkbox"/>	Cust2	335.57	59.984
<input type="checkbox"/>	Cust3	360.92	115.265
<input type="checkbox"/>	Cust4	245.49	79.712

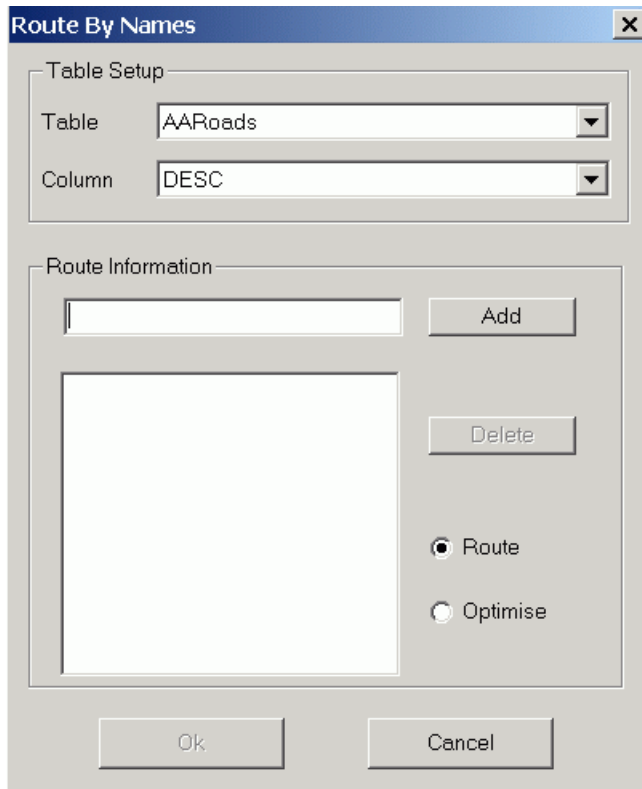
Each record will have a route attached to it that can be mapped.

3.2.3 Select Locations

Go to RouteFinder > Select Locations

This function will allow the user to select the start location, any via's and the end destination point from a gazetteer. This will allow users to specify London as a start point and Newcastle as the end point. The system will then produce a route from one to the other.

The following dialog is displayed:



1. Select the table from the drop down list.
2. Select the column that contains the identifiers (e.g. Town)
3. Type in the name of the first location.
4. Click on the "Add" Button. If the location is not found in the table then close matches are displayed for the user to select from
5. The location is displayed in the list box.
6. Repeat steps 3-5 to add locations. At least two must be selected.
7. Select between generating a "Route" and/or optimizing the route between the selected points.
8. Click on the OK button and the locations are processed and displayed on the map.
9. If you add a location by mistake then you can select the location from the list box and then press the Delete button.

3.2.4 Distance Matrix

Go to RouteFinder > Batch Functions > Distance Matrix

This function will allow generation of a matrix showing time and distance between numbers of points. For example, depots to outlets.

The following dialog is displayed:

1. Select the table from the drop down list in the "From" box
2. Select the column that contains the identifiers (e.g. Town)
3. Repeat the selections from the "To" box

If the tables are the same you will have the option of calculating the routes in both directions. i.e. Town1 to Town2 and Town2 to Town1

The default is to calculate in one direction only.

You can also decide to not build the mappable routes. This option runs more quickly and will create a smaller route results table.

The results will look like this, but can also be shown on a map:

RouteResults Browser				
	FromID	ToID	Time	Dist
<input type="checkbox"/>	ABERDEEN	ABERYSTWYTH	1,030.26	429.27
<input type="checkbox"/>	ABERDEEN	ALLOA	293.71	122.38
<input type="checkbox"/>	ABERDEEN	ANDOVER	1,231.24	513.02
<input type="checkbox"/>	ABERDEEN	ANTRIM	692.24	288.43
<input type="checkbox"/>	ABERDEEN	ARBROATH	118.06	49.19
<input type="checkbox"/>	ABERDEEN	ARMAGH	778.56	324.4
<input type="checkbox"/>	ABERDEEN	ASHFORD	1,305.92	544.13
<input type="checkbox"/>	ABERDEEN	ASHINGTON	547.2	228
<input type="checkbox"/>	ABERDEEN	ATHLONE	1,117.63	465.68
<input type="checkbox"/>	ABERDEEN	AYR	427.88	178.28
<input type="checkbox"/>	ABERDEEN	BALLYMENA	715.68	298.2
<input type="checkbox"/>	ABERDEEN	BANBRIDGE	749.05	312.1
<input type="checkbox"/>	ABERDEEN	BANBURY	1,062.65	442.77
<input type="checkbox"/>	ABERDEEN	BANGOR	958.07	399.2

The distance column will be in the currently selected distance unit, either miles or kilometers. The time will always be returned in minutes.

Route Directions cannot be generated with this option.

3.2.5 Route Pairs

Go to RouteFinder > Batch Functions > Route Pairs

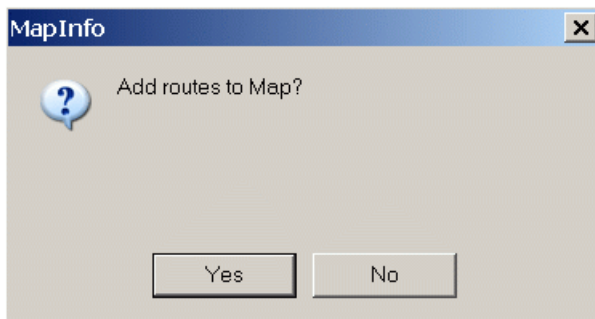
This function will allow routes to be generated between two points in different tables. The number of rows in each table must match for this function to work. When used the first row from table one is selected as the start point and the first row in the second table is used as the end point.

When selected the following dialog is displayed:



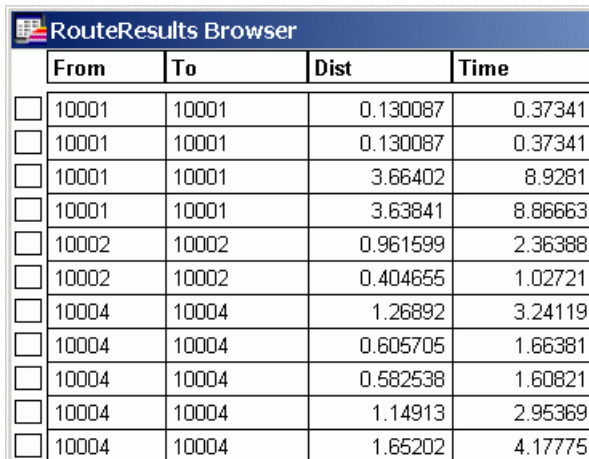
1. Select the first table from the drop down list in the "From" box
2. Select the column that contains the identifiers (e.g. Town)
3. Repeat the selections from the "To" box for the second table

The other option is to build map objects of each of the routes generated. If you use this option then before the results are displayed you get the following question:



By selecting "Yes" the routes will be added to the map.

The results will look like:



	From	To	Dist	Time
<input type="checkbox"/>	10001	10001	0.130087	0.37341
<input type="checkbox"/>	10001	10001	0.130087	0.37341
<input type="checkbox"/>	10001	10001	3.66402	8.9281
<input type="checkbox"/>	10001	10001	3.63841	8.86663
<input type="checkbox"/>	10002	10002	0.961599	2.36388
<input type="checkbox"/>	10002	10002	0.404655	1.02721
<input type="checkbox"/>	10004	10004	1.26892	3.24119
<input type="checkbox"/>	10004	10004	0.605705	1.66381
<input type="checkbox"/>	10004	10004	0.582538	1.60821
<input type="checkbox"/>	10004	10004	1.14913	2.95369
<input type="checkbox"/>	10004	10004	1.65202	4.17775

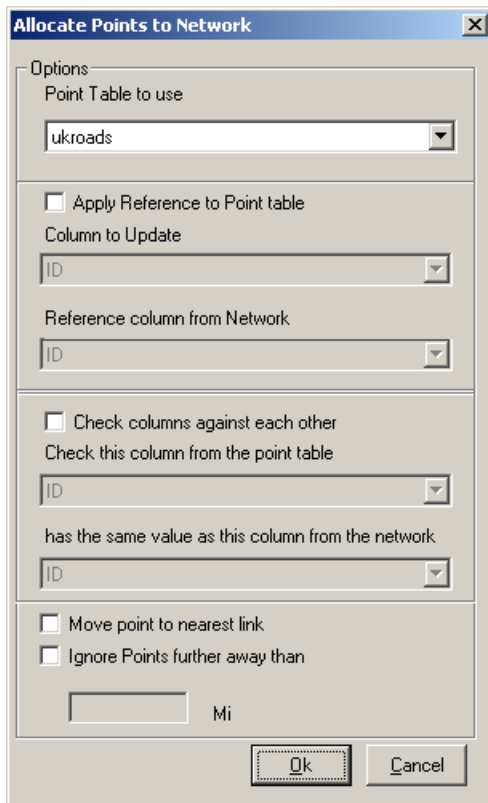
The distance column will be in the currently selected distance unit, either miles or kilometers. The time will always be returned in minutes.

