

Biennial survey of vehicle routing software reveals fierce competition produces creative solutions.



FreshDirect relies on VR software to deliver groceries to 10,000 customers a day in Manhattan.

By Janice Partyka and Randolph Hall

ON THE ROAD TO INNOVATION

ROUTING SOFTWARE COMPANIES ARE COMPETING FIERCELY to produce the most creative solutions. Just having the best routing algorithm doesn't cut it. And offering GPS tracking isn't enough either. "Customers want a more connected fleet," says Cyndi Brandt of Roadnet. "We are seeing more dynamic, real-time routing, open systems, and partnerships to provide an even deeper level of analytics that serve the entire organization."

Whether in the software or in the digital technology that supports routing, innovation is the driver. There has been a sharp uptake in mobile device usage in the vehicle. Customers are increasing using on-board computers and Android-based smartphones. Following consumer patterns, small- and medium-sized businesses want to have their data reside in the cloud to reduce computing and IT resources.

Innovative Problem Solving

INNOVATION BEGINS by finding the right approach to solve real routing problems, which often differ from standard "out of the box" formulations. Successful software vendors offer services, as well as software, to ensure that routes are effi-

cient for their intended application. "A creative routing solution can provide customers with both better service and cost savings," says Chris Jones at Descarte.

Case 1: In Manhattan, buying groceries requires a lot of schlepping. Enter FreshDirect, a grocer that delivers to 10,000 people a day throughout the city, supported by Roadnet software. In dense areas of the city, FreshDirect trucks find a parking space early in the morning near their starting route target. Additional workers take subways to the parked trucks, and each worker delivers grocery orders on foot via the routes produced by the software. When the truck is empty, another full FreshDirect truck arrives and takes the same parking space and the deliveries continue.

Case 2: Working with Descartes, John Lewis (a large United Kingdom retailer) created a real-time delivery scheduling system to be used by customers at point of sale. When a customer places an order for a king-sized feather bed, she can choose from several delivery times. Some are free, but others carry a price. The free times are less popular slots, often in the middle of a workday, whereas the paid spots are the most sought-after times at the beginning and end of the day. John Lewis uses

delivery-time pricing to balance the workload across the day, increasing route efficiency.

Case 3: The Fonterra Dairy is a large cooperative of 15,000 dairy farms in New Zealand. Bulk milk pickup is a complex operation handled by 500 trucks. The production from cows varies from day to day; truck container volume is limited, and because it is perishable, the milk must be picked up on schedule. With unknown quantities, deterministic routes cannot be created in advance, so MJC2 created a real-time routing system in which the vehicles are rerouted after every pickup.

New Devices

MANY CALL 2012 the year of the dragon, but in routing it is the year of the in-vehicle device. Regulations that require electronic logs for driver hours-of-service and gas tax have increased sales and lowered prices of on-board computers. These devices enable telematics that will provide management with visibility into the wait at customers' loading docks, unsanctioned stops, speeding and delay that holds up the route.

On-board computers can connect to the vehicle engine. Companies get a record of the vehicle's condition, need for maintenance and how it is driven. Idle time, the temperature of a reefer, when doors open and hard braking can all be measured. Getting drivers to eliminate engine idling is a challenge for fleet managers. Idling strains the engine and is prohibited in some locales. For instance, in New York City, vehicles that idle for more than three minutes face up to a \$2,000 fine.

Smartphones are a cheap and easy alternative to on-board computers. "Phones work well because everyone knows how to use them," says Hugh Gigante of TMW. "Fleets like them because they are easy to use, cheap and can utilize off-the-shelf apps that can be helpful." Routing software makers are favoring Android operating systems. Smartphones are unable to provide information about a vehicle, but can be effective for tracking, navigation and limited data entry. Service fleets (e.g., engineers or health care workers) are more likely to use a smartphone. Pickup and delivery vehicles often rely on mobile handheld terminals that enable scanning and signature capture.

The mix of devices purchased by fleets is changing. One large routing provider saw 50 percent of new customers adopting smartphones, 25 percent on-board computers and 25 percent personal navigation devices. Another routing vendor reported 40 percent of new customers utilizing smartphones and 60 percent on board computers. Yet another company reported 15 percent of U.S. customers have onboard computers, but 80 percent of their proposals now incorporate in-vehicle on-board computers.

