Biennial survey of vehicle routing software reveals many innovations in response to market demands.

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By Randolph Hall and Janice Partyka

Higher expectations drive transformation

In the two years since the last survey, vehicle routing has begun a transformation that mirrors changes occurring throughout the software industry, pushed forward by expectations set in consumer markets for transportation and retail. For instance, Waze (and its owner Google) has seen an explosion of followers in app-based, crowd-sourced navigation, residing on the mobile phone. Rather than relying on static maps that may be older than your car, Waze navigates and updates from information gathered from its users, and, as more users gravitate to its platform, the data becomes increasingly valuable (see accompanying sidebar article). For retail, Amazon's same-day deliveries along with user-friendly interfaces for tracking and ordering have set new standards for customer empowerment.

We spoke with representatives of Omitracs Roadnet, Descartes, DNA-Evolutions, ALK and Appian TMW, and also surveyed vendors, to get the pulse of the industry. All of these companies offer software to solve variations of the "vehicle routing problem" – finding an optimal assignment of customers to vehicles, as well as the optimal sequence and schedule of customers served by each vehicle. The aim is to minimize transportation costs while satisfying feasibility constraints as to when and where stops are visited, what can be loaded in each vehicle, and what routes drivers can serve. Solutions are usually generated in advanced and executed as planned, though sometimes routes are dynamically updated throughout the day.

Routing software is used to plan deliveries from central locations, pick-ups from shippers, routes of service fleets (e.g., appliance repair), and bus and taxi schedules. The companies that use routing software vary greatly in size, ranging from small businesses with a fleet of 10 vans or fewer, to large corporations routing thousands of trucks. What these companies have in common is the need to coordinate and sequence tasks across multiple drivers and stops, ensuring predictable and expedient customer service at the lowest cost.

Which way to go

By Randolph Hall

As a new graduate student at U.C. Berkeley in the early 1980s, I was intrigued by the possibility of empowering travelers with information as a way to improve transportation. My first publication, titled "Habituality of Traveler Decisions and Travel Time Reliability," proposed a method motivated by three theories. First, travel can be more reliable and faster when exploiting the full diversity of a network, utilizing different routes at different times (i.e., breaking habits). Second, for stochastic and time-dependent networks, the fastest path from point A to B is not a path in the classic sense, but instead an adaptive strategy that permits changes based on information learned while en route. And last, when initiating a journey, one should not only care about the travel time along individual links of a path, but whether they offer multiple options along the way, thus permitting changes as you acquire new information.

Thirty-five years later, however, it was as though I had forgotten my own ideas, choosing the same route almost every day for 20 years traveling to work, and the same (but different) route traveling home. Then I discovered the mobile phone app Waze. Crowd-sourcing travel time data by tracking the movements of its users' mobile phones, Waze offered me dynamic choices, as well as an estimated time of arrival that reflected current travel conditions. Soon I was navigating through back streets of Echo Park, Silver Lake and downtown Los Angeles that I would have never considered. I had gotten out of my rut, but had my journeys become better?

Waze has several challenges in getting its algorithms to produce the best choices. First, because travel times constantly change (especially around the start of rush periods), it is not sufficient to have a good estimate of travel times at time of departure; a forward projected travel times along all points of a route is also needed (a USC spin-off company, TallyGo, is working on this issue). Second, travel times vary significantly along route segments depending on where you are heading next and which lane you have selected, and thus precise lane- and destination-based measurement is important. Third, travel time is partly a reflection of roadway congestion, but also a reflection of driver behavior, making the fastest route at least partly dependent on the individual. And last, owing to Waze's own success, the system has the power to over-saturate streets (particularly the obscure ones) with traffic, resulting in unanticipated "Waze-induced congestion."

So am I still using Waze? Absolutely. It has broken my habits, made me aware of routes I had never considered, and given me information on traffic congestion at the moment I'm traveling. But I do often ignore its choices because my experience tells me alternate routes are likely to be better, and I am fully aware that its ETA will be overly optimistic at certain times of day and overly pessimistic at other times of day. And no matter how many times Waze tells me otherwise, I do know that my office is not situated on a freeway on-ramp.

