



# Route Optimisation and Tracking

*Author: Laurie Edwards  
Principal Consultant  
17 June 2010*

## Contents

Introduction .....	3
Objectives .....	3
What is Route Optimisation? .....	3
What is Route Vehicle Tracking? .....	3
Background .....	3
Information .....	3
Route Optimisation .....	4
Reference Data .....	4
Input Data .....	4
The Process .....	5
Vehicle Tracking .....	6
The Need .....	6
The Process .....	6
The Benefits .....	7
Route Optimisation and Vehicle Tracking.....	7
Things to Watch Out For.....	8
Do's and Don'ts.....	8

## Introduction

**Objectives** How can Route Optimisation and Vehicle Tracking improve your business processes?

---

**What is Route Optimisation?** Route Optimisation is the science of computing the best path for a person or vehicle to take considering all of the potential constraints of the vehicle or person and taking into account conditions that must be met at load and unload point or points.

**What is Route Vehicle Tracking?** Vehicle (or Asset) Tracking is a process that allows mobile items to capture information from typically the Global Positioning System satellites and immediately relaying that information to a central site so that the assets position can be determined. If the asset is not connected to a central site the position data is collected on the device so that at a later time the historical position of that mobile asset can be reasonably accurately determined.

---

## Background

**Information** This paper briefly addresses the utilisation of two highly spatially aware technologies to bring significant efficiencies to the business or organisation that is deploying the technology. It will focus on understanding the best possible path to take for a typical fleet of vehicles that could be picking up goods, dropping off goods, or an engineer that has a series of maintenance calls to make on any given day. It is also based on the likelihood that cars or trucks will be used and that they would need to use the road system for any given city.

---

## Route Optimisation

### Reference Data

Reference Data Optimisation is possible in today's world because we have models and knowledge about vehicles, client locations and the road network for many cities. In this case reference data is the road network, that provides us with the understanding of restrictions such as speed, weight, one way segments and turn restrictions as well as the structure and road hierarchy. By building this road network geometry into a model that is understood by an optimisation engine we are able to compute the shortest path between two points. We can modify the absolute shortest path by qualifying the types of roads that a particular vehicle is allowed to traverse.

To make the point obviously, a person on a bicycle could physically take a very different path to a B Double truck. But the B Double could carry a very different load to a bicycle.

The reference data enables us to make sense of these obvious and the more subtle differences between a 1 tonne van and a 5 tonne truck.

### Input Data

To enable us to use the Route Optimisation tools we must have a task to undertake. This task could be that we have 20 Computer Engineering jobs to be undertaken by 6 people with different skills, who will start their day at home, but must complete their work day at a central depot.

The 20 clients have varying times that the tasks can be undertaken and they are all spread out across the city.

The first thing we must do is understand where the clients are located and therefore Geocode their locations accurately. We must enter the job types so that we only assign an appropriately skilled engineer to each task and we must enter into the database any time constraints or blackout times during which it would be inconvenient for the business to be disrupted.

This would conclude the input data for a typical mobile workforce type of application.

---

## The Process

Route Optimisation in itself is a reasonably simple process, albeit with an extremely complex set of algorithms behind it. The most complex and time consuming aspect of undertaking any route optimisation process is that of understanding and AGREEING the rules that need to be applied.

This is a consultative process between the Route Optimisation experts and the client. In some cases these two parties may be both within the one organisation or they may be two separate organisations. In either case it is imperative that the business rules that apply to the people, the vehicles, and the clients are clearly understood and agreed.

An example of a business rule could be that a worker must rest for 15 minutes after 2 hours work. If everyone agrees that that is the case, then we have a rule that can be applied to the Route Optimisation tool. If people do NOT agree to that rule, IE some think that it is 10 minutes after 2.5 hours a negotiation process or hard decision must be made.

Our experience tells us that there are dozens of small and large issues such as this that need to be agreed and confirmed before you can really have a meaningful process deployed.

Once the rules are agreed and tested, we are able to load real data about real people, vehicles and jobs and test the process. It is not uncommon for these first test results to be looked upon with scepticism as they are often so far from what a dispatcher or manager believes to be true or logical. The next phase of proving the process is a step by step process which usually opens eyes and minds to allow the new process to be accepted.

When it is realised that by reorganising a few aspects of a person's day, savings of 15% to 20% in time or travel distance can be achieved, the efficiencies brought about by automating the process are very rapidly appreciated.

Some days or weeks of testing and analysing results will soon prove that more jobs can be achieved by each person per day, generally because less time is spent on the road. Less time on the road means less distance travelled and therefore less wear and tear and fuel consumed.

