

Healthcare-Fleet Optimization Study

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Healthcare-Fleet Optimization Study

Final Report

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Notice

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Abstract

This study examined paths for economic and environmental efficiency improvement through management of a complex healthcare fleet, comprised of five sub-fleets, using existing software solutions. The process consisted of three steps: (1) development of a full definition of the desired functionality of the system from the viewpoint of each stakeholder, (2) evaluation of existing solutions, and (3) comparative and gap analyses. In addition, the process was generalized to enhance replicability statewide to other entities that manage diverse fleets and face similar challenges. Three specific off-the-shelf software solutions were examined in detail. The study further illustrated data-driven, fleet performance baselining, using data from vehicle trackers. Challenges associated with performance economics and environmental metrics and their impact on cost-benefit decisions were examined.

Keywords

Fleet monitoring, automated routing, vehicle tracking, fleet optimization, economic and environmental performance of complex vehicle fleets

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Acronyms and Abbreviations

ACM Labs	ACM Global Laboratories
API	application programming interface
CAN	Controller Area Network
CO ₂	carbon dioxide
Core Group	RIT researchers and three (later two) principals from RGH
Extended Group	Core group plus representatives from ACM Labs and ACM Labs' Mobile Phlebotomy Unit
GHG	greenhouse gas
IT	information technology
LIS	laboratory information system
MMS	medical motor service
MP	mobile phlebotomy
NYS	New York State
NYSERDA	New York State Energy Research and Development Authority
PACE	Programs of All-Inclusive Care for the Elderly
PC	personal computer
PDF	portable document format
PSC	patient service centers
RGH	Rochester General Hospital
RIT	Rochester Institute of Technology
RRH	Rochester Regional Health

Executive Summary

Modern hospital systems encompass large geographic areas, which require transporting a wide array of supplies and equipment among dispersed facilities, patients, and vendors. The transportation needs are typically organized at the business-unit level, leading to inefficiencies when viewed as a system. Rochester Regional Health (RRH) management saw overlap and redundancy in travel patterns (e.g., drivers from different groups made stops at the same facility). This report documents Rochester Institute of Technology's (RIT) work to explore challenges to RRH's transportation system and to evaluate possible technology approaches to optimize the system.

RRH has five major business units that provide transportation services. They are referred to in this report as the following:

- Rochester Regional Health (RRH) couriers—Drivers that transport materials between RRH's main hospital, Rochester General Hospital (RGH), and other medical facilities or supply depots.
- ACM Global Laboratories (ACM Labs) couriers—Drivers that transport patient samples from collection points to central testing labs.
- ACM Labs' mobile phlebotomy (MP) unit—Technicians that visit patients at home to collect medical samples and deliver them to central testing labs.
- Care Management—Care managers that support people at risk by providing both personal counselling and transportation.
- ElderOne—Group that provides transportation for elderly, with one location in Irondequoit.

As part of the project, RIT researchers performed a site visit to each of the five business units to learn about existing processes and to collect metrics. They then evaluated these data and identified common points, similarities, and critical differences. Based on the evaluation, the team narrowed their research to three of the five business units: ACM Labs couriers, ACM Labs' MP unit, and RRH couriers.

Two were eliminated: ElderOne and RRH's Care Management service. ElderOne was removed from consideration, because its transportation group was outsourced, and third-party buses not under RRH control were used. Care Management service was taken out of the study because its transportation is scheduled independently by care managers to accommodate for utmost flexibility in service provision. The three remaining units represent the majority of RRH's transportation activities.

The goal of the research project was to identify potential technology options that RRH could leverage to better manage its internal transportation network. In support of this goal, the RIT team analyzed the data it collected from site visits to find processes, needs, and competencies common to all three business units.

The results of this analysis were used to define the feature requirements of a best-fit software package for RRH. The RIT team then built an initial list of potential software packages to consider further, which was pared down to three final candidates. These software vendors were contacted to organize software demonstrations. After several rounds of demonstrations, the RIT team assessed each software package's ability to manage and optimize RRH's transport activities. A fourth option was added to the short list in order to better address RRH's unique routing needs. In a concluding meeting with RRH, RIT's researchers provided an assessment of the final four packages and a gap analysis of critical, essential features. The next step for RRH following the close of this project is to directly engage with one of the short-listed vendors to work out a contract.

The project was not without challenges. In addition to the loss of the two groups mentioned above, RRH is, like most health organizations, resource-constrained, which put completion of the project at risk. Nonetheless, challenging issues were mitigated, and the RIT team was able to identify a commercial software package that could effectively manage and consolidate RRH's transportation system.

1 Introduction and Background

Healthcare transportation requirements are diverse, and vehicles are typically grouped according to their main functionality in separate fleets: medical-supply fleet, laboratory carriers, and patient transportation. Any other specialized transportation needs are typically assigned to one of these groups. However, there are many functionalities that could but are not shared among fleets. Today, vehicles of independently managed fleets pass one another on roadways, even in cases when they have compatible tasks or purposes.