Our survey of fleet routing software tells us that the crowd-sourcing revolution has not spread throughout industry. But vehicle routing is ripe for disruption, as fleet drivers, like the rest of us, are ready to break habits to get places faster. Once perfected, smartphones, coupled with crowd sourcing and cloud computing, provide the perfect platform to do so.

The Cloud

Routing software emerged in the 1980s at a time when routing software resided on personal computers or on mainframes. While these options still exist, the direction has been toward cloud-based solutions or software-as-a-service (SaaS). As Cyndi Brandt of Omnitracs Roadnet tells us, "When customers have different versions of the software or only install part of the solution, it's hard for us to support them. Our customers use 10 to 15 versions, and they don't always update. By moving to SaaS, Omnitracs Roadnet can manage data better and offer better features."

According to Brandt, half of Omnitracs Roadnet customers are using SaaS.

Other companies have observed similar trends. "The cloud has removed the barrier of infrastructure and systems are easier to deploy," says James Stevenson at Appian TMW. "This is more important in large enterprises, such as those with multiple branches."

Ken Wood of Descartes indicates that the majority of its customers are cloud based, but he sees potential for future hybrid solutions to enable integration. "There are too many components outside the firewall that will be used as inputs to solutions," he says.

Smartphones

With pervasive consumer adoption of smartphones, it is not surprising that the technology is affecting how vehicle routes are conveyed to drivers.

Marc Gerlach of DNA Evolutions has found that "the availability of cheap and powerful mobile devices will step-by-step replace fixed installed units." In addition, he says, "most of our customers are providing telematics systems to communicate with the drivers on apps running on smartphones and tablets."

Nevertheless, as Brandt indicates, rugged devices installed on vehicles still have a place "for proof of delivery, mobile forms or tracking how a truck is being driven, such as idling or speeding." Device use also varies among transportation segments. As Stevenson tells us, "Long haul is less likely to use smartphones since they are required to comply with hours of service rules that require automated data logging connected to the engine bus." However, tablets or "phablets" (cross between tablet and phone) can sometimes serve this purpose. Recent regulatory changes mandating automated data logging has created a push in this direction.

What we did not find in our surveys and interviews is a big move toward integrating Waze-style crowd-sourced data with fleet routing. One challenge is that travel time estimates produced for cars are not very accurate for trucks, which travel more slowly and must observe height and weight restrictions on roads.

ALK Technologies is a provider of mapping data specifically for trucks, as well as truck navigation products, such as "CoPilot Truck." As Dan Popkin from ALK indicates, ALK has long provided mechanisms for customers to identify improvements in maps, which are then implemented through ALK's quality assurance process. More recently, ALK has offered "MapSure" as a more automated way for customers to edit their own map files and submit changes into ALK's data sets. As far as crowd-sourced navigation for trucks, Popkin says, "These are things we are looking into. It's an exciting opportunity for the future."

Integration

"Routing used to be just about creating a plan, but now it is about execution." That's the view of Omnitracs Roadnet's Brandt, who lists proof of delivery, tracking and compliance as supplemental needs that demand system integration. Omnitracs, long a leader in the truck telematics industry, acquired Roadnet at the end of 2013, and Descartes acquired Airclic in 2014, with an eye toward these forms of integration.

Another emerging form of integration is "self-scheduling," which Descartes' Wood describes as "a self-chosen delivery time." Wood also mentioned the need to satisfy "increased expectations