It would be very rare to believe that the very first set of rules and the very first attempt at optimisation would be perfect. It is generally an iterative process that is gradually tuned to achieve the best possible result over a few weeks or even months.

---

## Vehicle Tracking

### The Need

The very simplest aspect of vehicle tracking is the ability to understand where a particular vehicle is at any point in time. As a business need, this is only one of many pieces of information that can be gleaned from an applied vehicle tracking facility.

In the Route Optimisation example above, we have developed a process that we believe will add value to the business by reducing kilometres travelled and therefore increase the number of jobs performed per day. Importantly this increase in jobs would not come about because the engineer was working longer hours or faster, he or she would simply spend less time travelling. The business is being more efficient and is working smarter.

What we need to be able to do is qualify that the process that has been devised is in fact being honoured and that the timings, travel plans and directions, stop times and time at job, are not only being adhered to but are in reality achievable and are not forcing the people that undertake the tasks to break any law and that they are abiding by their company rules and regulations.

### The Process

Incorporating a vehicle tracking system within your fleet of vehicles allows the business to achieve many tasks. Assuming that we have installed a GPS enabled device with a GPRS communication facility there are many attributes about a days work that can be automatically transmitted to the business with little or zero input from the worker.

For example a GPS tracking device can be a time sheet facilitator. What time did the person start work, what time did they arrive at their first job, what time did they finish their first job and then commence travel to their second job. What time did they start their second job and so forth. Summarised, this can translate into Travel Time, Work Time, but also verifies sequence as specified by the Route Optimisation process. Confirms time at job, rest time, actual travel times per day (in case of long periods of travel), driving habits in case of need to counsel for excessive speed or to prove where someone was at what time or that they were not speeding. Distance travelled is also available for billing purposes or maintenance purposes. Business or private use of a vehicle for FBT reporting can also be derived very simply.

It is also possible to have two way messaging with a GPS/Personal Navigation Device and to therefore issue new work orders, and to accept and confirm work orders and be notified of the completion of a task.

So the Vehicle Tracking device can become something significantly more than a simple tracking device. In fact simple tracking has very little business benefit.

## The Benefits

### Route Optimisation and Vehicle Tracking

The combination of Route Optimisation and Vehicle Tracking are powerful tools that can deliver significant savings, efficiencies and stream line processes. The planning of a day's work so that it can be undertaken in a manner that meets the businesses rules as well as taking into account the needs of clients, and then being able to monitor and report to ensure that the expected KPI's are being met or exceeded are proving to be important business differentiators, cost cutters and increased client satisfaction indicators.

The ability to plan, perform and report against so many of the field forces activities of an organisation, with the capacity to automatically link into back office systems have rarely been seen to such a degree of completeness.

It is now possible to plan a day's activities, automatically determine start and stop times, issue invoices, assign next job, direct a worker to the next job, and build a history of all activities for a particular client without any paper work and minimal input from the person in the field.

Just imagine being able to send an email or text message to the next client and advise them that the engineer has just completed his current job and will be at your site in 30 minutes with the full knowledge that this communication is based on very accurate and timely information.

Not only can these systems enable you to plan a simple straight forward day, but it will also allow you to reschedule work if a worker becomes delayed because of unforeseen issues, enabling the dispatcher to select the nearest appropriately skilled person to be diverted to a more urgent task, whilst notifying planned clients of potential delays.

---

## Things to Watch Out For.

---

### Do's and Don'ts

#### Do

- Understand your businesses rules.
- Expect the initial planning to take longer than you think.
- Work closely with your supplier to build a system that is repeatable and very robust.
- Expect that some people will be concerned about privacy.
- Work very hard to alleviate privacy issues by building trust and explaining the business and private benefits of the systems.
- Install the best possible solution that you can afford even if all of the capabilities are not used initially.
- Generate lots of research on the topic so that you have a good understanding of what is possible and what is not.
- Select a supplier that will enable you to integrate into back office systems in a simplified manner.

#### Do Not

- Select inferior software or hardware products that will be obsolete too quickly.
  - Underestimate how important it is to be sure of exactly where your client locations are.
  - Make sure your staff are well educated and trained in the use of the technology.
  - Allow hybrid approaches to be used across your workforce.
- 

If you would like further information, please fax, phone or email us on one of the following.

#### MapData Sciences Pty Ltd

110 Pacific Hwy  
Greenwich, NSW, 2065  
+61 2 8436 2800 (phone)  
+61 2 8436 2888 (fax)  
[info@mapds.com.au](mailto:info@mapds.com.au)  
[www.mapds.com](http://www.mapds.com)