

The Route Delivery Problem

By

**Buddy Bradford
President & CEO
NetRouter, Inc.**

Problem Definition

One of the most costly problems encountered in industry is the physical distribution of products from point to point. Distribution costs typically make up about 25% of the cost of sales. Therefore, any reduction in cost that can be achieved through better route scheduling can easily mean a significant improvement in profits. Conversely, inattention to delivery costs can put the cost to distribute products out of line and result in non-competitive prices. Reducing route delivery costs is just as important to trucking companies that serve manufacturers, wholesale and retail businesses as it is to the manufacturers, wholesale and retail businesses which have private truck fleets.

A dispatcher who receives the days' orders, and routes the truck fleet to cover the demands usually handles the distribution routing function. Typically, the dispatcher will accumulate orders geographically. This is usually accomplished by putting orders in "pigeon holes" arranged in a geographical configuration, or by reviewing a map with all the destination points identified and grouping orders to make loads. The dispatcher goes through an iterative process until a workable solution is obtained. The problem is that the dispatcher does not have the overall optimum solution. Herein lies the problem with the manual technique. The problem is made further complicated when orders are eliminated, changed or added to the day's delivery. The number of required iterations to find the optimum solution increases dramatically as the number of orders increases.

The delivery problem is a generalization of the classical traveling salesman problem. The traveling salesman may be stated as follows: Find the shortest route for a salesman starting from a given city, visiting each of a specified group of cities, and then returning to his original point of departure. More specifically, the delivery problem is one of determining the "best" delivery routes, with respect to some objective, for commodities where the system is subject to a set of restrictions given a set of known parameters. In this problem, the delivery carriers may have different capacities, for example, and all of the demands, which are assumed known, must be satisfied (i.e., delivered). An example would be to determine the routes for delivering a commodity and minimize the miles traveled where there is a

limit on the time allowed for any route. In fact, there can be many parameters and constraints that may be a function of the type of business or distribution environment. The truth is that most businesses feel that their distribution function is unique and unlike any other, even in the same industry (e.g., food processing, retail drug stores, wholesale nursery and newspaper delivery).

Solution Using NetRouter

NetRouter, Inc. offers an application to meet the growing need to optimize routing and reduce distribution costs. NetRouter, Inc. has developed NetRouter, an application for optimal truck routing, distribution network optimization, distribution planning and distribution modeling. In general, NetRouter will reduce distribution costs by 10 to 25 percent over traditional methods for dispatching trucks for the delivery of orders to customers or company-owned stores.

In general, it is possible to find the longitude and latitude for any point in the United States and Canada using the automatic geocoding process of NetRouter. Thus, NetRouter can be used for route delivery between cities and towns and within metropolitan areas. NetRouter can also be used for routing in any other country, given the longitude and latitude of all points required in the distribution network.

The primary objective of NetRouter is to create optimal routes from central distribution centers to customer delivery points or company-owned stores. NetRouter minimizes distribution costs while filling trucks to their capacity and meeting required parameters and constraints. NetRouter creates a detailed report with extensive information regarding each route that is created and each order that is delivered. In addition, NetRouter creates a graph of each route that may be displayed showing each delivery location and the order of delivery. NetRouter also creates 32 different bar charts, line charts, pie charts, area charts and scatter diagrams that further explain the routing solution graphically. A detailed graph and specific driving instruction may be created for each route.

NetRouter provides for various parameters and constraints such as truck capacity, maximum route time allowed, fixed dock time per stop, variable dock time as a function of units unloaded, maximum miles between stops, average truck speed, speed zones for variable MPH, "time windows" for delivery, standard cost for driver pay, depreciation cost, average miles per gallon, standard cost for fuel, maximum driving time, standard cost to operate the fleet, cost for maintenance, driver layover cost, cost for backhauls, cost for empty miles and deficit cost for any "air weight".

NetRouter Benefits

The benefits from NetRouter include delivery cost savings between 10 and 25 percent, better truck utilization and improved loading of trucks, requiring approximately 20 percent fewer trucks. This also results in lower driver cost and lower maintenance cost on the fleet. Since NetRouter processes all orders that are to be delivered by truck, the dispatcher can select certain routes for delivery by common carrier when it is to the advantage of the company with the private truck fleet.

The results from NetRouter can also be used to determine geographical areas where it is advantageous to develop additional business in order to reduce distribution costs or eliminate the costly delivery to certain customers that results in a net loss to the company. In fact, the output from NetRouter may be loaded into an SQL database for profitability analysis and transportation budgeting. NetRouter is very fast, solving a 400 order consolidation and optimal routing problem in 50 seconds!

The modeling capabilities of NetRouter provides the opportunity to explore various "what if" scenarios such as changes in the capacity of trucks, increases in driver pay, increases in the cost of fuel, increases in maintenance cost, changes in depreciation cost on equipment, changes in order quantities, changes in the number of orders to be delivered, changes in the maximum route time allowed, changes in distribution center locations to deliver a given set of orders and much more.

NetRouter is described at www.netrouter.com. NetRouter is available as an ASP solution through IBM Global Services, IBM Business Partners and NetRouter, Inc.

###