Route Directions cannot be generated with this option.

3.2.6 Allocate Point to Network

Go to RouteFinder > Batch Functions > Allocate point to network

This function will allow a point file to be allocated a link ID value or moved to the nearest link on the network.



The first option is to choose the Point table you want to allocate. Then you need to decide what actions you want to do.

The first is to get the reference column from the road network table and put it into your point table. eg a street name.

Column to update

This is a column in your point table

Reference column

This is a column in the network table

You can validate the points so they are only updated if one column in the network table matches that in the point table being used. Eg the street names have to be the same.

Check this column from the point table

Use this column in your point table as a reference to check the link in your network table

Has the same value as this column from the network table

This is a column in your network table - it will be checked against the point being allocated. If the references are the same the columns will be updated

Move Point to nearest link

By checking this option the point will be updated with the new coordinates of the nearest point on

the link.

Ignore points further away than

If the distance from the point to the nearest link is greater than the distance specified in the box then it is ignored

3.2.7 Nearest N Centres

Go to RouteFinder > Batch Functions > Nearest N Centres

This function is useful for calculating the time and distance from a location until "Nearest" locations on the list has been reached. It will work in Node-to-Node and exact mode the off road portion of an exact route is ignored.

Select Parameters

Origin / Destination Table

Origin Table
towns

Origin ID Column
Name

Destination Table
towns

Destination ID Column
Name

Limits

Number of Nearest Centres: 10

Time limit (mins): 0

Ok Cancel

Origin Table

Use the drop down boxes to select the table and the column to use as the identifier. The table specified will be looped through one record at a time and used as the origin for the destinations.

Destination Table

Use the drop down boxes to select the table and the column to use as the identifier. This is then used by the function to get the nearest centres depending on the limits entered.

Number of Nearest Centres

If a number is entered in here then the function will find the nearest centres until this number is reached. You cannot specify more centres than are in the destinations table.

Time Limit

If a number is entered into this box then it is used to find the nearest centres within the time limitation.

You can combine the two limits together to say find the nearest 10 centres and within 20 minutes of

the origin. You should realise that this may return less centres than specified in the "Number of Nearest Centres" box.

When the process has run you will get a table like this:

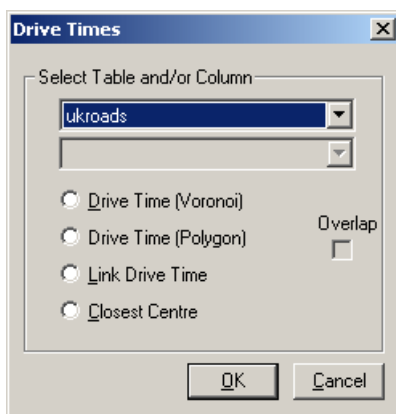
Nearest3 Browser					
	Origin	Destination	ID	time	Dist
<input type="checkbox"/>	Nottingham	Nottingham	1	0	0
<input type="checkbox"/>	Nottingham	Derby	2	40.3817	16.5737
<input type="checkbox"/>	Nottingham	Coalville	3	56.483	27.1084
<input type="checkbox"/>	Derby	Derby	1	0	0
<input type="checkbox"/>	Derby	Nottingham	2	40.3817	16.5737
<input type="checkbox"/>	Derby	Coalville	3	58.948	27.8917
<input type="checkbox"/>	Coalville	Coalville	1	0	0
<input type="checkbox"/>	Coalville	Leicester	2	35.7047	12.5195
<input type="checkbox"/>	Coalville	Nottingham	3	56.483	27.1084
<input type="checkbox"/>	Leicester	Leicester	1	0	0
<input type="checkbox"/>	Leicester	Coalville	2	35.7047	12.5195
<input type="checkbox"/>	Leicester	Hinckley	3	45.2232	16.8405
<input type="checkbox"/>	Hinckley	Hinckley	1	0	0
<input type="checkbox"/>	Hinckley	Rugby	2	36.5396	14.4157
<input type="checkbox"/>	Hinckley	Coventry	3	36.8131	12.4652
<input type="checkbox"/>	Coventry	Coventry	1	0	0
<input type="checkbox"/>	Coventry	Hinckley	2	36.8131	12.4652
<input type="checkbox"/>	Coventry	Rugby	3	45.5031	16.0561

3.2.8 Drive Times / Closest Centre

Go to RouteFinder > Batch Functions > Drive Times

This function will allow generation of multiple polygon or link based drive time or drive distance polygons.

The following dialog is displayed:



The first step is to select a table of point objects from which to produce isochrones.

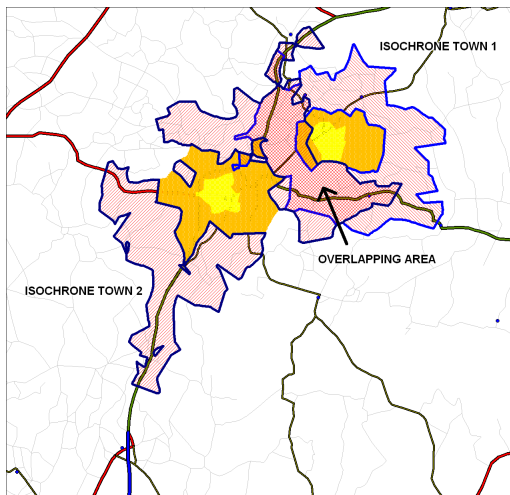
There are 4 options available in the Batch Drive Time (or drive distances).

The first option is to generate Voronoi^[31] based isochrone polygons.

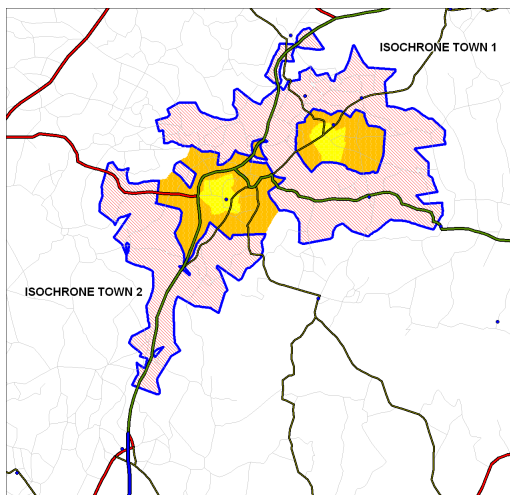
This next option is standard polygon isochrones. The style of these polygons is set using the Drive Time^[32] (or Drive Distances^[32]) option.

With the first two options you also have a choice of overlapping or non-overlapping polygons. If you want the isochrones to overlap then you check the "overlap" box.

Here is an example of an overlapping isochrone:-



And in this example there is no shared area they are merged together.



Link drive time or distances will shade the links on the network according to the values set up in the options dialog. These are non-overlapping by nature.

The last option in this dialog is to generate a map of closest center^[34] polygons. These are non-overlapping by nature.

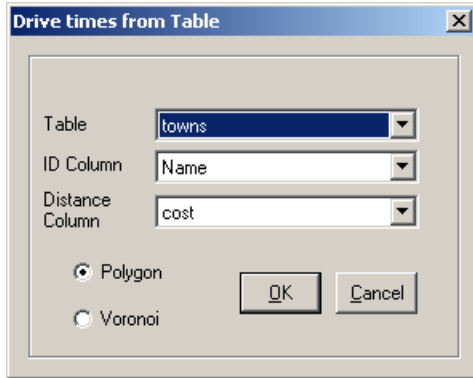
For the polygon options, you can also select a column name to work with the function. This will then update the polygons that are created with the value of the selected field for each point. This will allow you to easily identify which polygons have been created for each point on your map.

3.2.9 Drive Time from Column

Go to RouteFinder > Batch Functions > Drive Time From Column

This function will allow generation of multiple polygon or voronoi based isochrones that are based on a distance or time for each point. The time or distance is set in a column in a table.

The following dialog is displayed:



- 1) Select a table from the "Table" drop down menu of point objects from which to produce isochrones.
- 2) Select a column from the "ID Column" to use to Identify each isochrone generated.
- 3) Select a numeric column which contains the required drive time or distance for the isochrone.

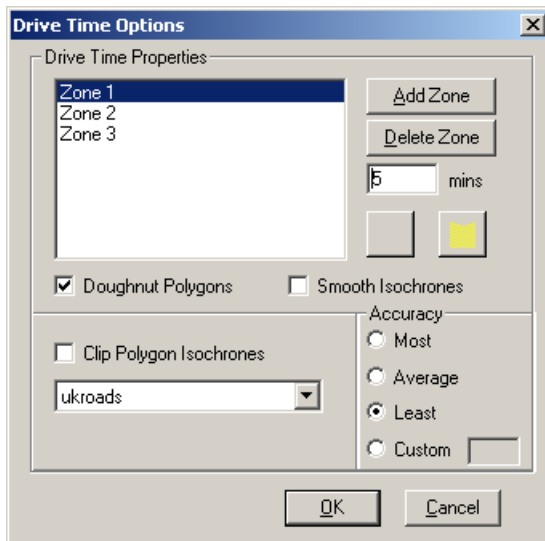
N.B if no numeric columns are in the selected table then the OK button will be greyed out and you will not be able to continue the process

3.3 Options

3.3.1 Drive Time Options

Go to RouteFinder > Options > Drive Time or Drive Distance

The following dialog is displayed which allows you to add, delete or amend the number of zones or the way they look.



