



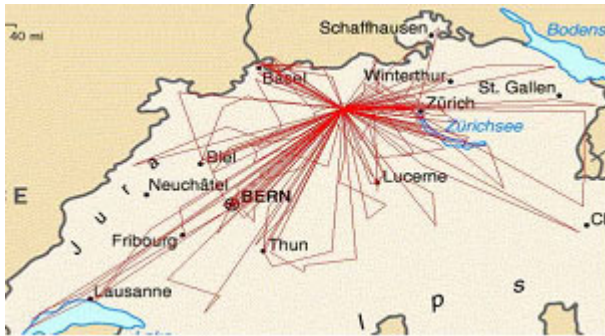
# Large Scale Dynamic Optimisation of Vehicle Routes and Fleets





AntRoute is made of the base module, **TOUR PLANNING OPTIMISER** for the daily distribution route planning, and of the supplemental modules:

- **GDO**: large-scale distribution
- **SIMTOUR**: simulation of the distribution process
- **TOUR ONLINE**: dynamic and real-time route planning



AntRoute is the software tool for large scale dynamic optimisation of vehicle routes and fleets.

It is the result of the joint work between AntOptima, a Swiss company specialised in innovative and high-performance optimisation algorithms, and a group of international distribution companies, leaders in their market sectors.

## The technology

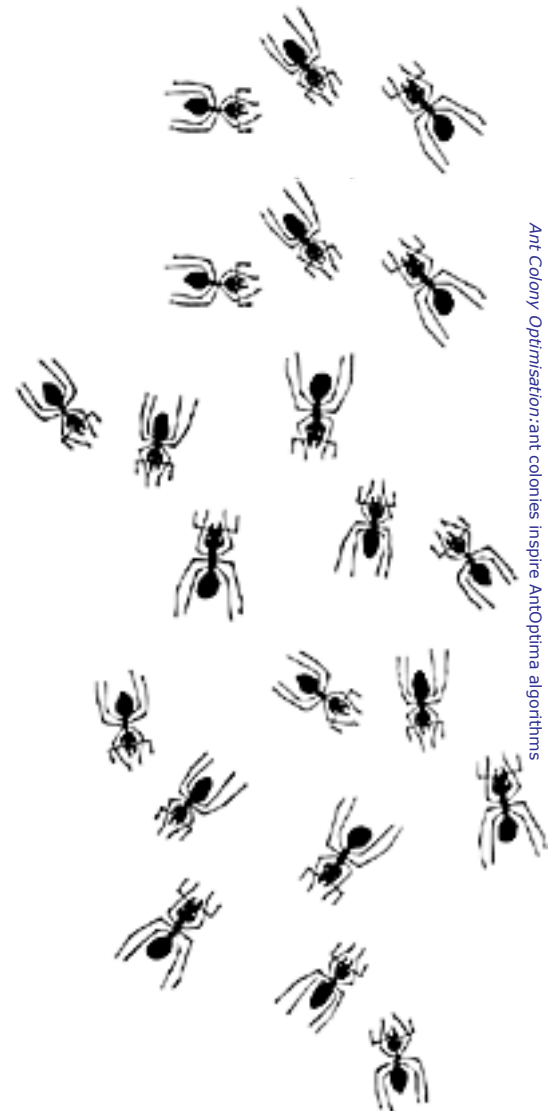
AntRoute uses state-of-the-art optimisation algorithms, invented at the Dalle Molle Institute for Artificial Intelligence Studies, during various projects, co-financed by the Swiss National Research Fund and by the Swiss Commission for Technology and Innovation. These algorithms, inspired by *ant colonies*, learn from past experience, adapt to unforeseen circumstances, and they are able to solve with extreme speed complex combinatorial optimisation problems, otherwise intractable with traditional algorithms.