Rochester Institute of Technology (RIT) partnered with Rochester Regional Health (RRH) to assess the transportation needs of the large healthcare organization in order to optimize its system using commercial software. If no commercial options were found to meet RRH's needs, the results of this project would have formed a starting point for building a custom solution. Furthermore, RIT's assessment was done with the intention of developing a standalone tool that other organizations could use as a guide for finding software to optimize their transportation systems.

The initial premise of the project was to minimize overlaps and to reduce redundant stops across RRH's fleets, despite their unique domain-specific functionality. Yet, after a detailed assessment and analysis of routing information, RIT's analysis found that there was minimal opportunity to achieve this objective, since each fleet's unique set of constraints in terms of driver skills or time requirements made consolidation impractical.

RIT and RRH agreed to refocus the project to the task of consolidating the array of tools used by different departments to manage their individual transportation needs. This meant engaging a process for collecting need requirements, weighting their relative importance, and refining the feature list to critical functionality. In parallel to this work, RIT staff searched for possible software packages already built that would meet RRH's needs. The set of requirements served as parameters for identifying candidate packages that were, in turn, evaluated in more detail by the project's stakeholders.

1.1 Software Selection Process Overview

The objective of the project was threefold: to learn about RRH's transportation system and the challenges it faces, to identify potential software packages with relevant features, and to determine a short list of options that best meets the needs of the organization. This was done through several tasks performed by the RIT researchers, as outlined below.

- Questionnaire—Administered a questionnaire to RRH staff to learn about the staff, organization, equipment, passengers/cargo, and current processes.
- Site visits—Met the RRH fleet principals and staff, learned about their processes, observed any special equipment and software tools/processes.
- Analysis of visits—Reviewed meeting notes and consolidated findings to identify common attributes. Started development of a features list based on current tools/processes and issues users have about the existing set of tools.
- Search for potential packages—Performed broad online searches for possible packages in the transportation market. Reviewed product websites for likely candidates.
- Review and ranking of software features—Developed a list of features and asked users to rank their importance in order to identify critical features. Held meeting with RRH to review user rankings and discuss and identify the most critical workflows.
- Short-listing software packages—With input from the users, assessed which packages would meet the bulk of the requirements. Assessment was based on reviews, YouTube videos, and vendors’ documents.
- Vendor engagement—Contacted a short list of four vendors and interacted with sales staff to described RRH’s types of drivers, deliveries, and vehicles. Confirmed each platform’s ability to meet RRH’s basic needs.
- Vendor demonstrations—Set up software demonstrations with all project stakeholders. Used demonstrations as an opportunity to provide “real” data.
- Refinement of critical features—With user input, determined which features are not fully realized in the packages and asked vendors for clarification and additional demonstrations.
- Assessment and gap analysis—Crossed off features offered by all of the packages and focused on those not listed. Assessed impact of missing feature(s) and determined if there was an acceptable work around. Set short list of four final vendors with viable software packages. Final selection and business justification—At the time of writing this report, RRH was in the process of selecting a final vendor.

1.2 What is Transportation Software?

Transportation-planning software is a suite of tools used to optimize fleet operation by maximizing vehicle and driver utilization, and in turn, minimizing delivery expenses. Furthermore, efficient use of the fleet can result in reduction in fuel use and subsequent greenhouse gases. Many vendors offer software packages and tend to focus product features to a target market. For example, the transportation planning tools of long-haul trucking and flower delivery companies have some overlap in features but will have many different features unique to their sectors. Current software solutions feature multiple modules: mobile applications for drivers, dashboards customized for managers, dispatchers’ displays, and screens for maintainers. Often hardware is installed on the vehicles that report position and vehicle status to backend servers.

After the system is set up with vehicles and drivers, a route planner will obtain a set of addresses (stops) that are entered into the system and associated with a driver. How the association occurs depends on the package. It may be done manually by the route planner, while others use algorithms to allocate stops to a territory, level driver time loads, or minimize travel distances.

Once the stops are assigned to a driver as a route, the route is sent to the driver's application—and provides driving directions—and the driver starts progressing through the stops. When drivers reach a stop, they select the stop icon in the application and complete the delivery. Some applications collect delivery signatures or other data. Meanwhile, the telematics hardware on the vehicle is sending back location, speed, and braking data so that a dispatcher can monitor the vehicle and the driver's progress along a series of stops. The telematics hardware reads the traffic on the vehicle Controller Area Network (CAN) bus (J1939/J1708)[1, 2] and sends selected content to the fleet-management modules that typically reside in the cloud, such as vehicle error codes that can be used by maintenance personnel or usage information (i.e., cumulative miles and hours) and speed data.

If a new on-demand stop comes in during the day, the dispatcher will select the best driver based on closeness or availability and assign the stop. The driver's application will be updated to show the new stop.

The operators of the vehicles, besides driving the vehicle, have special tasks that sometimes require specific training. For example, this project involved mobile phlebotomists who draw patients' blood. Within an individual business unit, most drivers are interchangeable, though there are advantages if the same driver serves the same general area and learns the roads and people at their stops.