The dialog shows a list of zone's added for generation of isochrones. The values reflect either distance or time depending on the choice of shortest or fastest route. Default values are 3 zones with values of 5, 10 and 15.

Adding a Zone

When you click on the "Add Zone" button a new one is added to the list. It will always be one greater than the last zone shown in the list.

Deleting a Zone

When the user clicks on the "Delete Zone" button the last zone displayed in the list is removed.

Changing a Zone Border Colour

To use this option you must first select a zone from the list displayed.

By clicking on the button with the line, the user will be able to select a line style in which the border of the selected zone will be displayed.

Changing a Zone Fill Pattern

To use this option you must first select a zone from the list displayed.

By clicking on the button next to the line style button the user will be able to select a fill pattern for the selected zone.

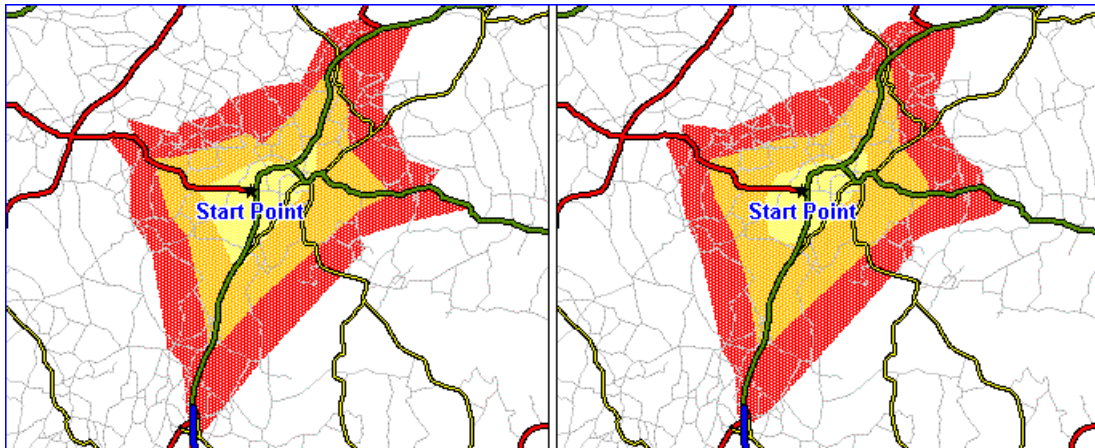
You can have separate styles and values for Drive Time and Drive Distances.

Doughnut polygons

When this option is checked then the overlaying polygons are cut from larger polygons. This results in polygons that represent "bands" of time between two values, i.e: 0-5, 5-10 and 10-15. Otherwise 0-5, 0-10 and 0-15 polygons are generated.

Smooth Isochrones

This option will remove a lot of the spikyness of the voronoi and polygon isochrones to give them a more rounded look and feel. This do slightly reduce the overall accuracy of the resulting polygons. Also there are some circumstances when using the voronoi type polygons that gaps may appear between polygon vertices. It is up to the user to decide when to use them and when it is inappropriate to use them. Closest centre polygons are not smoothed.



Normal / Smoothed Isochrone

Accuracy

The accuracy option will determine how the drive time boundaries and closest centre polygons are created. The same settings are used for both method I^[32] & method II^[31] and is explained here.

Drive time (I)^[31] / *Closest Centre*^[34]:

During calculations additional nodes can be added dynamically along the links, so long links will get more nodes added, while shorter links will not. You can define the approximate additional nodes to have added compared to the initial number of nodes:

Most: 6 times more nodes.

Average: 3 times more nodes.

Least: No additional nodes (default).

Custom: Enter a number corresponding to the number of additional nodes you want (in the same way as above).

The larger the number, the more RAM is needed and the requirements increases fast, so don't just type in a large number.

Drive time (II)^[32]:

Most – The isochrone will reflect very accurately the extents of the boundaries using every link in the network. This results in very jagged looking boundaries.

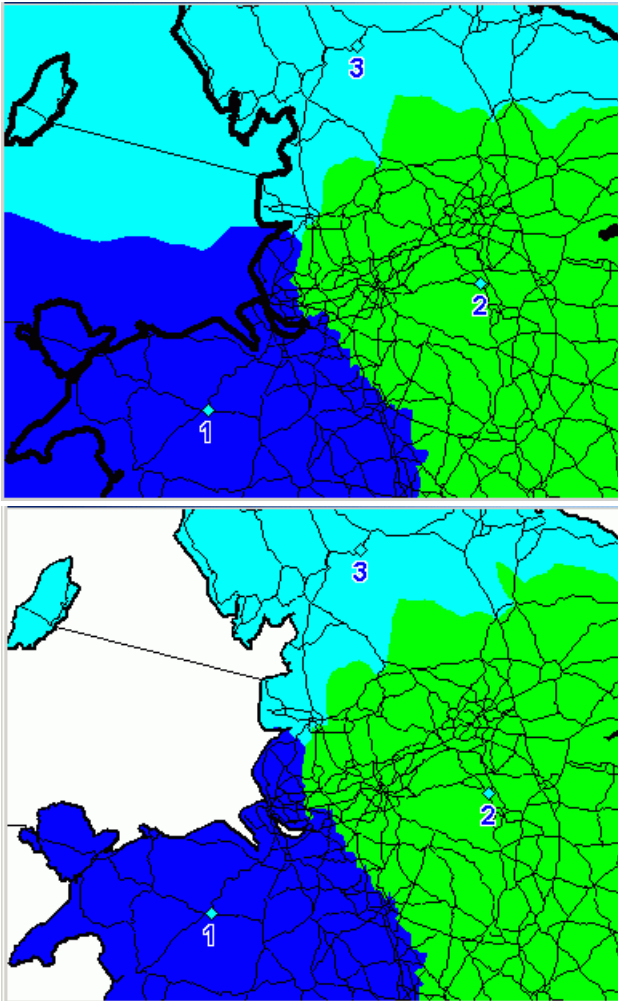
Average – This will generalize some of the spikes to produce a smoother looking polygon.

Least - This will generalize some of the spikes to produce a much smoother looking polygon.

Custom - This is automatically set to be the most accurate isochrones possible. The additional nodes do not affect this function in any other way

Clip Polygons

This allows the clipping of polygons to another table, for instance a coastline, and will give a nicer presentation of the result. See the images below to see the difference in the options.



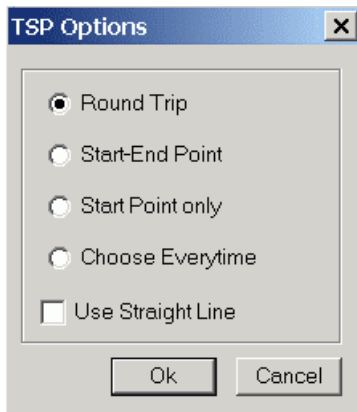
Closest centres with polygons not clipped / clipped to the coastline.

This setting applies to Drive Time Polygons and Closest Centres.

3.3.2 Travelling Salesman Options

Go to [RouteFinder](#) > [Option](#) > [TSP Options](#)

RouteFinder has a number of options for the Travelling Salesman routine:



Round Trip – This is the default option. The route will Start and finish at the first point you click on the map / found in your table.

Start-End Point – The route will start at the first point and finish at the last point. The order of the points in between are optimised.

Start-Point only – The Route will start at the first point and the order of the rest of the points are optimised. You will typically end at a point far away from the start point with this option (but not always).

Choose Every time – This dialog is presented after a shift click so that you can select which option you would like to run.

Use Straight Line – This can be a good option to use if you have a lot of points to optimise as it will run faster, but the result may not be optimal since straight line distances are used in the optimization instead of street distances.

Part IV

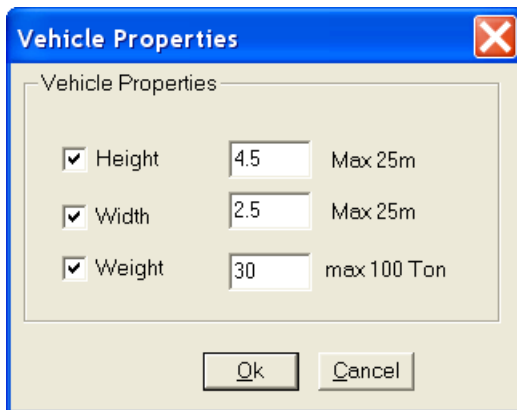
Professional Version

4 Professional Version

4.1 Vehicle Types

Go to RouteFinder > Options > Vehicle Properties

The professional version allows you to set parameters for a vehicle when navigating the network. On selecting the option the following dialog is displayed:-



Height

The height of the vehicle is entered in metres. Any links that are specified with a limit less than the vehicle height will be avoided.