Software Survey, *continued on p. 46*

Software Product Listing

	Year Introduced	Platforms Supported				Maximum Size of Problem Solvable by the System							Performance		Routing Functions										
		Windows	iOS	Android	Web-based Software as a Service (SaaS)	a. Number of Stops	b. Number of Vehicles	c. Number of Simultaneous Terminals	Recommended Hardware	Processor Speed	Memory	Hard Disk Space	Computation Time to Solve Problem with 50 Routes, 1,000 Stops, Two-Hour Hard-time Windows (*Specify Platform*)	What Types of Algorithms are Employed in the Software (*Open Ended*)?	Node Routing	Arc Routing	Same Day Re-routing	Daily Routing	Weekly Routing	Route Planning & Analysis	Ability to Create Territories	Utilizes Real-time Traffic Information to Re-assign Stops Among Drivers	Utilizes Real-time Traffic Information to Re-sequence Stops for Drivers	Provides Dynamic Turn-by-Turn Instructions	Utilizes Historical Travel & Stop Time Collected from Mobile Devices
ArcGIS Network Analyst *Esri*	1990	y	y	y	y	Unlmtd.	Unlmtd.	Unlmtd.	Windows or Linux. SSD recommended.	Multi-core 2 GHz or higher. x64	500 MB per SIC, plus 4 GB for OS	SSD twice size of network data	< 5 mins.	6 + core algorithms	y	–	y	y	y	y	y	y	y	y	y
ClearD Optima *Clear Destination Inc.*	2008	y	y	y	y	Unlmtd.	Unlmtd.	Unlmtd.	Intel processor	1 GHz	16 GB	200 GB	2 mins.	Heuristic	y	y	y	y	y	y	y	y	y	y	y
Descartes Routing, Mobile & Telematics *Descartes*	2005	y	–	y	y	Unlmtd.	Unlmtd.	Unlmtd.	Depends on customer requirements	Depends on customer requirements	Depends on customer requirements	Depends on customer requirements	sub second	Algorithms used vary by scenario	y	y	y	y	y	y	y	y	–	y	y
DirectRoute *TMW Systems*	1996	y	–	–	y	60,000	Unlmtd.	Unlmtd.	Windows 7 OS or newer	Intel i7 Quadcore 2.8 GHz or higher	4 GB+	125 GB+	5 mins.	Proprietary	y	y	y	y	y	y	y	y	–	y	y
DISC *MJC2*	2000	y	y	y	y	Unlmtd.	Unlmtd.	Unlmtd.	Depends on application	Depends on application	Depends on application	Depends on application	A few seconds, standard PC/laptop	MJC2-developed in-house algorithms	y	y	y	y	y	y	y	y	y	y	y
Epicenter SaaS Simulation Platform *Forio*	2014	y	y	y	y	Unlmtd.	Unlmtd.	Unlmtd.	n/a	n/a	n/a	n/a	Depends upon how fast you want it!	Several	y	y	y	y	y	y	y	y	y	y	y
eRoute Logistics *WM Logistics*	2001	y	–	y	y	Unlmtd.	Unlmtd.	Unlmtd.	Three Dell PowerEdge 2950 servers	2.33 GHz	64 GB	1.5 TB	5 mins. (Assuming OD metrix built)	Close loop	y	y	y	y	y	y	y	y	y	y	y
Intelligent Routing *Intelligent Routing Products (PTY Ltd)*	2014	–	–	y	y	–	–	–	Good internet connectivity	–	Latest Google Chrome Requirement	50 MB local network cache	5m+ (acceptance setting dependent)	Multiple Heuristics, dynamic select	y	–	–	y	–	y	–	–	–	y	y
JOpt *DNA Evolutions GmbH*	2006	y	–	–	y	Depends on application	Depends on application	Depends on application	Multicore platform	2 GHz+	4 GB+	10 GB	< 5 mins.	Combination of construction, SA, GA	y	–	y	y	y	y	y	–	–	–	–
logvrp *Netakil*	2010	–	–	–	y	Web app 500 Web API Unlmtd.	Web app 100 Web API Unlmtd.	Unlmtd.	Enough to run decent Web browser	Enough to run decent Web browser	Enough to run decent Web browser	Enough to run decent Web browser	~30 mins., depends constraints	LS, heuristics, SA, hybrid	y	–	y	y	y	y	y	–	–	–	–
ODL Studio *Open Door Logistics*	2014	y	–	–	–	No set limit but <2,000 recommended	Unlmtd.	Unlmtd.	Modern PC	Minimum dual core 2 GHz	Problem dependent, min. 4 GB	Up to 10 GB	10 mins. should suffice	Heuristic (Jsprit library)	y	–	–	y	–	y	y	–	–	–	–