Mapping and Traffic

ROUTING COMPANIES GENERALLY use NAVTEQ and TomTom (previously called TeleAtlas) maps to calculate distances and travel times as well as to display routes. More detailed mapping data for trucks are available, including hazardous routes, width, weight and height restrictions. "Consumer demand for navigation has increased the availability of

quality digital maps throughout the world in places like Eastern Europe," says Will Salter of Paragon Software Systems. "This has enabled us to expand our reach further to even more countries." Better traffic information is now available by road segments by time of day to establish historical traffic patterns.

This Year's Survey

TWELVE SOFTWARE VENDORS (eight North American and four from Europe) participated in this year's survey, representing 15 products. Our questionnaire was divided into sections covering platform, algorithmic capabilities, interfaces and features, applications, system integration and background information. All responses are self-reported and unverified.

Platform: Windows remains the dominant platform for routing software and is available for all software packages, with five offered in Linux and another four for Unix. Nine products are available in software as a service (SaaS). From a hardware perspective, there is range of requirements that depend greatly on the implementation. Vendors generally recommend a PC operating with one GHz up to three GHz, combined with up to four Gb of memory and two to 125 Gb on the hard disk. These figures have not changed much in the last four years, again showing that powerful routing software has become easier to run on one's desktop computer. In SaaS applications, computing requirements are even smaller than in the past.

Algorithmic capabilities: The algorithms underlying routing products are generally proprietary, though they typically involve a combination of integer programming methods and heuristics (likely some form of localized search). DNA Evolutions utilizes genetic algorithms, and IBM indicated constraint programming.

Vendors generally claim unlimited problem size for their software, but from a practical perspective, processor speed, memory size and disk space bound product performance, so it is important to test software on actual problems. In this regard, most vendors claim computation times at about five minutes for an average-sized problem, described as the time to solve a problem with 50 routes, 1,000 stops and two-hour hard-time windows. (Keep in mind that computation times are provided by the vendors and have not been verified.) These times are similar to two years ago.

Fast computation times are particularly important in real-time applications, such as when deliveries are scheduled while the customer is on the phone or when stops are inserted and scheduled while vehicles are in the field. Sometimes vendors can quickly update routes without going through a full execution of the routing algorithm.

Node routing is the capability to assign and sequence discrete stops, and arc routing is the capability to assign and sequence street segments. We believe it is available on all surveyed products. Arc routing is more specialized and occurs when vehicles visit every (or most) address on block segments, as in meter reading, mail delivery and garbage pickup. Most of the vendors claim they can do both of these, along with real-time routing, daily routing and route planning. However, a sin-

gle routing package is unlikely to be adept at all of these functions, and it is important to select a vendor that has experience in the intended application.

All vendors state that they have the ability to provide real-time re-routing of vehicles. Most vendors have the ability to incorporate real-time traffic and utilize historical traffic by road segments to better optimize routing. This can enable a fleet to reschedule in response to customer requirements, vehicle delays or traffic conditions.

Most vendors claim the ability to solve routing problems with soft time windows. However, when asked for specifics, some simply indicate that they represent a range of time or maximum allowed delay rather than a true soft window approach. On the other hand, IBM ILOG and Route Solutions permit early and late penalties, DNA Evolutions windows are “fuzzy by default,” and MJC2 and Optrak use “configurable rules.”

Interfaces and features: As a starting point, basic features offered by most include an ability to display routes and stops on maps and edit these routes with the “drag-and-drop” feature (i.e., click on a stop and move it to whichever route you desire). This enables the dispatcher to modify the algorithm-produced routes and is needed in practice to satisfy customer constraints. To make these features work, products need digital maps, which are not inexpensive, and are often sold separately and are chosen by customers according to their requirements.

Integration: Real-time communication with drivers, as well as tracking their locations, has become particularly important, and most products offer these features. This usually is provided with vehicle-mounted on-board computers, smartphones, personal navigation devices or hand-help mobile units. Interfaces with other software systems – such as order-entry and inventory management – is also important for retailers and distributors. Other important features include forecasts for delivery requirements, generation of load manifests and load planning.