Width

The Width of the vehicle is entered in metres. Any links that are specified with a limit less than the vehicle width will be avoided.

Weight

The weight of the vehicle is entered in tonnes. Any links that are specified with a limit less than the vehicle weight will be avoided.

N.B The settings are saved when the network is closed so it is up to the user to clear any limits when required.

4.2 Dynamic Cut offs

The professional version can make some changes to the network without having to recreate the binary files.

When the professional version is being used the following buttons are displayed:



Add a stop to a link on the network. Click to add the stop. Click again to remove the link. This symbol will be added to the map to represent the link, which has been closed.



Allow a link to have its default road speed to be changed. This may be useful when road works may be on a particular link on the network. This symbol will represent the link on which the speed has been changed.

These changes are stored in a separate txt file (stops.) along with the street network.

4.3 Network Analysis

Included in the professional version of RouteFinder is a number of functions that allow the network to be analyzed for topology and connectivity. It can also assist in removing nodes or links to make the network more compact and therefore faster in generating routes or isochrones.

Several functions rely on creating small buffers for locating the problems. Therefore we recommend that you avoid having street sections shorter than the size of these buffers or the result of the analysis gets distorted. This is especially true for the Close Nodes^[59] and the Node-Link check^[65] functions.

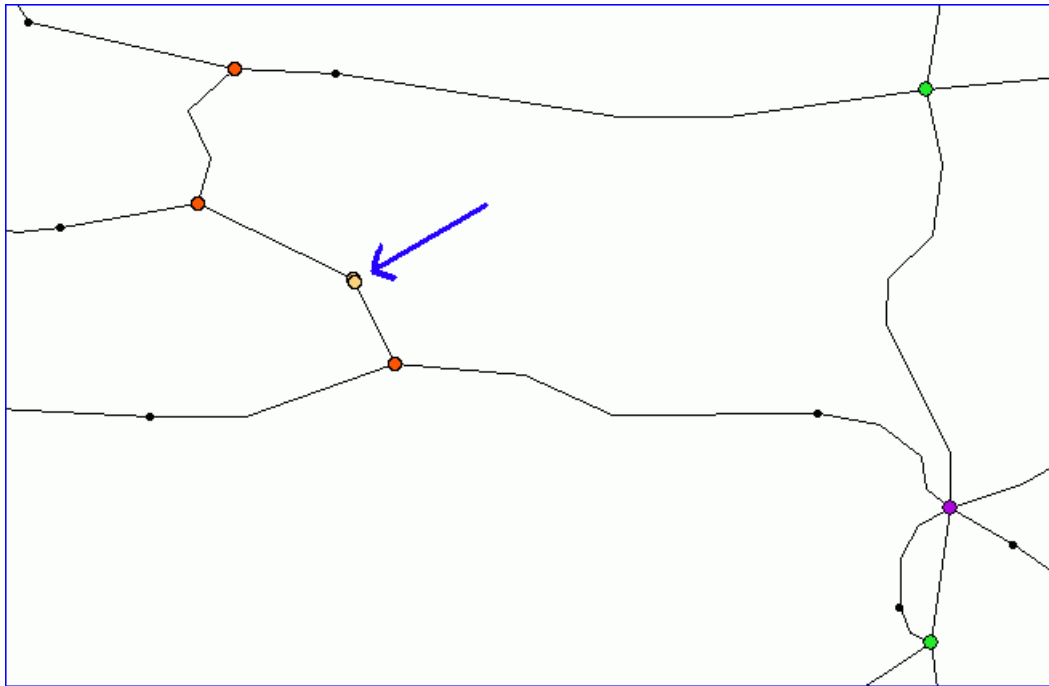
4.3.1 Add Node Layer

RouteFinder > Analyze > Add Node Layer

When you use this function you will get a new table added to your map window. The layer shows the nodes that are used as a part of the network. It may assist you while you are working with the network functions.

The node layer has these attributes: The internal ID (1, 2, 3) and the valency. Valency is a number ≥ 1 and denotes the number of links attached to the node. You will normally find that most nodes has a valency of 1, 2, 3 and 4, but larger values are also possible. If used with thematic mapping, you can use this to check if the structure of the map seems OK. An example of this is shown below.

The 2 nodes with valency 1 is probably the result of missing snap in the network. You would have to zoom closer to see this properly, but the 2 nodes should be visible even at the map below:

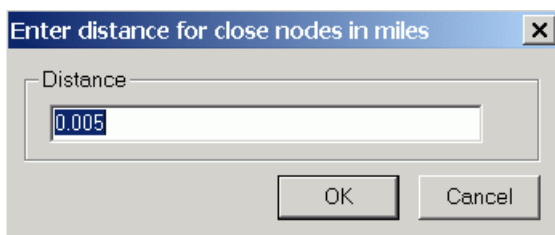


4.3.2 Detect Close Nodes

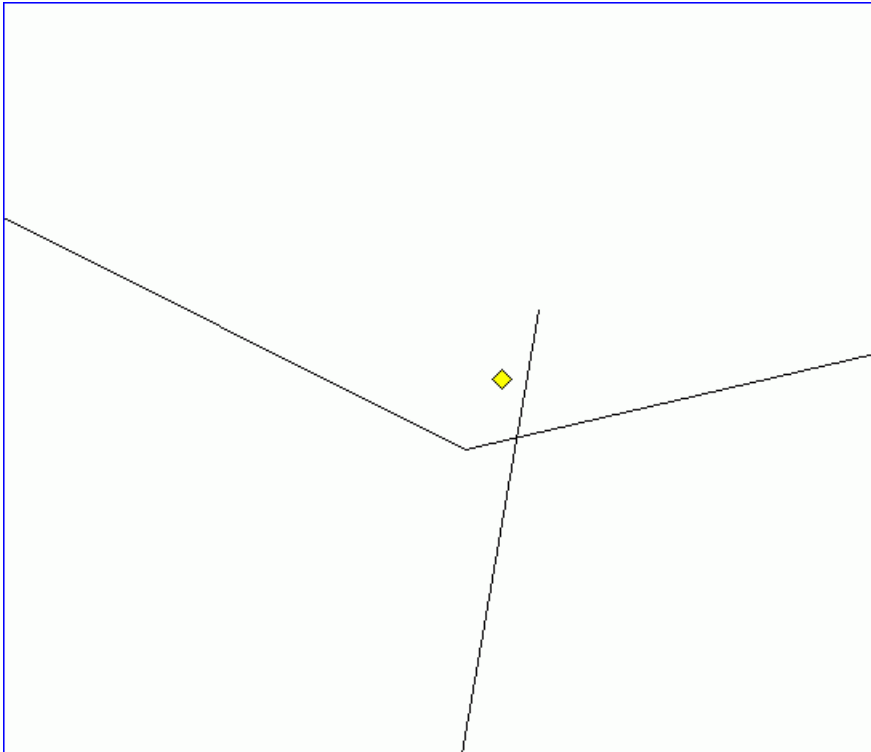
RouteFinder > Analyze > Detect Close Nodes

In almost any digitized network you may be able to find 2 or more polylines, which should have snapped but doesn't do. This causes breaks in the network and therefore routes not generated correctly. The function for detecting such problems is a very powerful tool for anyone working with street data, where the quality may not have been thoroughly checked.

When this option is selected the following dialog is displayed:



Simply enter the maximum distance between nodes that you wish to identify. You should only use rather small values or a very large table will be generated. Only pairs of nodes, that are not connected by a link, will be identified.



In this instance the results are two nodes that are close together and not actually connected.

This browser is displayed after the function has completed to help in detecting the close nodes. You can select a record from this browser and then use Query > Find Selection to move to that point on the map.

	Dist
<input type="checkbox"/>	0.00695736
<input type="checkbox"/>	0.0142272
<input type="checkbox"/>	0.0224375
<input type="checkbox"/>	0.0279319
<input type="checkbox"/>	0.0372778
<input type="checkbox"/>	0.037284
<input type="checkbox"/>	0.062138
<input type="checkbox"/>	0.0683543
<input type="checkbox"/>	0.0745681
<input type="checkbox"/>	0.0752762
<input type="checkbox"/>	0.0783946

4.3.3 Detect Cul-De-Sac

RouteFinder > Analyze > Detect Cul-De-Sac

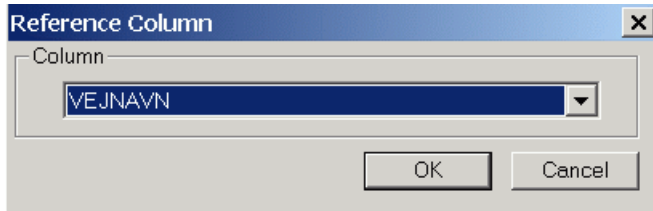
Identifies cul-de-sac or blind alleys, which are defined like this:

Position yourself in a node and drive in one direction using link A. If you can't get back to the same node without using the same link A again, it is a cul-de-sac.