Pricing Information					Solution Algorithms			Mapping					Part of a Suite that Provides:				Features					Types of Fleets that Currently Use the Product								Other Special Features								Usage	Most Significant Installations
Single Site License (50 routes)	a. License Fee Include Map for One Region?	Source of Mapping Used in Your Offering	b. Installation Support Cost ($/hour)	c. Typical Support Hours Needed for Installation (50 routes)	Consideration of Driver Skills & Needs?	Geographic Restrictions?	Driver Hours of Service Rules (e.g., rest breaks, 11-hour rule, etc.)?	Travel Times from External Sources?	If yes, what is the source?	Display Crowd-sourced Information?	If yes, what type of information?	Are Map Street Views Available?	RFID Scanner	Supply Chain Management Software	Customer Order Processing System	Computer-Aided Dispatch for Police, Fire or Emergency Vehicles	Assigns Individual Drivers to Routes	Turn-by-Turn Route Instructions	Load Manifest	Loading Plan for Truckload	ETA Automatically Sent to the Customer	Local Pickup and Delivery	Long-haul Less than Truckload	Long-haul Truckload	Courier	Buses	Taxis	Service Fleets	Emergency Services (police, fire, etc.)	24 by 7 Live Customer Service	Support Drivers Using Smartphones?	iOS	Android	Windows	Support Drivers Using Tablets?	Utilize an App Store for Distribution?	Mgmt. Use Devices to Monitor Drivers?	Number of Companies Using Software	
Dependent on deployment option	y	HERE, TomTom or Custom Data	Dependent on the consultant	Dependent on deployment option	y	y	y	y	HERE, TomTom, etc.	y	Dependent upon the source chosen	y	–	–	–	–	y	y	–	–	y	y	y	–	y	y	–	y	y	y	y	y	y	y	y	y	y	1001+	–
Per stop pricing	y	HERE	$187.50 per hour	2 hours	y	y	y	y	Source come from mobile devices	–	–	y	y	y	y	–	y	y	y	y	y	y	y	–	y	–	–	y	–	–	y	y	y	–	y	y	y	101–500	Many big box retailers selling furniture appliances and mattresses
Call for pricing details	–	Call for pricing details	Call for pricing details	Call for support details	y	y	y	y	Google Maps	–	–	y	y	y	–	–	y	y	–	–	y	y	y	–	y	y	–	y	–	y	y	y	y	y	y	–	y	1001+	DHL, Schwans, Ferrellgas, Home Depot, Best Buy, US Foods, Sears and many others
Contact us for pricing	y	ALK PC Miler Streets	Contact us for pricing	24 hours	y	y	y	y	PC Miler	–	–	y	y	y	y	–	y	y	y	–	y	y	y	y	y	–	–	y	–	y	y	y	y	y	y	y	y	501–1000	–
POA	–	–	POA	POA	y	y	y	y	Several	y	Several	y	y	y	y	–	y	y	y	y	y	y	y	y	y	y	–	y	–	y	y	y	y	y	y	–	y	101–500	All our customers have large operations with 100s or 1,000s of vehicles
It's based on the number of users	y	Google Maps	n/a	Web-email or 8-5 PST support	–	y	–	y	Google Maps & Waze	y	Multiple	y	y	y	–	–	y	y	y	–	y	y	–	–	y	–	–	y	–	–	y	y	y	y	y	–	y	1–100	Boeing, Liberty Mutual, Harvard, Wharton
–	y	Navteq and Bing	–	–	–	y	y	–	–	–	–	y	–	y	–	y	y	y	y	–	–	y	–	–	y	y	–	y	y	–	–	–	–	–	y	–	–	1–100	–
$65/ vehicle/ month	y	OSM (Mapbox)	$100	16 Hr (address quality dependent)	y	y	y	y	Android Users' Choice (e.g. Google)	–	–	y	–	–	–	–	y	y	y	–	–	y	–	–	–	–	–	y	–	–	y	–	y	–	y	y	y	1–100	62 Waters (62.co.za)
Case specific $10,000 to $30,000	–	Google Maps, Open Street Maps	Included in $600 trial package	Included in $600 trial package	y	y	y	y	Google Maps	–	–	–	–	–	–	–	y	–	–	–	–	y	y	y	y	–	–	y	–	–	–	–	–	–	–	–	–	101–500	Amazon Fresh, Pitney Bowes, Henry Schein Animal Health & various confidential software producers in different branches.
Starting $20 to $500/ month	y	Google Maps	None (Web-based SaaS)	None (Web-based SaaS)	y	y	y	y	Google Maps	–	–	–	–	–	–	–	–	y	y	–	–	y	y	y	y	y	y	y	–	–	–	–	–	–	–	–	–	1–100	International companies + SMEs. Specifics are confidential. Major industries: couriers, distributors, passenger freight
No license cost - software is free	y	Open Street Map (free data).	Contact Open Door Logistics	0 - 4 hrs	y	y	–	–	–	–	–	y	–	–	–	–	y	–	–	–	–	y	y	y	–	y	–	y	–	–	–	–	–	–	–	–	–	101–500	–