Applications: Whereas vendors generally claim that their products are designed to serve a broad range of applications, most specialize in an industry sector. Specialization is largely driven by interface requirements – both in terms of presenting information in a manner that is useful to the target user and in terms of interfacing with business software systems and hardware devices. Police, taxi and emergency vehicle dispatch, for instance, each demand special requirements that differ from the traditional market of private fleets. They fall in the realm of niche markets, even though in theory they are just variations of vehicle routing.

Vendors that are more experienced in an industry will be better prepared to consult on software installation and more likely to have relevant features, leading to a higher likelihood of success. The optimization code might also be different to account for the particular network structure, for instance the hub-and-spoke design of less-than-truckload (LTL) networks.

In our survey, most of the respondents have specialized in private truck fleets, serving such markets as food and beverage

(e.g., Kraft, Anheuser Busch, Coca Cola and Snapple). Route Solutions is being used by various state lotteries and Airport Bags, Inc. DNA Evolutions is routing the New York Department of Health.

Routing installations tend to require a large degree of customization, as reflected in software prices, which often run in the tens of thousands of dollars. As an alternative, SaaS requires little upfront cost. Beyond these software costs, some level of consulting is likely needed to ensure full integration into a fleet’s information systems, typically priced in the neighborhood of up to \$100 to \$250 per hour. In terms of pure size, many companies now claim more than 1,000 installations each.

General information: The accompanying directory provides contact information and product names for the vendors. Pricing is available for some vendors (in many cases, prices are negotiable and depend on fleet size). For a 50-route single site license, expect to pay \$20,000 to \$40,000. ESRI was the only vendor to provide a monthly price for SaaS (\$450). Higher-priced products generally offer more customized service, a larger array of features and interface capabilities, and specialized experience in a particular industry. Price structures do vary, so be sure to compare the full installed cost before making a choice, including license fees, installation and maintenance costs, hardware and digital maps.

How to Buy

THE MOST SATISFIED routing software customers know their goals before they purchase. “Be very clear about what you want to do and don’t be overwhelmed by technical jargon,” advises Julian Stephens of MJC2.

With your objectives as a framework, look for a routing company that knows your vertical market well, and one that can help you leverage the software for productivity gains throughout your organization. Look for experience with companies of your size with similar integration challenges. Consider how frequently routes must be generated and updated, and how much time is available to generate routes. Check references. Make sure the vendor has customer service available when you need it. If your routes are built between 7 p.m. and 9 p.m., make sure they will be answering calls during that time. The last step is to try it out. Some companies offer a free trial. Others will charge a customer for a trial that includes consulting services. The customer will pay for some of the trial and be obligated to make a purchase if all trial objectives are met. Some customers will ask three or four routing companies to compete for their business by giving them all the same routing problem to solve. **IORMS**

Janice Partyka (jpartyka@jgpservices.net) is principal of JGP Services (www.jgpservices.net), a marketing consulting practice that focuses on mobile technologies and applications. *Randolph Hall* (rwHall@usc.edu) is vice president for research and a professor in the Epstein Department of Industrial and Systems Engineering at the University of Southern California.