Many transportation-planning software packages support tracking data for vehicle maintenance and fuel usage, either as part of the core software or through a third-party provider like a fuel-card company. The maintenance can be high-level, like reminders for oil changes, or more focused, like detailed tracking of repairs and parts. An organization will need to select the level of detail required, which depends on whether they do maintenance internally or through a service provider.

2 Data Gathering

RIT engaged with the personnel from five different RRH sub-fleets over a month-long period. RIT staff performed on site interviews (i.e., site visits), investigating current processes, statistics, and associated costs. In preparation for these visits, a questionnaire was developed for the project (see appendix A).

2.1 Questionnaire

The questionnaire was used as a tool during the site visits. It contains sections that capture inputs from key personnel (business unit manager, dispatchers, and drivers), as well as supporting staff (e.g., information technology (IT) administrators and vehicle maintenance technicians). It was designed to facilitate conversations, ensure consistency among different interviews, and capture the data in a unified format. Appendix B contains the details of the site visits. Brief summaries are provided below.

2.2 Rochester Regional Health Couriers Site Visit: September 18, 2018

The first detailed interview occurred with RRH courier service at a garage dispatch office at Rochester General Hospital on Carter Street in Rochester, NY. The RRH couriers run two types of route plans using the same resources (i.e., drivers and vehicles). The first type is fixed-sequence stops in a loosely planned route with the driver choosing the exact route. The stops list changes when RRH adds a new stop. The second is an on-demand service, where RRH staff make a request via a web form for a nonscheduled pickup. The time horizon is immediate (e.g., broken surgery equipment needs to be replaced) to several days (e.g., delivery of print jobs). RRH couriers use nine small vans and make about 790 fixed and 33 on-demand stops per week.

2.3 ElderOne Site Visit: October 10, 2018

ElderOne operates a program called Programs of All-Inclusive Care for the Elderly (PACE). It has four facilities that act as day-care centers to improve the quality of life of the elderly. The centers have rooms where seniors can participate in group activities, enjoy meals, etc. PACE also provides space for basic medical needs and physical therapy. Patrons are bussed to the centers as well as to medical appointments. ElderOne has a small suite of buses, some with wheelchair lifts, to transport patrons.

ElderOne's transportation management is outsourced to Medical Motor Service (MMS). MMS staff co-locate at ElderOne and run scheduling and dispatching through RouteMatch transportation-planning software. ElderOne has 24 buses, which make approximately 780 stops a week, including 60–90 doctor appointments each day.

2.4 ACM Labs Site Visit: October 16, 2018

ACM Labs' couriers collect biological samples from locations across Western New York, from Syracuse to Buffalo to Jamestown. There are three types of courier runs: (1) Patient Service Centers (PSC) runs, which cycle between the large draw facilities; (2) fixed routes that visit smaller draw facilities and doctors' offices; and (3) STAT runs for time-critical analysis. Samples have three different temperature requirements for storage while in transport: ambient, refrigerated with cool packs, and refrigerated with dry ice. The samples are transported in standardized packages. For example, red boxes are used for PSCs and client samples are transported in coolers.

ACM Labs has 54 full- and part-time drivers, making a total of 3,000 stops per weekday. The service operates on weekends with a reduced staff. Most routes are fixed for the week, with possible daily variations due to “will call” pickups. There are several STAT drivers for on-demand work that cannot be added to a fixed route.

2.5 Care Management Site Visit: October 17, 2018

Health Home Care Management has a fleet of vehicles that care managers use to help people at risk interact with the social-support system. A care manager might take a person to doctor appointments, mental health appointments, court dates, or other important meetings related to social services. They use a car from Care Management's pool for both site visits and client transportation.

Care Management has 60 vehicles between two locations. Care managers arrange their client visit schedule and do any routing, using readily available tools (i.e., Google Maps). Each day is a unique combination of stops.

2.6 Mobile Phlebotomy Site Visit: October 19, 2018

Mobile phlebotomists visit home-bound patients to collect samples for processing by ACM Labs. At the beginning of their day, each mobile phlebotomist gets a list of stops and sample labels. They visit patients, make the draw/collections, and then move on to the next patient. At the end of the day, they visit an ACM lab to drop off the samples. Mobile phlebotomists start and end their day at the Kings Highway location in Rochester, NY. Each day is a unique combination of stops.

ACM Labs' MP unit has 19 vehicles outfitted with centrifuges for processing samples. Daily routes are planned by a third-shift scheduler, who typically assigns a driver to the same set of zip codes each day. The scheduler uses RoadNet for planning routes. Mobile phlebotomists pickup routes, sample labels, and supplies at the start of each day.

2.7 Activity of Rochester Regional Health's Courier Service

RRH manages four distinct fleets of vehicles. Sample data for one of these, RRH Couriers, is presented below within two tables. Table 1 shows the scheduled and on-demand driving per driver for one month (October 2018). The first column indicates the driver number, the second column indicates the number of scheduled weekly stops, and the subsequent columns indicate the number of on-demand stops.