If you however can come back without making a U-turn, it is a bridge or isthmus in graph theory

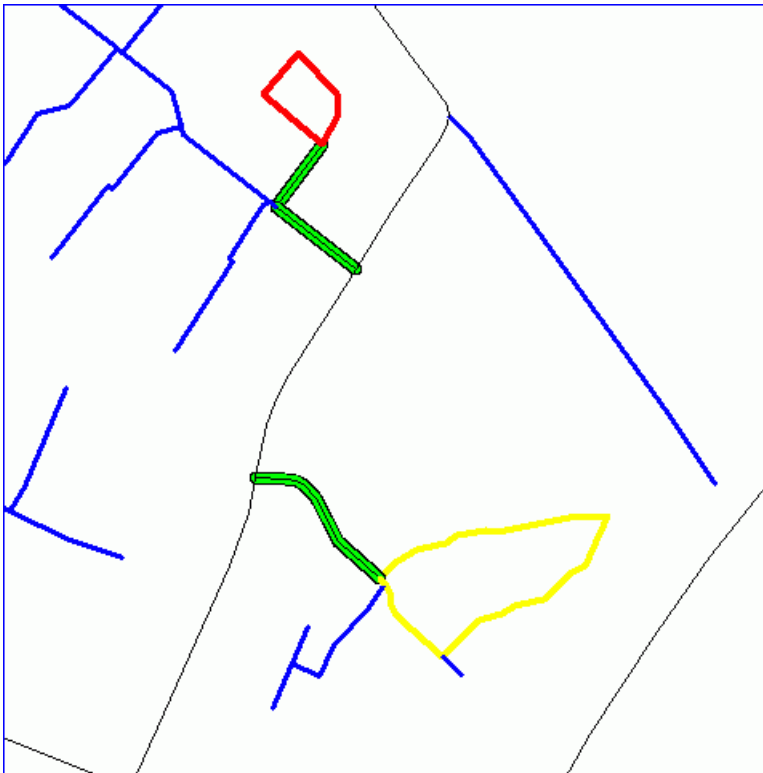
terms: If the link was missing, the network would be split into 2 components or subnets.

The first step is to choose a column to identify the links in the browser. This is typically the street name.



Once OK is pressed the network is analyzed and then the map is shaded. A browser is then shown.

A map is shown below:



The Map here shows all the available network types.

This browser is displayed after the function has completed to help in detecting the Cul-De-Sacs.




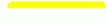
CulDeSac Browser			
	VEJNAVN	RF_Result	ObjectLen(Object, "M")
<input type="checkbox"/>	GRØNNINGEN	4.000	0.00120295
<input type="checkbox"/>	STENBUKKEN	1.000	0.00132776
<input type="checkbox"/>	NØRREBJERG RUNDEL	4.000	0.00134445
<input type="checkbox"/>	FLINTEBJERG VÆNGET	1.000	0.00136387
<input type="checkbox"/>	ÆBLEHAVEN	1.000	0.00137969
<input type="checkbox"/>	NÆRÅPARKEN	3.000	0.00143549
<input type="checkbox"/>	SKOVHAVEN	3.000	0.00144419
<input type="checkbox"/>	BERGMANN SVEJ	4.000	0.00144586
<input type="checkbox"/>	HUMLEBIVÆNGET	1.000	0.00146683
<input type="checkbox"/>	KOGTVEDHØJ	4.000	0.00147536
<input type="checkbox"/>	LILLEBÆLT SVÆNGET	4.000	0.00151881
<input type="checkbox"/>	ODINSVEJ	1.000	0.00152738
<input type="checkbox"/>	FASANVEJ	4.000	0.00153314
<input type="checkbox"/>	HESBJERG SKOVVEJ	1.000	0.00153858
<input type="checkbox"/>	TERNEVEJ	1.000	0.00154171
<input type="checkbox"/>	AVERNAKØVEJ	1.000	0.00154829

You can select a record from this browser and then use Query > Find Selection to move to that point on the map.

RF_Result contains the type of link found. The numbers represent.

- 1 = cul-de-sac
- 2 = loops
- 3 = bridge
- 4 = Minor net

Finally a legend is displayed to show how many links of each type were found.

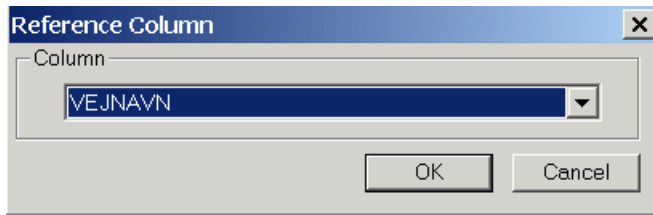
Legend	
Cul De Sac Result	
	Cul De Sac (15538)
	Loop (433)
	Bridge (1403)
	Minor Net (1693)

4.3.4 Detect Parallel

RouteFinder > Analyze > Detect Parallel

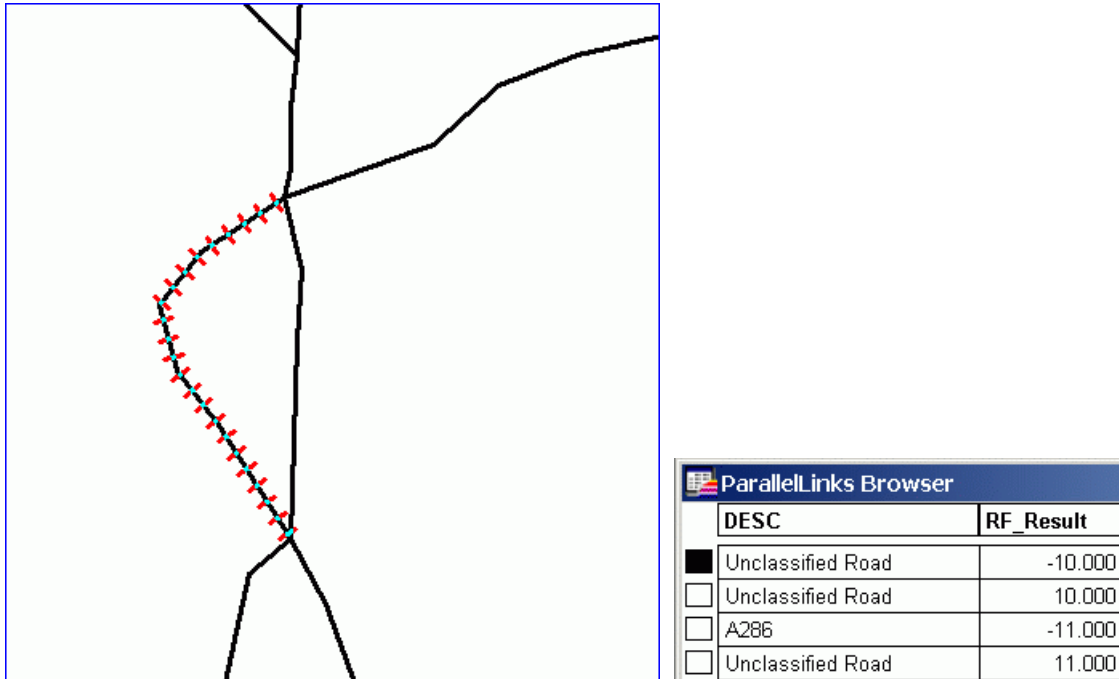
Identifies groups of links, which start and end at the same two nodes.

The first step is to choose a column to identify the links in the browser. This is typically the street name.



Once OK is pressed the network is analyzed and a browser is then shown.

A map is shown below:



Here is an example of a parallel link. You can now decide if both links are needed. If they are the same type and attribute, the longer one will always be ignored. However, it may be used in Dynamic Segmentation Mode.

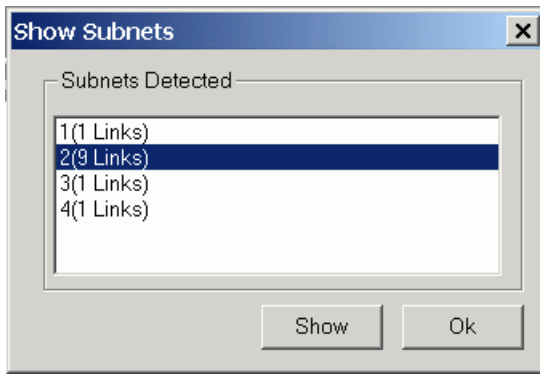
Three parallel links would have the value 10 (the shortest) and -10 for the other two. The next group of parallel links has value 11 / -11 and then 12 / -12 etc.

4.3.5 Detect Subnets

RouteFinder > Analyze > Detect Subnet

Detects which part of a network is a subnet. A subnet is defined as a part of the network that isn't connected to the rest of the network. The main net is defined as the part of the network, where node 1 is found. Node 1 is the one with the highest valency and if there are more than one of these, it is the West-most.