	Year Introduced	Platforms Supported			Maximum size of problem solvable by the system							Performance		Routing Functions					Price Information			Solution Algorithm						
		Windows	Linux	Unix	Web based Software as a Service (SaaS)	Number of Stops	Number of Vehicles	Number of Simultaneous Terminals	Recommended Hardware	Processor Speed	Memory	Hard Disk Space	Computation time (50 routes, 1,000 stops, 2-hr. hard-time windows)	What types of algorithms are employed (open-ended?)	Node Routing	Arc Routing	Same Day re-Routing	Daily Routing	Route Planning & Analysis	Incorporates Real-time Traffic Information in Route	Utilizes Historical Travel Time and Stop Time in Routing	Single Site License (50 routes)	Installation support cost (\$/hour)	Typical support hours needed for installation (50 routes)	Soft Time Windows?	If Yes, how are Soft Time Windows Specified?	Drivers Skills and Specialties? Geographic Restrictions?	
ArcLogistics Esri, Inc.	1998	y	-	-	y	Unlmt.	Unlmt.	Unlmt.	Windows desktop or web client	2GHz or higher	2GB	10MB online, 10GB local	< 5 Minutes	Proprietary	y	-	y	y	y	y	y	\$450 per month	None	None	y	Max Violation Time	y	y
Descartes Routing, Mobile & Telematics Suite Descartes Systems Group	1995	y	-	-	y	Unlmt.	Unlmt.	Unlmt.	Varies depending on platform	Varies depending on platform	Varies depending on platform	Varies depending on platform	Less than 1 Minute	Proprietary	y	y	y	y	y	y	y	Call	Call	Call	y	Unlmt.	y	y
DISC MJC2	1990	y	y	y	y	Unlmt.	Unlmt.	Unlmt.	Depends on application	Depends on application	Depends on application	Depends on application	A few Seconds	-	y	y	y	y	y	y	POA	POA	-	y	Configurable	y	y	
IBM ILOG Transportation Analyst IBM	2005	y	-	-	-	Several 1000 shipments	Unlmt. Depends on # shipments	Unlmt. Depends on # shipments	Windows	Dual or Quad Core recommended	4GB RAM recommended	100GB recommended	Between 2-120 Minutes	Heuristics and Constraint Prog.	y	y	y	y	-	-	y	Differs by request	Included in maintenance cost	Included in maintenance cost	y	Window Earliness /lateness penalties	y	y
JOpt.AAS DNA Evolutions GmbH	2009	-	-	-	y	Unlmt.	Unlmt.	Unlmt.	Intel or AMD	N/A	N/A	N/A	5 Minutes	Construction, SA, GA	y	y	y	y	y	-	-	Monthly fee	\$375 Setup Cost	4 Hours	y	Fuzzy Cost based Genetic Algorithm	y	y
JOpt.SDK DNA Evolutions GmbH	2005	y	y	y	-	Unlmt.	Unlmt.	Unlmt.	Intel or AMD	3GHz	4GB	200MB	5 Minutes	Construction, SA, GA	y	y	y	y	-	-	-	\$5,000	Free	Less than 1 Hour	y	Fuzzy Cost based Genetic Algorithm	y	y
Optrak Vehicle Routing Software Optrak Distribution Software Ltd.	1992	y	y	-	-	Unlmt.	Unlmt.	Unlmt.	Standard Windows PC	Minimum 2GHz	Minimum 4GB RAM	Minimum 20GB hard drive	5+ Minutes for a standard PC	Various heuristics	y	-	y	y	y	y	y	Price on application	Price on application	Depends on custom requirements	y	Configurable rules	y	y
Paragon Routing and Scheduling Optimizer Paragon Software Systems, Inc.	1997	y	-	-	-	20,000	3,000	2,000	PC / Windows Server	Fast Intel Core, e.g. 3.6GHz	Minimum 512MB	2GB	Around 2 Minutes	Cost saved & improvement algorithms	y	y	y	y	y	-	y	\$39,000	\$850 - \$1,050 per day	\$80	y	-	y	y
Roadnet Transportation Suite Roadnet Technologies	1983	y	y	y	y	Unlmt.	Unlmt.	Unlmt.	Implementation dependent	Implementation dependent	Implementation dependent	Implementation dependent	< 30 Seconds	Heuristic algorithms are employed	y	y	y	y	y	y	y	Contact for pricing	\$225	\$80 or less	y	Time window priority by customer	y	y
StreetSync Basic RouteSolutions	2008	y	-	-	y	Unlmt.	Unlmt.	Unlmt.	PC w/ High-Speed Internet Access	1GHz+	1GB+	2GB+	< 10 Minutes	Proprietary	y	-	y	y	y	y	y	Varies	Included	Unnecessary	-	-	-	y
StreetSync Desktop RouteSolutions	2005	y	-	-	y	Unlmt.	Unlmt.	Unlmt.	PC w/ High-Speed Internet Access	1GHz+	1GB+	2GB+	< 10 Minutes	Proprietary	y	-	y	y	y	y	y	Varies	Included	Unnecessary	-	-	-	y