Table 1. Scheduled Weekly and On-Demand Driving

Driver	Standard Stops/Week	On-demand Stops/Week			
		1-Oct	8-Oct	15-Oct	22-Oct
1	80	9	16	9	8
2	99	2	3	3	2
3	46	3	5	5	6
4	80	7	8	1	1
5	161	1	3	1	1
6	116	8	12	5	3
7	80	4	2	1	0
8	130	1	1	2	1
Total	792	35	50	27	22

Table 2 illustrates on-demand fleet activities by showing the number of daily on-demand stops handled by internal and external, third-party resources for the same month.

Table 2: On-Demand Stops—October 2018

Daily	Internal	External
Average	6.4	20.6
Min	1.0	11.0
Max	16.0	32.0

This level of visibility was enabled by RRH’s installation of Azuga tracking devices. During the course of this project, RRH greatly expanded vehicle tracking within this sub-fleet. Maps in the figures below depict Driver 3 stops; Figure 1 is the scheduled stops per day, Figure 2 is a sample of one week’s additional on-demand stops. This data was provided by RRH in a spreadsheet format, and RIT used Python scientific ecosystem for data analysis (Pandas [3], NumPy [4], Matplotlib [5], and Jupyter Notebooks [6]).

Figure 1. Driver 3—Scheduled Stop Locations

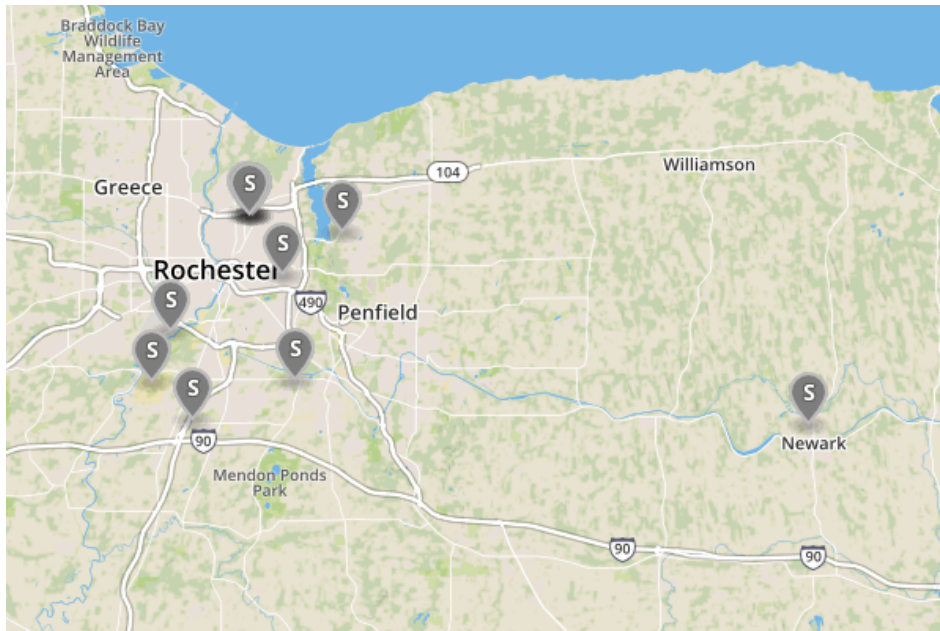
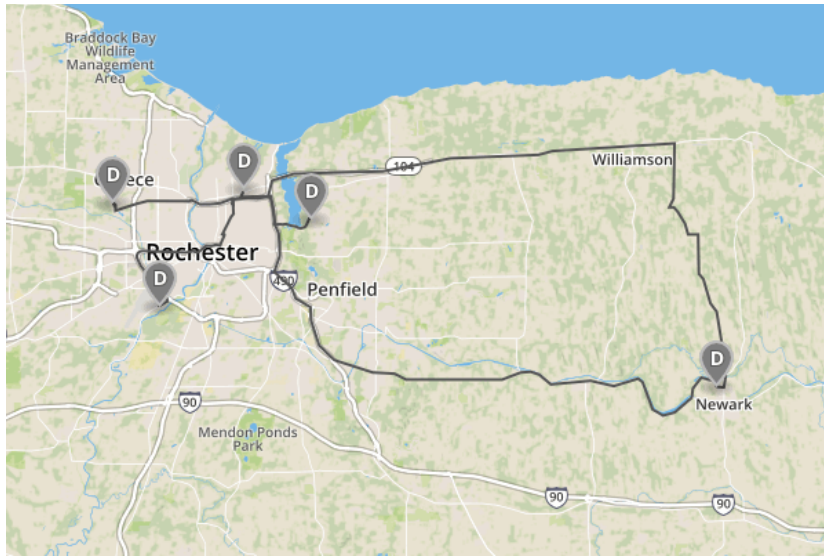


Figure 2. Driver 3—On-Demand Routes for One Week



2.8 Findings from Site Visits

RIT consolidated the site visit findings into a presentation for review and discussion with the project’s core group. The data were categorized to facilitate comparisons between business units.