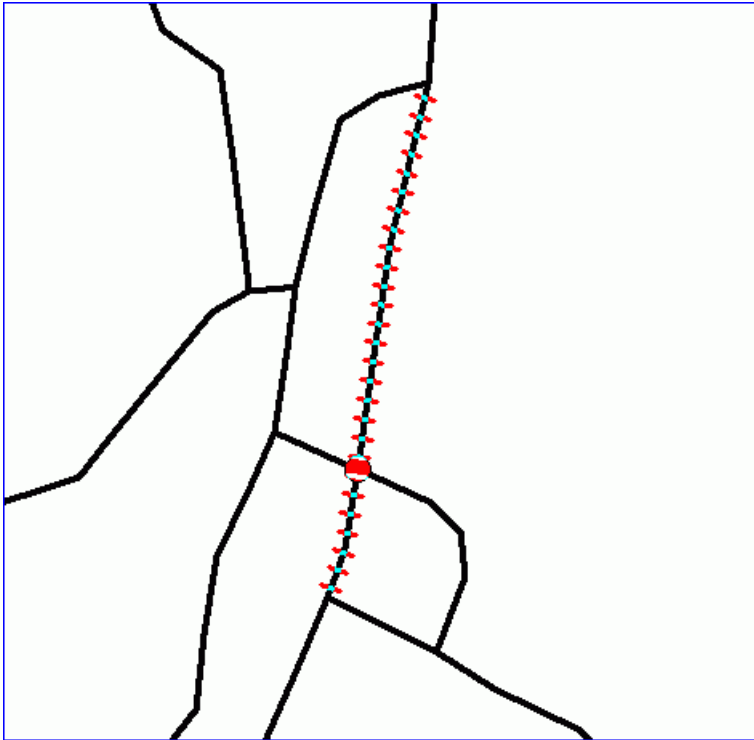
The function runs and then this dialog is displayed. You can view each subnet by clicking on the number in the list box and then pressing the "Show" Button.



After Pressing "Ok" the Browser is displayed. This time RF_RESULT contains the number of the subnet in which the link resides.

SubNetTab Browser			
	DESC	FCODE	RF_Result
<input type="checkbox"/>	Unclassified Road	4	1.000
<input checked="" type="checkbox"/>	Unclassified Road	4	2.000
<input checked="" type="checkbox"/>	Unclassified Road	4	2.000
<input checked="" type="checkbox"/>	Unclassified Road	4	2.000
<input checked="" type="checkbox"/>	Unclassified Road	4	2.000
<input checked="" type="checkbox"/>	Unclassified Road	4	2.000
<input checked="" type="checkbox"/>	Unclassified Road	4	2.000
<input checked="" type="checkbox"/>	Unclassified Road	4	2.000
<input checked="" type="checkbox"/>	Unclassified Road	4	2.000
<input type="checkbox"/>	Unclassified Road	4	3.000
<input type="checkbox"/>	A285	3	4.000

Below is a map that shows a subnet identified by the function.



You can see here that there is a link that does not break at a node junction.

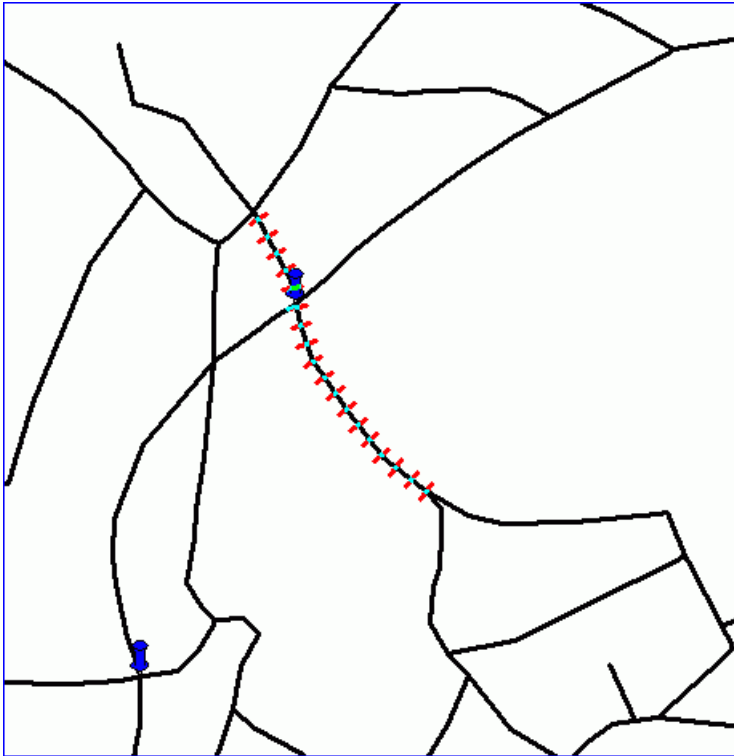
This function may also identify non-polyline or multi-sectioned polylines if you have any such in your TAB file.

4.3.7 Overpasses Check

RouteFinder > Analyze > Overpasses Check

This is used to check for links that do not break at intersections or what could also be just a bridge. This may cause problems when generating routes or be deliberately.

At the end of the function the map will display the locations:



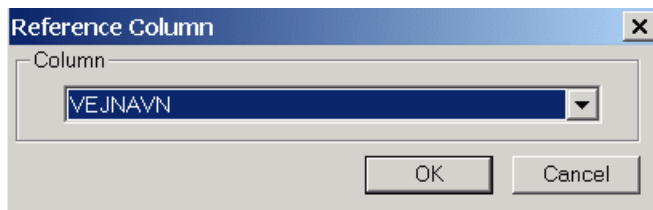
The pushpin's are in a browser called "Over Passes".

4.3.8 Remove Pseudo Nodes

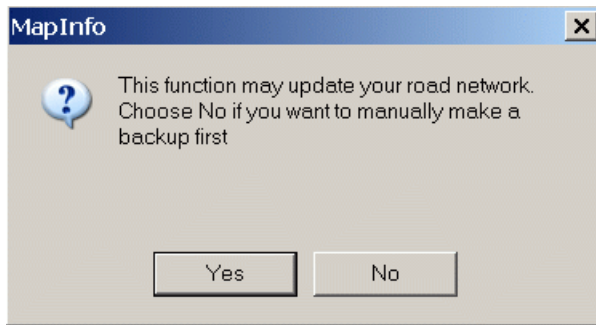
RouteFinder > Analyze > Remove Pseudo Nodes

This function locates which links in a network can be joined together. If a node has only two links connected to it, that node may be superfluous for some purposes (aka. a pseudo-node). For other purposes it is needed, e.g. if you want to calculate the distance from that node to another or some attribute value changes.

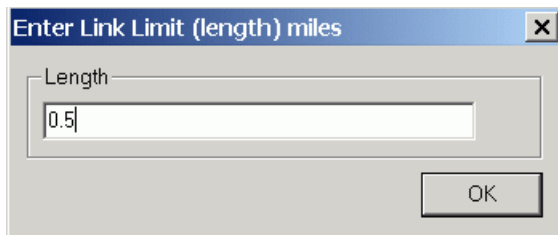
The first step is to choose a column to identify the links in the browser. This is typically the street name.



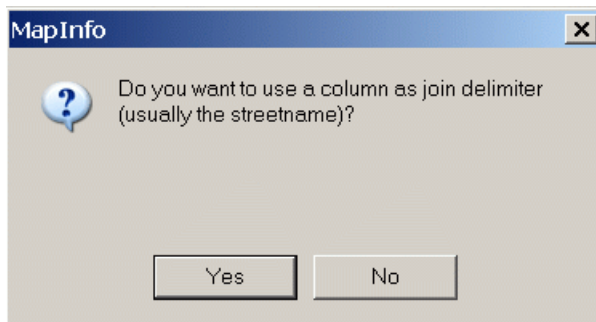
Next you are asked if you want to make a back up of the network first. This is strongly recommended, especially if you are going to change the links in your network. The following dialog is displayed.



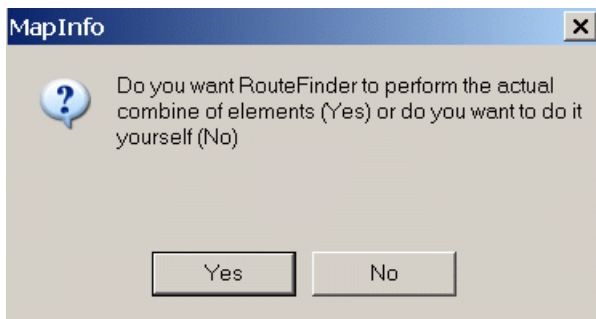
Now you are asked to input the distance at which nodes should be checked. If a network has many very short links, which you would like to join, you can specify that links should be joined until they reach a length of max length. If max length = 0, there is no upper limit and all links between nodes with more or less than 2 links, will be connected.



Next you are asked if you want to specify a column as a second check before links are joined. You would use this to only join links of the same street name.

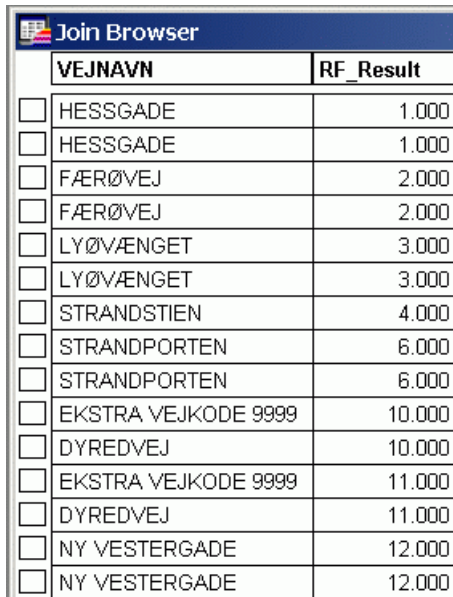


Next you will be asked if you want RouteFinder to perform the join of links automatically.