## The advantages

AntRoute optimises distribution logistics thanks to an integrated approach to the various features of the problem, thus rapidly enabling the user to:

- optimise the use of the vehicle fleet (type and quantity of the used vehicles, workload scheduling, capacity optimisation)
- improve the efficiency (less kilometres, less time, more delivered goods, all of this within the time constraints)
- increase customer satisfaction, thanks to online management of urgent orders

AntRoute runs on PC type computers, under Microsoft Windows® and most Unix dialects.



Ant Colony Optimisation: ant colonies inspire AntOptima algorithms

AntRoute can be interfaced with GPS, GPRS/GSM devices to use up-to-date information on the vehicle location in the online planning of urgent and unexpected deliveries.

## Tour Planning Optimiser (base module)

The Tour Planning Optimiser computes the best routes for the vehicle fleet, given a set of orders. Access constraints, workload and travel time limitations, and delivery and pick-up time windows are considered to compute the best routes.

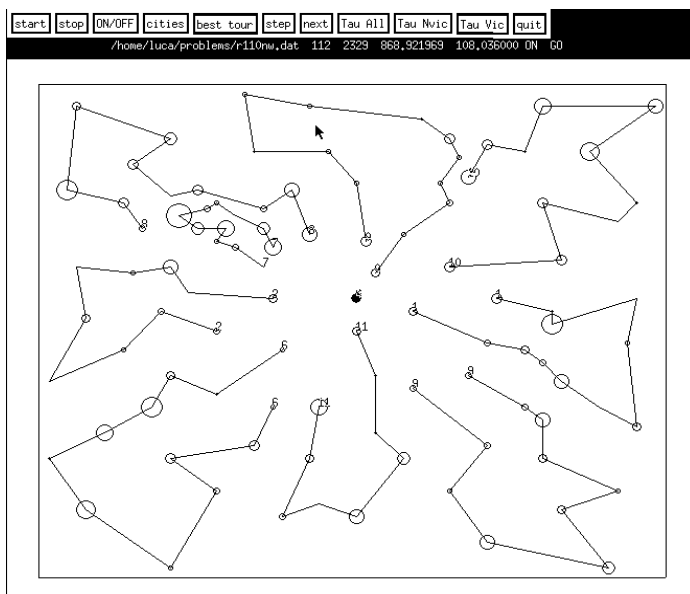
This base module can manage non-homogeneous fleets, where the vehicles are characterised by different dimensions, equipment, and load capacity.

The user can customise the parameters of the distribution process, such as loading and unloading times, travel times, and administrative times.

The Tour Planning Optimiser displays an easy and intuitive graphical interface to visualise the order status (waiting, in process, delivered) and the fleet location. Thanks to a lightweight GIS module, distribution routes can be graphically displayed on a map.

Nome Cliente	cap	Località	LT...	Qta	Capa.	ULIV	Dal	Al	C...	Plan.
5661	6992	CANOBBIO	0	1000	2000	23	17.11.97	22.11.97	0	34P-Lun
70462	8982	ABNO	0	1000	1900	34	17.11.97	22.11.97	0	34W-Ma
71124	6994	BIGORIO	0	1700	2000	27	17.11.97	22.11.97	0	24W-Lun
26169	8976	CASTAGNOLA	0	8000	10000	29	17.11.97	22.11.97	0	27W-Lun
23678	6816	NORANCO	0	1600	2100	22	17.11.97	22.11.97	0	27W-Lun
5488	8982	VIBANELLO	0	3500	4000	22	17.11.97	22.11.97	0	22W-Lun
71677	6848	REGGIOLA-POR...	0	600	1000	27	17.11.97	22.11.97	0	34P-Lun
16868	8805	MEZZOVICO	0	4000	6000	23	17.11.97	22.11.97	0	24W-Ma
89812	6864	DAVESCO	0	3500	4000	23	17.11.97	22.11.97	0	24W-Ma
6940	6910	MASPARANO	0	1900	2000	23	17.11.97	22.11.97	0	24W-Lun

The Tour Planning Optimiser is a full-fledged Decision Support System for the human vehicle route planner. The routes are automatically computed, but the planner can manually evaluate, modify and adapt them to the situation at hand, in order to face unexpected and unplanned changes