Table 3. Operation Comparisons

	ACM Labs	Care Management	ElderOne	Mobile Phlebotomy	RRH Couriers
Description	Collection of samples and delivery to labs.	Providing transportation and consoling to social services clients.	Providing transportation of elderly to day care centers and doctor appointments.	In home collection of blood and other bodily samples.	Transportation of physical objects between RRH facilities.
Stops	Sequential points repeated for weeks. Occasional on demands. Territory based.	Each day different. Based on case assignments.	Multi pickup/drop off. Each day different.	Each day different. Territory based.	Sequential points repeated for weeks. On demands. Territory based.
Time Constraints	Stats. Sample processing time limit.	Client Appointments	Doctor Appointments	Fasting patients first.	Stats
Outsourcing	Occasional Stats	None	Medical Motor Services manages for RRH. Lots, 2+ minibuses	None	Lots, most on demand. ElderOne care deliveries.

Table 3 compares the operations of the sub-fleets. ACM Labs and RRH couriers have very similar routing and planning, while ACM Labs' MP unit and ElderOne have some similar operational processes. Care Management unit has little in common with the other fleets.

Functional requirements were summarized and organized by sub-fleets. For example, product tracking is considered to be an important requirement for some groups, but not for all, as shown in Table 4.

RIT determined that MP's opportunity for automation of their processes is software integration between their laboratory information system (LIS) and route planning software. In addition, equipping the phlebotomists with portable printers has the potential to reduce driving, because currently, the daily updates require the dispatcher to meet with drivers to provide them with newly generated (i.e., printed) paperwork.

The Care Manager group is very different than the others, because the key requirement of this group is to maximize flexibility and accessibility to patient care, and because they use their vehicles considerably less. Their operations do not lend themselves to fleet management. However, RIT observed that the reduced vehicle usage can be exploited to equalize usage across sub-fleets by rotating the vehicles among the groups. Consequently, during the performance period of the project, RRH decided to harmonize their sub-fleets across the groups, whenever possible, which facilitates vehicle rotation among sub-fleets.

Table 4. Product Tracking

	ACM Labs	Care Management	ElderOne	Mobile Phlebotomy	RGH Couriers
What	Bodily Samples	Care Manager and Client	Elderly	Bodily Samples	Physical Items like lab equipment, medical and office supplies.
Packaging	Boxed/Bagged and tagged with LIS codes. Refrigeration requirements.	None	Some with wheelchairs and walkers.	Bagged and tagged with LIS codes. Refrigeration requirements.	Varies
Current	No tracking of samples. Signoff transfer of red boxes.	None	None	None	Some items with identification codes. COC for Gov forms and money.
Required	Check in/out of samples at box or individual.	None	None	Check in/out of samples.	Chain of Custody paperwork.
Desired	LIS integration for sorting of samples for particular destination and temps	None	None	LIS integration for sorting of samples for particular destination and temps	Check in/out pickups.

The identified metrics, distilled during site visits, are listed in Table 5.

Table 5. Fleet Metrics

	ACM Labs	Care Management	ElderOne	Mobile Phlebotomy	RGH Couriers
Current	MIA samples, stops/day, accidents.	None	Outsourcing cost.	Speeding, hard brakes.	Stops/month, Outsourcing costs.
Required	MIA samples, stops/day, accidents.	None	Outsourcing cost.	Speeding, hard brakes.	Stops/month, Outsourcing costs. Gas/ideal times/unnecessary trips.
Recommended	Sustainability				

2.9 Study Group Consolidation

After analysis and discussion with RRH principals, the group decided to constrain the project to just ACM Labs, ACM Labs’ MP unit, and RRH couriers. The reasoning is that ElderOne was managed by a third party that RRH contracted to run ElderOne’s transportation network, and that Care Management trips were erratically scheduled as care managers set up meetings with clients on an ad hoc basis.

The study group already uses some common tools. Azuga is installed on most of the vehicles to get a discount on insurance. Azuga is a cloud-based driver monitoring tool that has a telematics module installed in each vehicle to report vehicles position, speed, hard stops, and idling. Additionally, RRH relies on Enterprise Fleet Management for tracking vehicle maintenance and repairs.

2.10 Reaching Out to Peers

The evaluation process included reaching out to other large hospital systems to learn about their approaches to transportation planning and diverse fleet management. This evaluation was particularly focused on automation and existing software solutions employed for transportation planning and fleet management.

2.10.1 Exploring Transportation Best Practices with Columbia University

Shortly after project kick-off, New York State Energy Research and Development Authority (NYSERDA) provided contacts to two directors of transportation at Columbia University, an institution with a combination of education and hospital facilities. RIT’s team developed a short list of questions that the two managers kindly answered. Through these questions, it was discovered that Columbia University

outsources a lot of their transportation and only has a small fleet of security and maintenance vehicles. Thus, the information that could be gleaned for this project was limited. The most useful information discovered was a website¹ that evaluates the environmental efficiency of vehicles. This site could be a useful guide when replacing fleet vehicles.