	Mapping		Product is available as part of a suite that provides				Features				Types of fleets that currently use the product				Innovations & Special Features					# of Companies Using	Most Significant Installations	Largest Change over the last two years									
	Map include for one region?	Brand of map provided?	Electronic Driver Display	Wireless Messaging to Driver	Real-time Vehicle Tracking	RFID Scanner	Supply Chain Mgmt. Software	Customer Order Processing	Computer Aided Dispatch for Police, Fire or Emerg. Vehicles	Assigns individual drivers	Turn-by-turn Route Instructions	Loading Manifest	Weather Forecast Information Displayed to Dispatcher	ETA Automatically Sent to Customer, if there is a Delay	Local Pick-up and Delivery	Long-haul Less-than-Truckload	Courier	Buses	Taxis				Service Fleets	Emergency Services (Police, Fire, etc.)	Other Special Features	24 hr 7 Live Customer Service	Recent Innovation in System Integrations	Support for Smart Phone/Tablets?	Support/Integrate Navigation?	Which Personal Navigation Devices?	How is the Economy Affecting the Market?
	y	Esri Inc., NAVTEQ or custom	y	y	y	-	-	y	y	y	y	y	-	y	y	y	y	y	y	y	y	Rich network model supporting nav. restrictions & soft barriers	y	-	y	y	-	-	101-500	-	-
	y	Variety includes Navteq and TeleAtlas	y	y	y	y	-	-	y	y	y	-	y	y	y	y	y	-	y	-	Platform to manage stop level & track driver & vehicle perfor.	y	Integrated route planning, mobile and telematics	y	-	-	-	1001+	Idom Transport Consulting (Spain), Saudi Aramco, CAMS Pro, New York DoH, other	Application integration capability is becoming a key feature for optimization software	
	y	Several	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	-	y	-	y	-	-	-	1001+	Idom Transport Consulting (Spain), Saudi Aramco, CAMS Pro, New York DoH, other	Application integration capabilities of flexible and adoptable optimization algorithms.	
	y	IBM Views	-	-	-	-	y	-	-	-	-	-	y	y	y	-	-	-	-	-	Hub inbound and outbound scheduling	y	-	-	y	Multiple; Peoplenet, Xata, Navtrak, Android phns, tablets, etc.	Lengthening dec. process & increasing need for solution.	501-1000	Walgreens, Kelloggs, 19 of the top 25 3PLs in the U.S.	On board electronic driver information and tracking.	
	-	Time and distance matrix - any map	-	-	-	-	-	-	-	-	-	-	y	y	y	y	y	y	y	-	Flexible cost function for different planning objectives	-	Multi core support, faster algorithm	-	-	-	Shippers are trying to increase TL and reduce LTL spend.	1-100	Cannot be provided due to IBM Customer confidentiality	More push towards TL shipping and away from LTL due to fuel price increases.	
	-	Time and distance matrix - any map	-	-	-	-	-	-	-	-	-	-	y	y	y	y	y	y	-	-	Domain specific construction algorithm, etc.	-	Multi core support and improved 4x faster algorithms, CO2	-	y	TomTom WORK, TomTom, Garmin	-	101-500	Walco International Inc, Arca Inc., Airport Bags Inc.	Bundling of back-office route planning with on-board tracking, navigation, et al.	
	y	Varies by country, e.g. OS, Navteq	y	y	y	-	-	-	y	y	y	-	y	y	-	-	-	-	-	-	Cleaning for bulk liquids. Loading charts and 3D packing.	-	Lubricants, optimizing cleaning and flushing regime	-	y	TomTom WORK, TomTom, Garmin	-	101-500	Coca-Cola Enterprises, Ghirardelli Chocolate, Mosquito Squad	Bundling of back-office route planning with on-board tracking, navigation, et al.	
	y	NAVTEQ	-	y	y	-	-	-	y	y	y	-	-	y	y	y	y	-	-	-	Single multi-site & integrated fleets planning; et al	y	Link w/truck tracking & movements can be tracked	-	y	TomTom WORK, TomTom, Garmin	-	101-500	Various State Lotteries, Navteq, Cintas	Bundling of back-office route planning with on-board tracking, navigation, et al.	
	y	Multiple global providers	y	y	y	-	-	-	y	y	y	-	-	y	y	y	y	-	-	-	Integrated planning, routing, dispatch and telematics	y	Allowing GPS from any source to be used for integration	y	y	Navman Wireless, Peoplenet, Trimble, TomTom, et al	Using Paragon to improve efficiency & costs	101-500	McLane Company, CEVA, Exel Logistics, Martin-Brower, Ryder, Airgas Inc., others	(Details may be found via online survey.)	
	y	NAVTEQ	y	y	y	-	-	-	y	y	y	-	-	y	-	-	-	-	-	-	Easy to use, inexpensive compared to other systems.	-	Full TomTom WORK integration for routing, tracking, et al	y	y	TomTom Business Solutions	Want greater fleet efficiency & cost savings	1-100	3663, Matthew Clark, Menzies Distribution, Oakwood, Filshill and many more.	(Details may be found via online survey.)	
	y	NAVTEQ	y	y	y	-	-	-	y	y	y	-	-	y	-	-	-	-	-	-	Integrated customer database. Various licensing	-	Full TomTom WORK integration for routing, tracking, et al	y	-	-	Outsourcing in Asia requires non US, non Japanese routing	1-100	Major petroleum, food delivery, construction companies	SaaS Services	