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		Windows	iOS	Android	Web-based Software as a Service (SaaS)	a. Number of Stops	b. Number of Vehicles	c. Number of Simultaneous Terminals	Recommended Hardware	Processor Speed	Memory	Hard Disk Space	Computation Time to Solve Problem with 50 Routes, 1,000 Stops, Two-Hour Hard-time Windows *(Specify Platform)*	What Types of Algorithms are Employed in the Software *(Open Ended)*?	Node Routing	Arc Routing	Same Day Re-routing	Daily Routing	Weekly Routing	Route Planning & Analysis	Ability to Create Territories	Utilizes Real-time Traffic Information to Re-assign Stops Among Drivers	Utilizes Real-time Traffic Information to Re-sequence Stops for Drivers	Provides Dynamic Turn-by-Turn Instructions	Utilizes Historical Travel & Stop Time Collected from Mobile Devices
OptimoRoute *OptimoRoute Inc.*	2013	–	–	–	y	5,000	Unlmtd.	Unlmtd.	Not applicable / Cloud service	Not applicable / Cloud service	Not applicable / Cloud service	Not applicable / Cloud service	2 mins. on OptimoRoute cloud	–	y	–	y	y	y	y	y	–	–	y	–
Optrak *Optrak Distribution Software Ltd.*	1992	y	–	–	y	No fixed limit. Will run >4,000	No fixed limit. Will run > 200	n/a	i5 processor	2 GHz	8 GB	20 GB	15 mins. depending on constraints	Construction heuristics, LNS	y	–	y	y	y	y	–	–	–	–	y
Paragon HDX *Paragon Software Systems, Inc.*	2002	y	–	–	y	20,000	30,000	2,000	PC/ Windows Server	Fast Intel Core, e.g. 3.6 GHz	2 GB Min	50 GB	About 2 mins.	Proprietary Heuristic	y	–	y	y	y	y	y	–	–	–	y
Paragon Routing and Scheduling Optimizer *Paragon Software Systems, Inc.*	1983	y	–	–	–	20,000	30,000	2,000	PC/ Windows Server	Fast Intel Core, e.g. 3.6 GHz	2 GB Min	50 GB	About 2 mins.	Proprietary Heuristic	y	y	y	y	y	y	y	–	–	–	y
Roadnet Anywhere *Omnitracs Roadnet*	2008	y	–	–	y	Unlmtd.	Unlmtd.	Unlmtd.	–	–	–	–	1 minute	Custom heuristics	y	–	y	y	–	y	–	–	–	y	–
Roadnet Transportation Suite *Omnitracs Roadnet*	1985	y	y	y	–	Unlmtd.	Unlmtd.	Unlmtd.	–	–	–	–	1 minute	Custom heuristics	y	–	y	y	y	y	y	–	–	–	–
Route4Me *Route4Me*	2009	y	y	y	y	10,000	1,000	Unlmtd.	Web-browser or Mobile Smartphone	Any	Any	Any	20 secs.	Proprietary Metaheuristics	y	y	y	y	y	y	y	y	y	y	y
Routist *Fleetmatics*	2013	–	–	–	y	Unlmtd.	Unlmtd.	Unlmtd.	Standard PC with a Web-browser	–	–	–	3 to 5 mins. - SaaS	Proprietary metaheuristic	y	–	y	y	–	y	y	–	–	–	y
Routyn *Wide Scope*	2010	y	y	y	y	Unlmtd.	Unlmtd.	Unlmtd.	8 GB RAM + 2.9 GHz GPU	Any	8 GB RAM per each 2,000 stops	100 MB	10 mins. with 8 GB RAM, 2.9GHz CPU	Metaheuristics, linear programming	y	–	y	y	y	y	y	y	y	y	y
Sci–Log (Scientific Logistics) *Scientific Logistics, Inc.*	2011	–	–	–	y	No practical limit	No practical limit	No practical limit	n/a	n/a	n/a	n/a	1-15 mins. (# of CPUs used)	Proprietary parallel computing	y	–	y	y	y	y	y	–	–	–	y
STARS 6.0 *SAITECH, inc.*	1995	y	–	–	y	Unlmtd.	Unlmtd.	Unlmtd.	Windows PC	Fast	2 GB+	10 GB +	1 sec - a few mins.	Local search, MIP	y	y	y		y	y	y	y	y	–	–