2.10.2 Benchmark Meeting with Baystate Health

RRH staff contacted a peer healthcare provider, Baystate Health located in Springfield, MA, and held a conference call to discuss the tools that this provider uses for managing their fleet and planning transportation. The contact described the vehicles using the transportation management system, revealing a close match to RRH's Courier group. They also discussed the recent acquisition of the system and the selection process used. Baystate Health chose GEOTAB,² a provider of vehicle tracking and status hardware, as well as web-based dashboard and analytics software. The system is similar to Azuga, which RRH is currently using. Baystate Health is actively using the data stream for tracking vehicles and driver performance. They have been using the system to help reduce overlap of vehicle routes and to utilize other vehicles for on-demand movement of materials. Baystate Health is engaging a third-party geo-analysis company to work with its first-year data to develop optimized routes. While Baystate Health is very excited about their new capabilities, at this time, they could not yet point to any specific metrics that improved since they started using the system. In addition, they assessed that the transition requires a commitment and a period of adaptation to new processes.

2.11 Metrics and Data Analysis

This section describes efforts towards establishing the fleet performance. In order to compare and assess potential benefits of fleet trip planning automation and vehicle tracking, it is critical to establish the baseline performance. Because of the disparity of needs and characteristics, the team struggled with developing a set of metrics that can be shared across the different sub-fleets. The discussion on metrics and data analysis of tracked vehicles is described in turn.

¹ <https://greencars.org/>

² <http://www.geotab.com>

2.11.1 Metrics

As indicated in Table 5 above, the metrics differ among groups and were not directly aligned with sustainability and related economics. Meeting with Baystate Health, described in the previous paragraph, revealed that this situation is not uncommon in hospital fleets. Brainstorming on how to define a set of unified metrics applicable across the fleets was made a part of every team meeting.

The discussions were productive and identified difficulties associated with the selection of the functional unit. In general, the functional unit is defined by the service provided, the system examined, and further shaped by the goal of the study [7]. It is an essential part of the definition to properly set the scale of the functional unit: for example, a functional unit can be fuel consumed per mile, or per stop service, or number of deliveries. These metric candidates would readily translate to environmental performance, such as greenhouse gas (GHG) emissions (e.g., GHG/gallon) [8], as well as economic cost (e.g., \$/gallon). However, it was challenging to arrive at the normalization that would be reasonable across sub-fleets: some sub-fleets (e.g., ACM) had many stops, with short bursts of driving, whereas others (Couriers services) included long drives. Normalizing per mile would make performance of Courier Services look better than ACM, while normalizing per stop would make the metrics comparison unfair to Courier Services. It was determined that the best strategy would be to encourage individual fleets to strive to improve standard fuel efficiency metrics, discussed in the next section, and to underline that metric comparisons across sub-fleets would not be appropriate.

2.11.2 Data Analysis

Installation of Azuga trackers on many vehicles across the fleet enabled initial baselining of performance. The performance metrics from the analyses below served as the baseline and enable the comparisons when the fleet management software is put into service.

RRH provided the data as a set of files, which RIT organized in a Microsoft SQL database “RRH Couriers”, with three tables: RRH Couriers.FuelData (66 columns and 10,431 rows), RRH Couriers.Trips (25 columns and 16,978 rows) and RRH Couriers.AzugaVehicle2VIN (3 columns and 136 rows).

The RRH Couriers.FuelData table, illustrated by a few representative rows and columns in Table 6, stores critical usage information: fuel usage and cost, cumulative mileage, and associated fuel economy. In addition, the table includes the vehicle description and the sub-fleet/department membership.

Table 6. Selected Rows (out of 10,431) and Columns (out of 66) from FuelData Database Table

Time	Units	Unit Cost	Total Fuel Cost	Merchant Brand	Current Odometer	Previous Odometer	Distance Driven	Fuel Economy	Cost Per Dist.	Vehicle Description	Department
45:00.0	5.703	2.898	16.53	Exxonmobil	29460	29298	162	28.41	0.102	2018 CHEV EQUINOX	Logistics 350
47:00.0	10.424	2.759	28.76	SUNOCO COMPANY	82610	82394	216	20.72	0.133	2016 JEEP PATRIOT	HB Phlebotomy 351
18:08.0	9.467	2.429	23	SPEEDWAY LLC	250751	250587	164	17.32	0.14	JEEP PATRIOT	HB Phlebotomy 351
42:00.0	10.952	2.899	31.75	Exxonmobil	77626	77391	235	21.46	0.135	2016 JEEP PATRIOT	Logistics 350
03:58.0	11.148	2.639	29.42	SPEEDWAY LLC	67844	67646	198	17.76	0.149	2016 JEEP PATRIOT	Logistics 350

Selected rows and columns of the RRH Couriers.Trips table are shown in Table 7. This table contains trip details: departing and arriving addresses, ignition on and off timestamps, together with associated distances traveled, and some statistics on driver’s metrics related to speeding and idling.

