



Power Optimization™

Cloud-Computing Route Optimization

Summary

Distribution-intensive companies have an opportunity to materially improve financial performance by re-examining the technology supporting the route planning process. New technology has proven the ability to wring out an additional 5-20% mileage reduction. As fuel costs continue to escalate, the route planning process and associated technology will be spotlighted as the area that has the greatest potential to improve enterprise financial results.

Route planning technology in use today evolved from the first commercially available software developed in the mid 1980's. Running on a single desktop machine with limited computing power, simplistic algorithms generate "starting point" solutions that an individual tweaks by adding or subtracting customer stops to the route. Daily volume fluctuation, customer time windows, truck capacity differences, and many other variables quickly add complexity to this process that overwhelms any human beings' ability to minimize routes and miles – irrespective of their individual talent. Routes are *manually planned* because the technology was originally designed for *human interaction* to take the starting point solution and finish building out the route. This shortcoming is compounded by the decentralized nature of most distribution-intensive organizations. Dozens of route planners scattered around the country, each manually building routes, usually under stringent time constraints, does not generate low cost solutions.

For the larger and more complex routing problems, the simplistic algorithms often are abandoned entirely, replaced with manually designed standard routes based on customer ordering histories or estimates of future order volumes. Route planners manually attempt to adjust the standard routes each day to respond to actual customer orders. This generally results in a very inefficient and expensive process as well as poor service compliance because the manual process of designing, maintaining, and adjusting these standard routes is tedious and frequently neglected. Because of the decentralized nature of this process, senior management has very little actual control of their most expensive customer facing process. This is the Achilles heel of all interactive route planning software in use today.

Leveraging the Internet and harnessing virtually unlimited cloud computing horsepower offers a much better approach to this complex problem and unquestionably delivers superior results. Further, it enables standardization and centralization of a key process that empirically balances corporate financial goals and customer service objectives. Scientific Logistics (Sci-Log) has developed technology that replaces the weakest aspect of interactive software by looking across the full range of possible route solutions to seek out the lowest cost solution *without human interaction*. That technology is called Power Optimization™ (*PowerOpt*) and is offered as a web-based cloud computing service.

No Process Disruption or Costly IT Conversion

PowerOpt has been intelligently designed to “plug into”, *but not replace*, existing interactive software packages. The beauty of this design allows the route planners to continue to do their job as usual with the software tool they are familiar with – no new screens to learn, parameters to change, etc. which ensures no day-to-day business disruption. Further, since *PowerOpt* only requires a secure internet link to receive orders and transmit back optimized routes, costly and time consuming IT involvement is minimized. This concept provides access to a very powerful optimization “engine” that generates the starting point solution. The high quality of the *PowerOpt* routes negates the need for the route planner to spend time and effort to produce a final route plan. Figure 1 illustrates the basic connection options to *PowerOpt*.

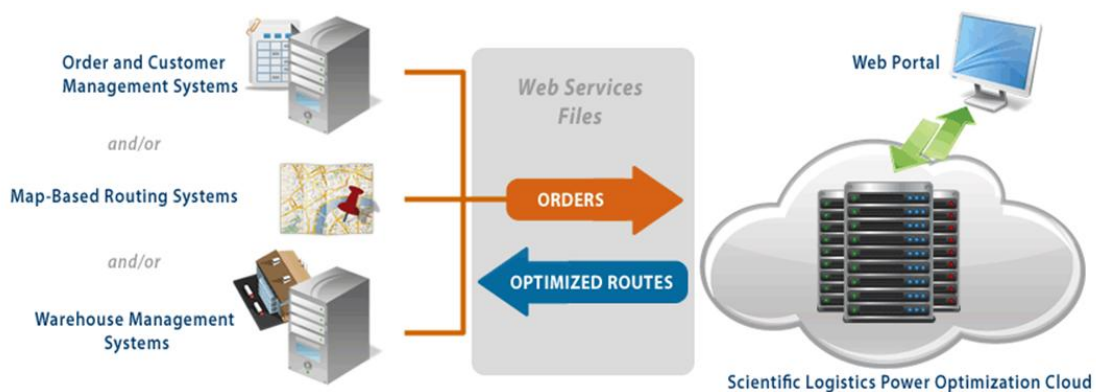


Figure 1: Connecting to *PowerOpt*

As an example, the UPS Technology package Roadnet is in use in many companies today in conjunction with *PowerOpt*. Each day, customer orders are transmitted via internet to the *PowerOpt* cloud; optimized routes are automatically created honoring all relevant business rules and costs; then the route plan is transmitted back via internet to the route planner. The route plan then “appears” in Roadnet as the starting plan for the day – route planners continue to handle exceptions and adjustments using their existing tools and processes.