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Single Site License (50 routes)	a. License Fee Include Map for One Region?	Source of Mapping Used in Your Offering	b. Installation Support Cost ($/hour)	c. Typical Support Hours Needed for Installation (50 routes)	Consideration of Driver Skills & Needs?	Geographic Restrictions?	Driver Hours of Service Rules (e.g., rest breaks, 11-hour rule, etc.)?	Travel Times from External Sources?	If yes, what is the source?	Display Crowd-sourced Information?	If yes, what type of information?	Are Map Street Views Available?	RFID Scanner	Supply Chain Management Software	Customer Order Processing System	Computer-Aided Dispatch for Police, Fire or Emergency Vehicles	Assigns Individual Drivers to Routes	Turn-by-Turn Route Instructions	Load Manifest	Loading Plan for Truckload	ETA Automatically Sent to the Customer	Local Pickup and Delivery	Long-haul Less than Truckload	Long-haul Truckload	Courier	Buses	Taxis	Service Fleets	Emergency Services (police, fire, etc.)	24 by 7 Live Customer Service	Support Drivers Using Smartphones?	iOS	Android	Windows	Support Drivers Using Tablets?	Utilize an App Store for Distribution?	Mgmt. Use Devices to Monitor Drivers?	Number of Companies Using Software	
$950-$1,950 per month	y	–	Included in the license	2	y	y	y	–	–	–	–	–	–	–	–	–	y	y	y	–	–	y	–	–	y	y	–	y	–	–	y	y	y	y	y	–	–	101-500	–
On application	–	HERE (non UK), Ordnance Survey (UK)	On application	120 includes customizations	y	y	y	–	–	–	–	y	–	–	–	–	y	y	y	y	y	y	y	y	y	–	–	–	–	–	y	y	y	y	y	–	–	1-100	Matthew Clark, Fuchs Oils, NOCO, Wakefield Candad
Depends on client requirements	y	HERE	Will depend on client requirement.	Dependent on complexity and size	y	y	y	–	–	–	–	–	–	–	–	–	y	y	y	–	y	y	y	y	y	–	–	y	–	–	y	–	y	y	y	–	y	1-100	IKEA, Dreams, Argos
POA	y	HERE	Will depend on client requirement.	Dependent on complexity and size	y	y	–	–	–	–	–	y	–	–	–	–	–	y	y	–	y	y	y	y	y	y	–	y	–	y	y	–	y	y	y	–	y	101-500	Martin-Brower, McLane, George's Inc., DHL, CEVA, Toyota Materials Handling, National Food Corp, Agreliant, Tesco, Sainsbury's
–	–	–	–	–	–	y	y	y	INRIX	–	–	–	–	–	–	–	y	y	y	–	y	y	–	–	–	–	–	–	–	y	y	y	y	y	y	y	–	–	–
–	–	TomTom, HERE	–	–	y	y	–	–	–	–	–	–	–	–	–	–	y	y	y	y	y	y	y	–	–	–	–	–	–	y	y	y	y	y	y	y	y	1001+	–
$500 per SMB, Unlmtd. drivers	–	OSM and All Major Vendors	0	0	y	y	–	y	Commercial and Proprietary	–	–	y	–	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	1001+	One customer plans 2M routes per year, another plans 5,000 stop routes daily for parcel fullfilment
Contact Fleetmatics	–	–	–	–	y	y	y	–	–	–	–	y	–	–	–	–	y	y	–	–	–	–	–	–	y	–	–	y	–	y	y	y	y	y	y	y	y	1-100	–
€47,500	y	Open Street Maps	€300	24	y	y	y	y	TomTom, INRIX	y	Road blocks, Traffic	y	–	–	–	–	y	y	y	y	y	y	y	y	y	–	–	y	–	y	y	y	y	y	y	y	y	1-100	Large drinks distributors, 3PL operators, dairy producers, wholesale distributors, long-haul carriers, etc.
Contact	y	Various	Contact	Contact	y	y	y	–	–	–	–	y	–	–	–	–	y	y	y	–	–	y	y	y	y	–	–	y	–	–	–	–	–	–	–	–	–	1–100	Walmart, Pepsi Beverages, Reinhart Foodservice, Young's Market, RaceTrac
Call	–	Call for specifics	Included in the licensing fee	1 day	y	y	y	y	Call	–	–	y	–	y	–	–	y	y	y	y	–	y	y	y	y	–	–	y	y	–	y	y	y	y	y	–	–	1–100	Just-in-time manufacturing, express, carrier, petroleum company