Table 7. Selected Rows (out of 16,978) and Columns (out of 25) from Trips Database Table

Vehicle	Ignition On	Depart	ignition Off	Arrive	Drive Time	Dist. Travel	Stop Time	Idle Time	Idle	Max Speed MPH	Avg Speed MPH
JCC6007 - ESCAPE	Jan-01-2019, 08:46 AM EST	1425 Portland Ave, Rochester, NY 14621, USA	Jan-01-2019, 08:52 AM EST	1425 Portland Ave, Rochester, NY 14621, USA	5m 25s	0.5	23m 12s	2m 27s	45.23	26	11
JCC6007 - ESCAPE	Jan-01-2019, 09:15 AM EST	1335 Rochester General Hospital Dr, Rochester, NY 14621, USA	Jan-01-2019, 09:28 AM EST	Rochester General Hospital Dr, Rochester, NY, 14621, USA	12m 46s	2.24	2m 22s	3m 46s	29.5	47	15
JCC6007 - ESCAPE	Jan-01-2019, 09:30 AM EST	1425 Portland Ave, Rochester, NY 14621, USA	Jan-01-2019, 10:17 AM EST	1425 Portland Ave, Rochester, NY 14621, USA	47m	18.89	21m 48s	13m 27s	28.62	67	34
JCC6007 - ESCAPE	Jan-01-2019, 10:39 AM EST	1425 Portland Ave, Rochester, NY 14621, USA	Jan-01-2019, 10:55 AM EST	1425 Portland Ave, Rochester, NY 14621, USA	16m 21s	2.8	15m 13s	6m 8s	37.51	48	16
JCC6007 - ESCAPE	Jan-01-2019, 11:10 AM EST	1425 Portland Ave, Rochester, NY 14621, USA	Jan-01-2019, 11:41 AM EST	Rochester General Hospital, Rochester, NY, 14621, USA	30m 11s	2.24	25m 14s	17m 59s	59.58	22	11

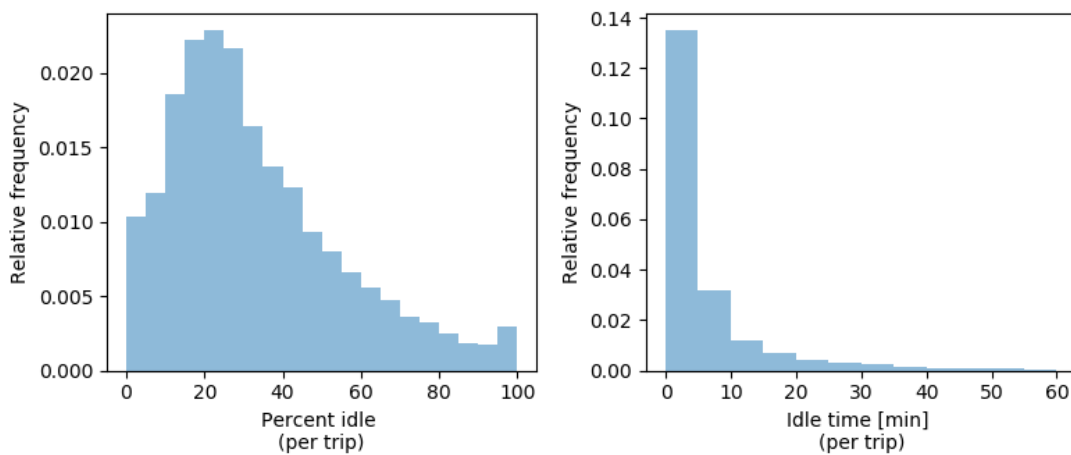
Finally, Table 8 shows a few rows of RRH Couriers.AzugaVehicle2VIN, which contains group membership of installed Azuga tracker devices.

Table 8. Selected Rows of AzugaVehicle2VIN Database Tables

Vehicle	Group	VIN
303	SECURITY	1FM5K8D82JGA12704
6110761084	Default Group	2G1WB57N891270218
6110761085	Default Group	1FTYE1ZM2GKB10966
6110761088	Default Group	2D4RN4DE9AR426995
6110761099	Default Group	1FA6P0G79F5103475

The data in the database was used to assess the fleet performance as a whole. Figure 3 shows the histograms associated with idling across all instrumented vehicles. The histogram on the left shows how much the vehicle idled per trip expressed as percent duration of the trip, and the histogram on the right shows the same data expressed in units of time. The histograms are scaled so that the total area under the histogram curve equals one, giving the y-labels the units of relative frequency. It is clear from both graphs that there is an opportunity to improve environmental performance and reduce cost by reducing idling. According to the United States Department of Energy,³ even small changes in idling time can lead to noticeable benefits, including cost savings, less pollution, and reduced noise. Researchers are exploring public attitudes towards fines for idling longer than three minutes [9]. The RRH fleet currently, before the effects of monitoring have been introduced, is idling longer than five minutes about 86% of the time.