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		Windows	Linux	Unix	Web based Software as a Service (SaaS)	Number of Stops	Number of Vehicles	Number of Simultaneous Terminals	Recommended Hardware	Processor Speed	Memory	Hard Disk Space	Computation time (60 routes, 1,000 stops, 2-hr. hard-time windows)	What types of algorithms are employed (open-ended?)	Node Routing	Arc Routing	Same Day re-Routing	Daily Routing	Route Planning & Analysis	Incorporates Real-Time Traffic Information in Route	Utilizes Historical Travel Time and Stop Time in Routing	Single Site License (50 routes)	Installation support cost (\$/hour)	Typical support hours needed for installation (50 routes)	Soft Time Windows?	If Yes, how are Soft Time Windows Specified?	Drivers Skills and Specialties?	Geographic Restrictions?
StreetSync Pro <i>RouteSolutions</i>	2011	y	-	-	y	Unlmtd.	Unlmtd.	Unlmtd.	PC w/ High-Speed Internet Access	1GHZ+	1GB+	2GB+	< 10 Minutes	Proprietary	y	-	y	y	y	y	y	Varies	Included	Unnecessary	y	Pro Time range - early/late penalties	y	y
TMW Applan Direct Route <i>TMW Systems, Inc.</i>	1996	y	-	-	-	40,000	5,000	Unlmtd.	PC - current level processor	1.7GB+	3GB	60GB	<3 Minutes	Proprietary	y	y	y	y	-	y	App. \$26,000	Included in training package	24	y	Fixed time with +/- factors	y	y	
TruckStops VRS <i>MapMechanics</i>	1991	y	-	-	-	Unlmtd.	Unlmtd.	Unlmtd.	PC, Server optional	1.4 or higher	256KB	1GB	User settable, minimum 1-5 minutes	Proprietary heuristics	y	y	y	y	-	y	Contact	Contact	Varies	-	-	y	y	
WebSTARS 5.4 <i>SAITECH, Inc.</i>	2009	y	y	y	y	Unlmtd.	Unlmtd.	Unlmtd.	Windows PC	3GHZ+	2GB+	125GB+	1-3 Minutes on a PC	Local search, integer programming	y	y	y	y	y	y	Call for quote	125, if necessary	2 day support included	y	Allowable delay time	-	y	

VR VEHICLE ROUTING

VENDOR DIRECTORY



Descartes Systems Group
120 Randall Drive
Waterloo, Ontario N2V1C6 CAN
800.419.8495
info@descartes.com
www.descartes.com

DNA Evolutions GmbH
Bei der Laug 56
Ulm, Baden Württemberg 89081 GER
info@dna-evolutions.com
www.dna-evolutions.com

Esri, Inc.
380 New York Street
Redlands, CA 92373 USA
909.793.2853
909.793.5953
www.esri.com/software/arclogistics/index.html

IBM
71 S. Wacker Drive
Chicago, IL 60606 USA
312.529.2832
rodonovan@us.ibm.com
www.ibm.com

MapMechanics
Canal Court 155 High Street
Brentford, Middlesex TW8 8JA UK
4.42086E+11
4.42086E+11
info@MapMechanics.com
www.TruckStopsRouting.com

MJC2
33 Wellington Business Park
Crowthorne, Berkshire RG45 6LS UK
+44 1344 760000
info@mjc2.com
www.mjc2.com/Frameset_products_distribution.htm