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StreetSync Pro *RouteSolutions*	2011	y	y	y	y	Unlmtd.	Unlmtd.	Unlmtd.	PC w/ High-Speed Internet Access	2GHz+	2GB+	2GB+	Several mins.	Propri-etary	y	–	y	y	y	y	y	y	y	y	y
StreetSync Standard *RouteSolutions*	2014	y	y	y	y	Unlmtd.	Unlmtd.	Unlmtd.	PC w/ High-Speed Internet Access	2GHz+	2GB+	2GB+	Several mins.	Propri-etary	y	–	y	y	y	y	y	y	y	y	y
Truckstops *Mapmechanics*	1983	y	–	–	–	Unlmtd.	Unlmtd.	No fixed hardware	PC, Server optional	Imple-menta-tion depen-dent	Imple-menta-tion depen-dent	Imple-menta-tion depen-dent	Set by user, min. 1-5 mins.	Propri-etary heur-istics	y	y	y	y	y	y	y	y	y	y	y

Software Survey, *continued from p. 41*

of delivery as a continued expansion of the Amazon model." In addition, Appian TMW's Stevenson relates, "companies now want full end-to-end solutions. They want the day's activities fed into a complete feedback loop." This means providing information on actual performance that can be used to improve future routing.

Gerlach of DNA-Evolutions sees the future challenge as the "interfacing of all systems along the supply chain. This will lead to more cloud- and web-based offerings on one hand, and the dispatching process will have to consider more aspects and data will thus become more complex." One example is integration with the energy industry, where routing and production planning need to be optimized together.

This Year's Survey

Twenty-two companies participated in this year's online survey, ranging from small vendors (less than 100 customers) to large corporations (1,000+ customers). We asked for demographic information on the companies (such as contact information and date of introduction), platform (hardware, operating system, driver devices, maps), features and capabilities, and installations. We also asked several open-ended questions, inviting comments on recent and expected industry changes, innovations and impacts of the economy on the industry. Keep in mind that results are all self-reported and unverified.

What's notable in this year's survey?

Operating systems: Almost everyone offers a SaaS solution, most provide a Windows solution, and half have solutions implemented on mobile devices (iOS or Android).

Digital maps: Solutions are diverging. HERE, TomTom, ALK, Google Maps and OpenStreetMaps were some of those mentioned.