If you want to do the join yourself then you will normally do it with MapInfo's Combine command, as this gives control to how attributes are treated.

Finally a browser is displayed showing groups of links ready for joining:



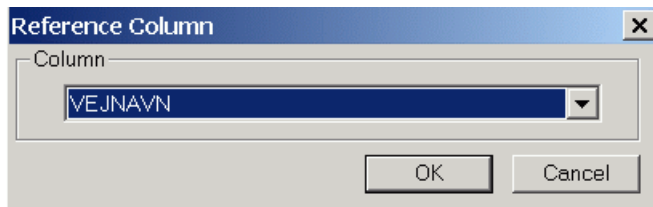
	VEJNAVN	RF_Result
<input type="checkbox"/>	HESSGADE	1.000
<input type="checkbox"/>	HESSGADE	1.000
<input type="checkbox"/>	FÆRØVEJ	2.000
<input type="checkbox"/>	FÆRØVEJ	2.000
<input type="checkbox"/>	LYØVÆNGET	3.000
<input type="checkbox"/>	LYØVÆNGET	3.000
<input type="checkbox"/>	STRANDSTIEN	4.000
<input type="checkbox"/>	STRANDPORTEN	6.000
<input type="checkbox"/>	STRANDPORTEN	6.000
<input type="checkbox"/>	EKSTRA VEJKODE 9999	10.000
<input type="checkbox"/>	DYREDVEJ	10.000
<input type="checkbox"/>	EKSTRA VEJKODE 9999	11.000
<input type="checkbox"/>	DYREDVEJ	11.000
<input type="checkbox"/>	NY VESTERGADE	12.000
<input type="checkbox"/>	NY VESTERGADE	12.000

4.3.9 Show Unused Links

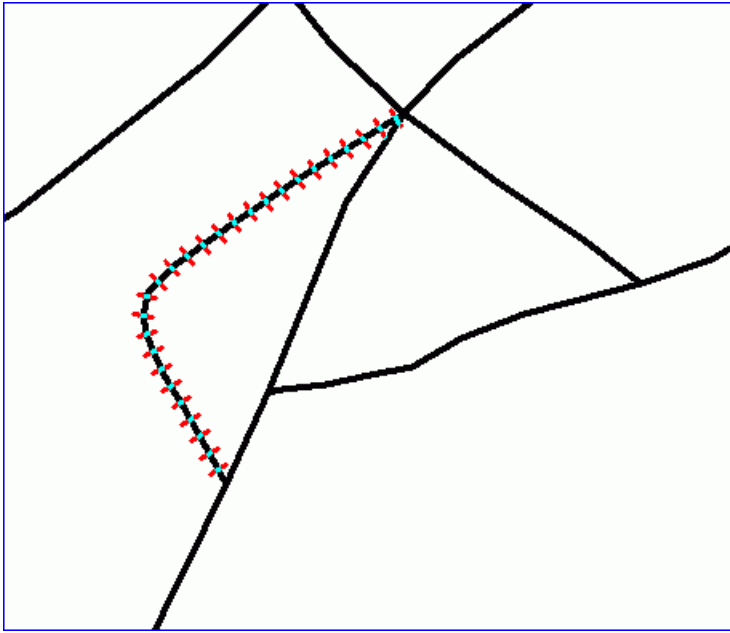
RouteFinder > Analyze > Show Unused Links

This function returns the number of unused links in the network. An unused link is one that isn't part of any route at all. This is determined using the current speed setting (Shortest or Fastest) in the route options dialog.

The first step is to choose a column to identify the links in the browser. This is typically the street name.



This map is displayed with the result of the function:



Here this link will never be used when the fastest route is selected. You can decide to remove this link. However, it can be used in Dynamic Segmentation Mode.

After pressing "Ok" the browser is displayed.

	DESC	RF_Result
<input checked="" type="checkbox"/>	Unclassified Road	1.000
<input type="checkbox"/>	Unclassified Road	1.000
<input type="checkbox"/>	Unclassified Road	1.000
<input type="checkbox"/>	Unclassified Road	1.000
<input type="checkbox"/>	Unclassified Road	1.000
<input type="checkbox"/>	Unclassified Road	1.000
<input type="checkbox"/>	Unclassified Road	1.000
<input type="checkbox"/>	Unclassified Road	1.000
<input type="checkbox"/>	Unclassified Road	1.000
<input type="checkbox"/>	Unclassified Road	1.000
<input type="checkbox"/>	Unclassified Road	1.000

RF_Result contains the type of link found.

Part V

Street databases

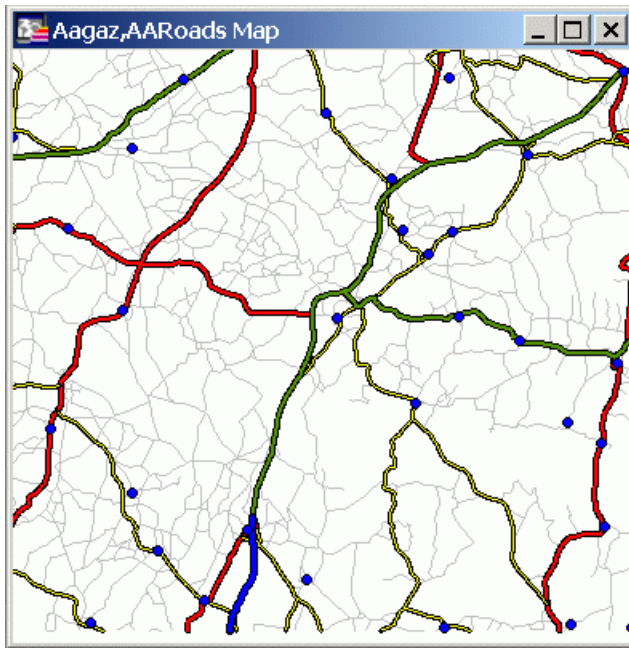
5 Street databases

5.1 Sample Data

RouteFinder comes with 3 datasets, which can be used for input for testing the functions:

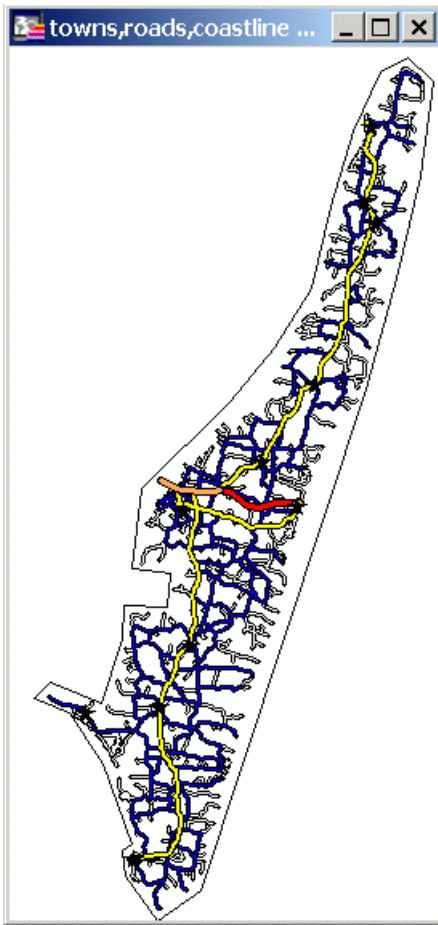
Note: This sample dataset has more than 3000 links, so in order to try it in the free version, you will have to delete some parts first.