## GDO (distribution optimiser)

GDO specializes in the optimisation of flows and vehicle routes for large-scale distribution

- it handles loads expressed in units such as pallets, kg and m<sup>3</sup>
- it is able to manage various transport means, such as trailers, semi-trailers, etc.
- it solves both single and multi-depot optimisation problems
- it can incorporate third-party vehicles in fleet optimisation
- optimises driver-to-vehicle assignments, accounting for workload constraints
- handles trans-shipment areas

GDO can be used to strategically plan the management of the fleet of vehicles and of the resources under alternative scenarii. It also allows to gather and analyse statistical data on the distribution process and to deduce trends and make forecasts.

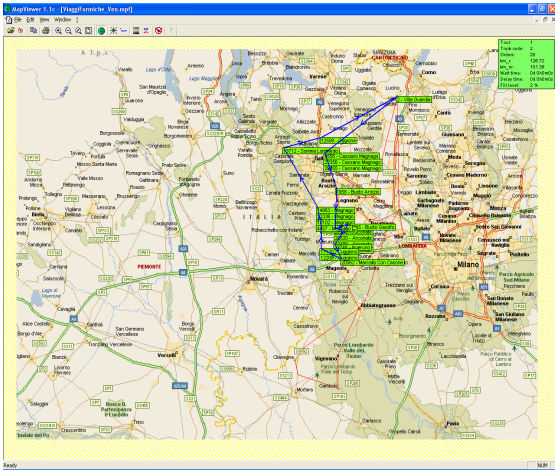
GDO uses standard road network data and it can perform the daily optimisation of fleets ranging from a few tens to thousands of vehicles. GDO has been installed, tested and validated by major large-scale distribution companies in Europe.

AntRoute can be easily integrated in your ERP system and it can dialogues with most supply-chain management software tools.

## SimTour

The human planner can use the tour simulation module to assess the feasibility and the quality of the automatically generated tours in front of new traffic and meteorological conditions, which are affected by uncertainty and are random in nature. In the simulation environment the user modifies the parameters to construct a set of delivery routes, which are both efficient and robust.

Thanks to SimTour the planner can evaluate alternative strategies and analyse different plans and distribution scenarii. This module, used with the Tour Online module, plays a key role in the evaluation of management strategies for urgent deliveries.



## Tour Online

The online planning module is a tool of the utmost importance during the delivery process. Thanks to it, the planner can follow the execution of deliveries on the map, where the current vehicles' positions are represented. The fleet is connected to the base station via GSM/GPRS and is localised thanks to GPS devices.

On the basis of this information, the Tour Online module finds the best way to deliver incoming urgent orders, which keep coming during busy working days. These orders are very frequent in the case of heating oil deliveries, since during Winter months customers cannot be left with an empty tank for more than a few hours. The flexibility and extreme speed of AntOptima's algorithms are the reason behind the performance of the Tour Online module, which returns quick answers and has the ability to adapt to the unforeseen.



Tour Online uses data transmitted from palm computers (see an example above) that are connected to the black-box of the tanker trucks, linked via GPS/GPRS to the base station

## Company profile

AntOptima was founded in 2001 in Lugano, Switzerland, as a spin-off of Istituto Dalle Molle di studi sull'Intelligenza Artificiale, a leading research institute in AI. AntOptima acts as liaison between basic research and industrial production, providing companies with cutting-edge technology and ideas to cope with problems in optimisation, logistics, scheduling, and data mining. AntOptima solves complex industrial problems that require deep knowledge both of the production system and of the solution techniques. AntOptima's job involves identifying the correct level of abstraction of the problem and to apply the best available technological solution, integrating novel algorithms and hardware solutions within well-established information systems. AntOptima's software is flexible and it evolves with your company's growth. We build intelligent systems that learn from past experience how to continuously improve the quality of the solutions.

**Antoptima**  
*we speed up your business*

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