Optimizing Cost/Service Trade-off's

Customers generally prefer “standard routes” where they are visited by the same driver on the same day(s) at the same time for each delivery. However, from the company perspective, there are three big problems with a “standard route” strategy:

1. It is difficult to generate a good set of standard routes using interactive technology because of the human involvement factor in the design – the tendency is to build in enough capacity to handle the highest volume day;
2. When new customers are added and existing customers either leave or change their buying patterns there is a need, but in most companies not a routine process, to regularly update standard routes; and,
3. In virtually all distribution-intensive companies, there is typically daily variability in customer ordering patterns. In this environment even good standard route plans are less efficient and more costly than routes that are allowed to flex with demand.

PowerOpt provides the computing bandwidth to overcome all three of these problems. The technology, in the hands of Sci-Log professionals, can automatically tune-up or completely re-design an existing set of standard routes to provide immediate financial savings. It allows “A” customers that truly require a high level of service to remain on standard routes while “C” customers that do not required this level of service to be placed on flex routes. This exploits the optimization strength of *PowerOpt* to seek out lower delivery cost alternatives. *PowerOpt* optimizes the full route strategy spectrum: a standard route strategy, where all customers are delivered on standard routes; a “hybrid” strategy blending the operational consistency of standard routes for high priority customers with the cost reductions possible from flexible route optimization; and finally a flexible strategy where routes are optimized each day based on actual orders.

Evaluation Methodology

Evaluating *PowerOpt* in a real world situation is simple and straightforward through a trial pilot program that is staged to allow proof of value at every step. The concept is to select a single site and run the *PowerOpt* solution in parallel with the incumbent technology using the four step methodology below. The beauty of this approach is that it does not disrupt the existing route planning process and does not require heavy IT support to get started. The overarching objective is to quantitatively determine the incremental cost reduction potential of utilizing *PowerOpt* beyond what the incumbent technology provides. Sci-Log route solutions are compared daily to the results generated in house so a “side-by-side”

comparison is generated highlighting all pertinent metrics – routes, miles, service compliance, etc. At the conclusion of the pilot, management is armed with enough cost/benefit information to determine if subscribing to the web service is a sound business decision.

The pilot methodology consists of four major steps:

1. Pilot Kick Off: The initial step involves identifying the specific site to serve as the pilot and scheduling an on-site working session with appropriate client and Sci-Log personnel. Prior to the kick off meeting, Sci-Log professionals observe one route planning cycle to better understand the current process and technology being used. We discuss and document the objectives of the pilot, the specific metrics to be used in evaluating pilot success (miles, routes, costs, missed windows, etc.) and the expected timeline. In addition to route planning personnel, we strongly recommend a multifunctional team comprised of representation from sales, finance and IT be assembled for this evaluation.
2. PowerOpt Setup: This step consists of working with IT personnel to establish a simple secure linkage for the purpose of transmitting daily orders to Sci-Log's data center. We review all data for completeness and accuracy and work with client personnel to scrub data as necessary. All business rules, planning assumptions, and other inputs used to plan routes are documented and reviewed with the appropriate personnel. Lastly, using the information gathered in this step, we calibrate *PowerOpt* vis-à-vis the incumbent technology to ensure an “apples-to-apples” comparison.
3. Business Case Development: This step marks the beginning of developing the business case by benchmarking the existing routes and score carding key metrics. A byproduct of this effort highlights existing rules that are apparently breakable and data that is invalid. After a few iterations of cleaning up invalid data and determining which rules have some flexibility, we begin running *PowerOpt* in parallel with the incumbent technology and capturing and summarizing all agreed upon metrics. Typically the side-by-side comparison runs for 8-10 weeks which provides ample time to determine if *PowerOpt* is providing real benefit.

A key part of this step is the careful definition and measurement of the various costs associated trucks and drivers.

4. Field Validation: The final step in the pilot involves the site actually running the routes developed by *PowerOpt*. Instead of using the old manual process, the route planner visually checks the *PowerOpt* routes and notes any last minute issues that must be considered (phone in

order quantity change, truck mechanical failure, etc.) and dispatches the vehicles.

The *PowerOpt* evaluation methodology is offered to selected clients without cost or future obligation.