Optrak Distribution Software Ltd.
Orland House
Mead Lane Hertford
Hertfordshire SG13 7AT UK
01992 517 100
0207 117 3347
vrs-sales@optrak.com
www.optrak.com

Paragon Software Systems, Inc.
2591 Dallas Parkway, Suite 300
Frisco, TX 75034 USA
972.731.4308
sales@paragonrouting.com
www.paragonrouting.com

Roadnet Technologies
849 Fairmount Avenue, Suite 400
Towson, MD 21286 USA
410.847.1900
410.847.6246
info@roadnet.com
www.roadnet.com

RouteSolutions
3460 Marron Road, Suite 103-137
Oceanside, CA 92056 USA
858.541.2738
800.293.2815
greg@routesolutions.com
www.routesolutions.com

SAITECH, Inc.
P.O. Box 431
Holmdel, NJ 07733 USA
732.410.9192
732.444.5911
logi@saitech-inc.com
www.saitech-inc.com

TMW Systems, Inc.
21111 Chagrin Blvd.
Beachwood, OH 44122 USA
216.831.6606
216.831.3606
hgigante@tmwsystems.com
www.tmwsystems.com

Mapping	Product is available as part of a suite that provides	Features	Types of fleets that currently use the product	Innovations & Special Features	# of Companies Using	Most Significant Installations	Largest Change over the last two years	
Map include for one region? Brand of map provided?	Electronic Driver Display Wireless Messaging to Driver Real-time Vehicle Tracking RFID Scanner Supply Chain Mgmt. Software Customer Order Processing Computer Aided Dispatch for Police, Fire or Emerg. Vehicles Assigns individual drivers Turn-by-turn Route Instructions Load Manifest Loading Plan for Truckload Weather Forecast Information Displayed to Dispatcher ETA Automatically Sent to Customer if there is a Delay Local Pick-up and Delivery Long-haul Less-than Truckload Long-haul Truckload Courier Buses Taxis Service Fleets Emergency Services (police, fire, etc)	Other Special Features 24 hr 7 Day Live Customer Service Recent Innovation in System Integrations Support for Smart Phone/Tablets? Support/Integrate Navigation? Which Personal Navigation Devices? How is the Economy Affecting the Market?						
y NAVTEQ	y y y - - y - y y y y - y y y - y - y -	Enables route planning based on complex rules.	Full TomTom WORK integration	y y NAVMAN, Garmin, TomTom, CoPilot	Making market more aware to route/sched. efficiently	1001+	-	Increased centralization and integration of business systems.
y Teletias; PC Miler, + others	y y y - - - y y y y - y y y y y - y -	Various analysis tools for what-if analysis and for bidding	Web based order entry/route management	y y ALK CoPilot Truck	Pushes companies to become more efficient.	1001+	Unifirst, Dr. Pepper Snapple Group, Anheuser-Busch, Cintas, Mohawk Industries, et al.	(Details may be found via online survey.)
y NAVTEQ or local supplier	y y y y y y - y y y y - - y y y y - - y -	Automated use of pallet services or parcel carrier. Et al.	Computing packing loading for improved use	- - Can be provided in handheld or telematics.	Demand is up. Fleet managers need to save money.	1001+	Kraft, Schwans Foods, USIC, SABMiller, Core-Mark, Amerigas, Ferrelgas, et al.	Demand for integrated route planning, mobile and telematics in a real-time solution.
y MapOCX Pro	- - y - y y - y y y y - - y y y y y y -	SaaS service worldwide, JIT sched., multi-day/depot rtg.	Inclusion of Asian (China, Taiwan, etc.) maps	- y Tom Tom	Increasing demand as gas prices rise and cost cutting	1001+	Many large customers with national and regional fleets	Cloud computing makes services available without needing to install software or data.

NEW THOUGHT LEADERS IN ANALYTICS ARE PODCASTING! HEAR THESE LATEST ADDITIONS TO THE INFORMS SCIENCE OF BETTER PODCAST SERIES:



- **STANFORD'S STEFANOS ZENIOS**
on Helping Patients Make Critical Choices
- **COLUMBIA'S EMANUEL DERMAN**
on Models Behaving Badly
- **CARNEGIE MELLON'S AL BLUMSTEIN**
on Crime and Redemption
- **TEXAS A&M'S GARY GAUKLER**
on Nuclear Threats at Our Borders
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