Special features and innovations: These included integrated telematics, bulk load routing, integrated workforce management, integrated call centers and ultra low-latency route optimization.

Installations: Most common are private fleets transporting consumer goods (think of Home Depot, Walmart, Coca-Cola, Walgreens), but for-hire carriers were also mentioned (DHS, R+L), as well as transporters of industrial goods. It was less common for companies to support taxi or bus fleets, but some do.

As to where the industry is heading, predictions include heading toward "connected fleet solutions," integration of real-time information, cloud offerings and mobile offerings via smart phones. "Amazon Now" was mentioned as an influence, creating a standard for coordinated immediate delivery. Descartes emphasized the need to harmonize the consumer's delivery experience across multiple channels of transportation. And, as James Stevenson explained, "We are now seeing same-day delivery that bypasses distribution centers. It is the ultra last-minute transportation, a bit like Uber, that's setting the direction." Amazon, Waze and Uber – all software-driven companies that depend on routing – are setting new standards for the industry.

In selecting a vehicle routing product, look for vendors that have experience serving similar industries to your own, and test the software on a representative data set to assess the quality and speed of solutions. Ask for references and determine whether any prior customers have switched to another product and why. And look ahead to see whether the company has the capability to maintain and update the software to meet your future needs. Consider total cost of ownership, including license costs, staff support and future upgrades and maintenance. **ORMS**

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Pricing Information					Solution Algorithms				Mapping					Part of a Suite that Provides:			Features					Types of Fleets that Currently Use the Product								Other Special Features								Usage	Most Significant Installations
Single Site License (50 routes)	a. License Fee Include Map for One Region?	Source of Mapping Used in Your Offering	b. Installation Support Cost ($/hour)	c. Typical Support Hours Needed for Installation (50 routes)	Consideration of Driver Skills & Needs?	Geographic Restrictions?	Driver Hours of Service Rules *(e.g., rest breaks, 11-hour rule, etc.)?*	Travel Times from External Sources?	If yes, what is the source?	Display Crowd-sourced Information?	If yes, what type of information?	Are Map Street Views Available?	RFID Scanner	Supply Chain Management Software	Customer Order Processing System	Computer-Aided Dispatch for Police, Fire or Emergency Vehicles	Assigns Individual Drivers to Routes	Turn-by-Turn Route Instructions	Load Manifest	Loading Plan for Truckload	ETA Automatically Sent to the Customer	Local Pickup and Delivery	Long-haul Less than Truckload	Long-haul Truckload	Courier	Buses	Taxis	Service Fleets	Emergency Services *(police, fire, etc.)*	24 by 7 Live Customer Service	Support Drivers Using Smartphones?	iOS	Android	Windows	Support Drivers Using Tablets?	Utilize an App Store for Distribution?	Mgmt. Use Devices to Monitor Drivers?	Number of Companies Using Software	
Route Solutions.com lists pricing	y	HERE (formerly NAVTEQ)	Included	Typically unnecessary	y	y	y	y	Via TomTom Telematics integration	y	Via TomTom Telematics integration	y	y	–	y	–	y	y	y	–	y	y	y	y	y	–	–	y	–	–	y	y	y	y	y	y	y	101-500	Numotion, Ole Mexican, R.H. Barringer, SteriHealth
Route Solutions.com lists pricing	y	HERE (formerly NAVTEQ)	Included	Typically unnecessary	–	–	–	y	Via our TomTom integration	y	Via our TomTom integration	y	y	–	y	–	y	y	y	–	y	y	y	y	y	–	–	y	–	–	y	y	y	y	y	y	y	101-500	Coca-Cola Enterprises, Ghirardelli Chocolate, Mosquito Squad, State of Michigan
Contact	y	HERE Maps or local supplier	Included in purchase price	Varies, please contact	y	y	y	y	HERE Platform	y	Display of traffic situation	y	y	y	y	–	y	y	y	y	y	y	y	y	y	–	–	y	–	–	y	y	y	y	y	–	y	1001+	Walgreens, R + L Truckload Services, Agrifoods, Kurt Weiss, TNT

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