AA road (UK small sample)



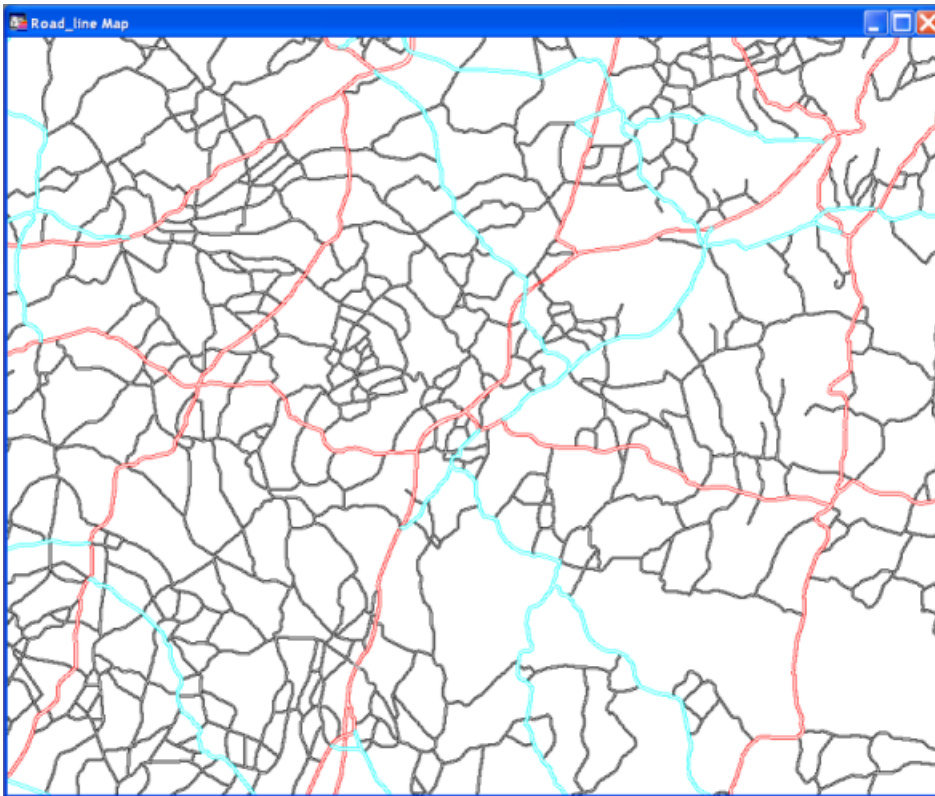
This data is kindly supplied by Kingswood MapMechanics and is the copyright of Automobile Association

DAV (Denmark, sample)



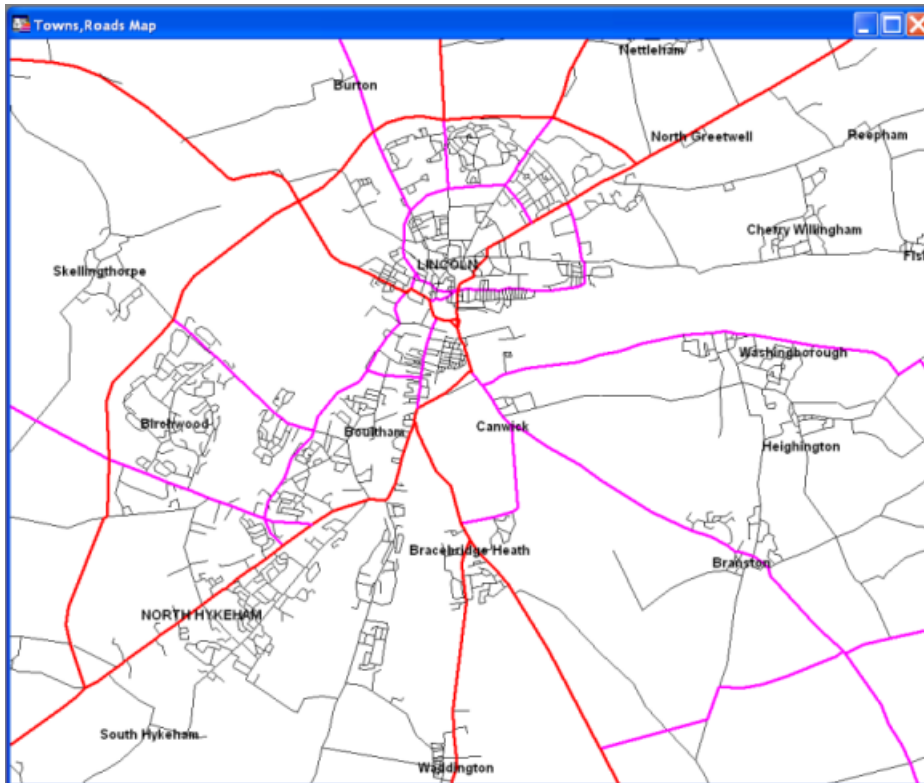
This data is kindly supplied by COWI and is the copyright of DAV organization

Harper Collins Sample



This data is kindly supplied by Harper Collins.

OS Meridian Sample



This data is supplied under to OS Open data agreement and is (c) Crown Copyright

5.2 Your Own Data

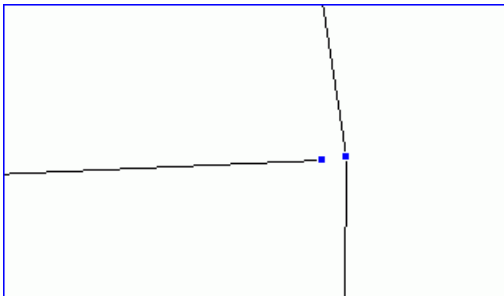
The quality of the data you will be using for street network calculations is very important. Many street maps looks nice, when printed or viewed in a mapping application, but unless you check out the details there may be problems.

How should your own street data look like, in order to be used in RouteFinder? ***The short answer is they should snap and split at intersections and the network should be plane unless there is an overpass.***

Below is shown some examples on street networks, which are NOT correct, but all look correct unless you check out the details:

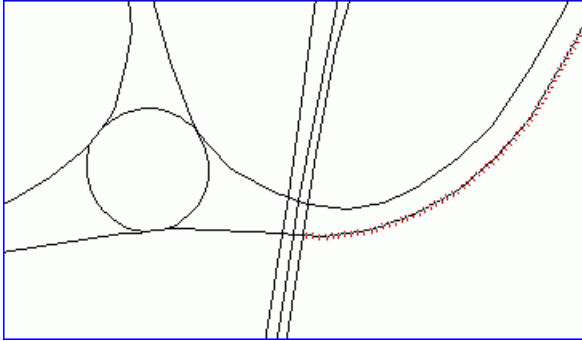
Example 1: Missing snap at an intersection

This means the network doesn't connect and the movement to / from the disconnected section, isn't possible. In the example below, the gap is just 1 meter and can't be seen at normal zoom levels.

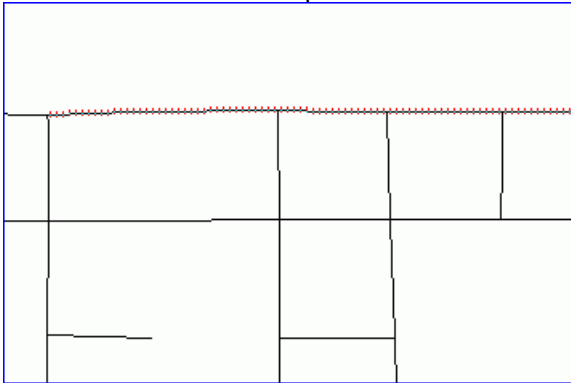


Example 2: Split at overpass / underpass

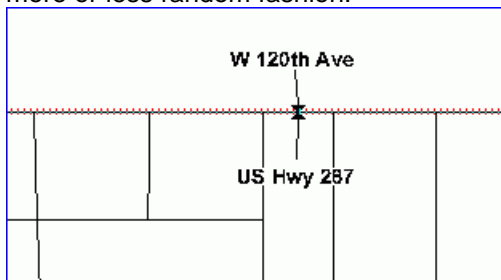
This means a lot of impossible turn movements are suddenly made possible. This is a typical problem with TIGER data.

**Example 3: Doesn't split/break at intersections**

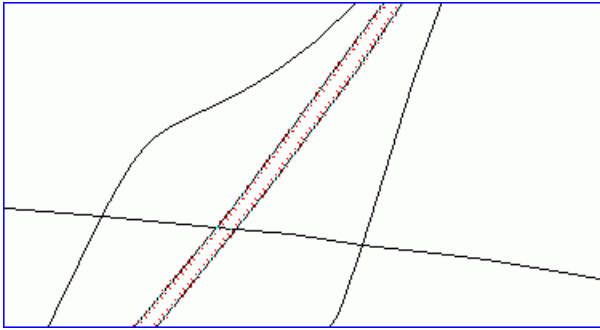
This means turns are not possible at most intersections.

**Example 4: Double digitization with two street names, here name + route number**

Not a really big problem, but the result of a route calculation may include one of the two streets in a more or less random fashion.

**Example 5: Multi sectioned Polylines**

Polylines with more than 1 section are ignored. They will not be part of any route.



When it comes to attribute data, there are actually no requirements at all, but you can read more about it in the section about network creation^[15].

5.3 Commercial Databases

RouteWare maintains a [list on our website](#) with commercial street database vendors.

Part VI

Troubleshooting

6 Troubleshooting

RouteFinder appears to crash on batch operations

This is usually because the tables selected for batch operations has deleted rows in it or ungeocoded records. Please pack the table and try again.

If the problem persists please contact RouteWare or your local reseller.

RouteFinder produces a -30 error on network creation

There can be a number of reasons for this error to appear. The first thing to check is the range of attributes used to classify the network. You can find more details here [\[15\]](#) on valid ranges.

RouteFinder will recognise most projections. However if an error occurs please try saving a copy of you table in Latitude/Longitude and see if the network is created successfully. If so then please send a sample of your original road network to RouteWare so it can be analyzed and added to our list of supported projections.

RouteFinder produces strange routes or gives an error on a simple route

This would normally happen because the attribute indicating road speeds has exceeded 32. Please check the network table and make sure the attributes are within the 0-31 range.