Other Benefits

When compared to existing routing solutions, *PowerOpt* typically demonstrates mileage reductions of 5% - 20%, and reductions in the numbers of trucks and drivers of 3%-5%. In addition to relentlessly seeking out the lowest cost solution, *PowerOpt* provides other benefits as well:

1. Automates the route planning process, significantly reducing the amount of planning effort needed;
2. Accelerates the route planning process and compresses the order fulfillment process, allowing orders to be booked later from customers, and route plans to be delivered sooner to warehouses;
3. Improves customer service by ensuring all customer time windows are met;
4. Enables automated evaluations of “what-if” scenarios (often tedious to do with manual interactive routing systems). For example, all days in an entire month can be re-optimized automatically using different business rules, costs, service strategies, potential new customers, etc. to evaluate the impact of those changes;
5. Standardizes the planning process, ensuring corporate goals for cost and service are aligned with operational plans;
6. Centralizes the planning process, enabling “regional” planning centers reducing the number of planners needed, and providing visibility across locations and time periods;
7. Plans territory configuration and identifies customers that should be moved to another division or depot;
8. Automatically adds/drops new/old customers

Since *PowerOpt* is offered as a web-based service, there are no upfront license fees or messy IT conversions to endure.

Business Applications

PowerOpt solutions are available for the following business applications:

- *Multi-stop dynamic route planning.* These applications are characterized by truck routes that visit multiple stops and by variability in customers and customer order quantities. While firms could ignore variability in customers and customer order quantities and simply run the same fixed routes each day or week (in fact, many firms do!), transportation costs can be reduced significantly if the routes dynamically adjust or “flex” to a given set of customers and order sizes. Given a set of customers and associated order quantities, *PowerOpt* automatically finds the lowest cost plan while respecting all business rules and constraints. *PowerOpt* optimizes a variety of multi-stop route applications, including delivery routes, pickup routes, and mixed pickup and delivery routes.
- *Multi-stop fixed route design and ongoing tuning.* These applications are characterized by truck routes that visit multiple stops, and either by customer ordering patterns or service patterns that are relatively constant or by situations where high route consistency is required even in the face of order variability. Thus the same fixed or standard routes can be run each day or period. *PowerOpt* is used to design the optimal set of fixed routes – then, just as importantly, *PowerOpt* is used on an ongoing basis to keep the fixed routes tuned (as customers are won or lost, for example). Further, *PowerOpt* can be used in a “hybrid” fashion combining the operational consistency of fixed routes with the cost reductions of dynamic routes. Here, certain aspects of routes are “locked” for consistency (such as key customers to certain drivers, or certain route sequences), but other rules and decisions are left open for more flexible route optimization.
- *Shipment consolidation and mode/carrier optimization.* Firms without their own private or dedicated truck fleets must rely on various transportation firms and shipping modes (such as less-than-truckload carriers, truckload carriers, and small package carriers) to move their shipments. A key savings opportunity is consolidating less-than-truckload shipments into multi-stop truck routes. Shipment consolidation by itself is complex, but even more complicated given different carriers usually have different fees depending on shipping lanes, numbers of stops made, fuel surcharges, etc. *PowerOpt* automatically optimizes shipment consolidation and shipping mode, including determining the lowest cost carrier for a multi-stop route.
- *Full truckload continuous move optimization.* These applications are characterized by full truckload legs that can be “strung together” to form attractive tours that minimize empty miles. Firms with private fleets can significantly reduce empty miles; firms shipping via truckload carriers can receive discounts by offering attractive tour combinations to carriers.

- *Supply chain network design and configuration.* Classical supply chain network design projects do not model multi-stop routes, but rather roll up shipments to point-to-point “flows” of quantities. This modeling approach works well for supply chains without significant multi-stop routing. For supply chains with significant multi-stop routing, the “flow” cost estimates of multi-stop routes can be very difficult to accurately model. *PowerOpt* automatically evaluates the precise impact and costs of different supply chain configurations and strategies on multi-stop routes. The centralized design of *PowerOpt* also makes it easy to analyze and optimize multi-stop routes across multiple distribution centers or divisions.
- *Routing strategies and what-if analytics.* Firms with truck fleets face ongoing higher-level routing questions and decisions, such as the impact of new business on existing routes, how to tradeoff customer service windows with transportation cost, the impact of driver overtime policies, etc. Traditional interactive map routing systems do not provide much help with these analyses, as each scenario must be interactively analyzed and solved, a tedious and time-consuming process. *PowerOpt* automatically generates high quality route plans, making routing strategy analyses practical and fast. *PowerOpt* also maintains a centralized data warehouse of historical orders and routes across multiple facilities or distribution centers, so histories can be automatically “played back” to evaluate the impact of different business rules or costs.

Conclusion

Distribution-intensive companies face considerable headwind in improving financial results in a difficult economy. Ironically, while last mile transportation is the single largest logistics cost component, the software being used to support the route planning process has not kept pace with technological advances. Simplistic algorithms and glitzy maps are disguising a manual process. *PowerOpt* provides the optimization muscle that brings state-of-the-art technology to the route planning process.

For more information visit www.scientific-logistics.com.