Figure 3. Idling Across the Entire Fleet

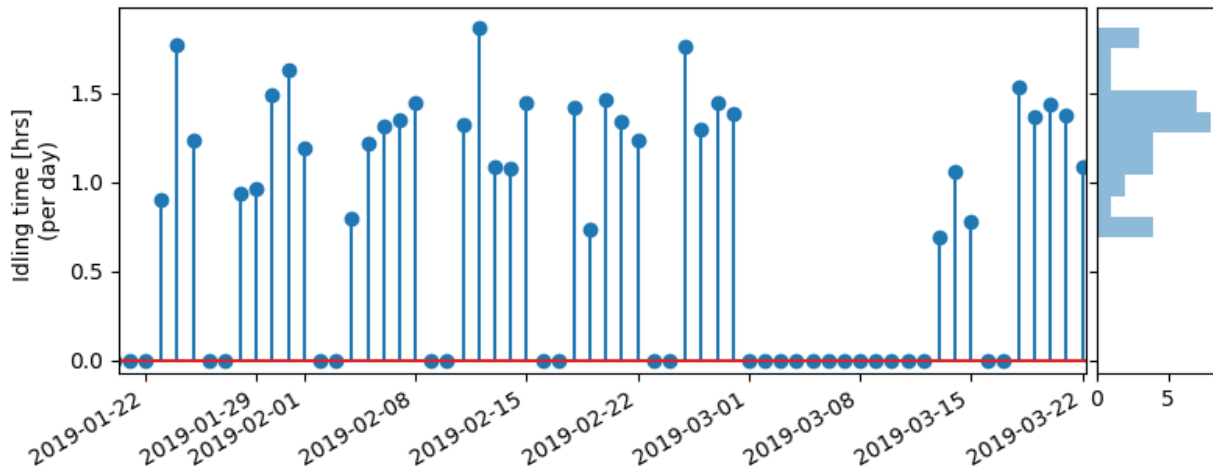


Another way to view the idling is by sub-fleet over time. Figure 4 shows idling of the Courier Services sub-fleet over time. Ability to observe the usage for a brief period seem to have produced a moderate reduction in waste associated with idling. Idling loss for a typical vehicle is on the order of 0.2 gallons/hour. Thus, with an assumed fuel cost of \$2.50/gallon, this idling results in about

³ https://afdc.energy.gov/conserve/idle_reduction_basics.html

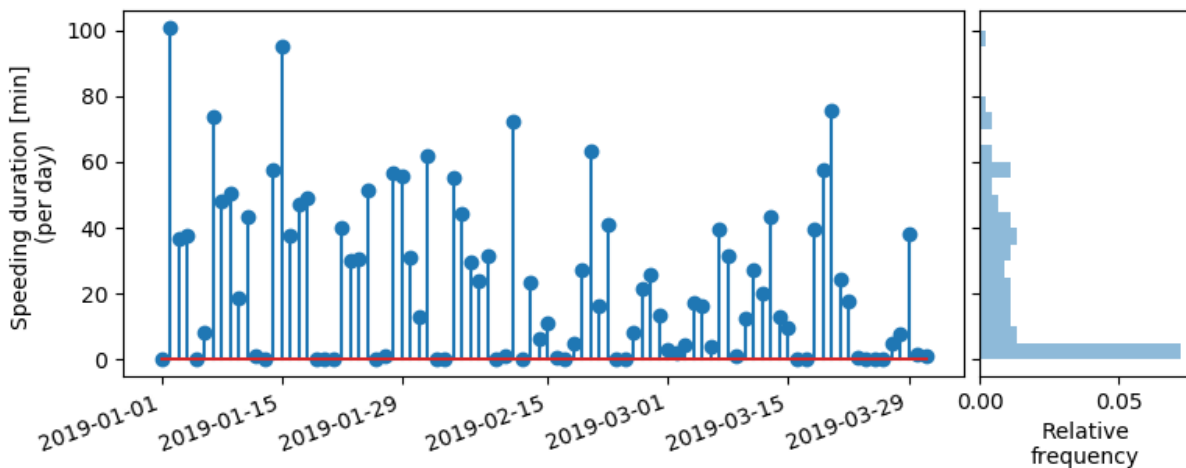
\$0.50 of economic loss and releases 20 pounds of carbon dioxide (CO₂) in the atmosphere⁴ per hour. The CO₂ estimate release was based on the Greet model by Argonne Laboratory, which provides comprehensive estimates for all GHGs [10, 11].

Figure 4. Idling of Courier Services Sub-Fleet Over Time



Similar to idling, speeding duration is one of the commonly used metrics in assessing fleet performance. Overall, the data suggests a mild downward trend in speeding duration, as shown in Figure 5.

Figure 5. Speeding Duration Over Time for the Entire Fleet

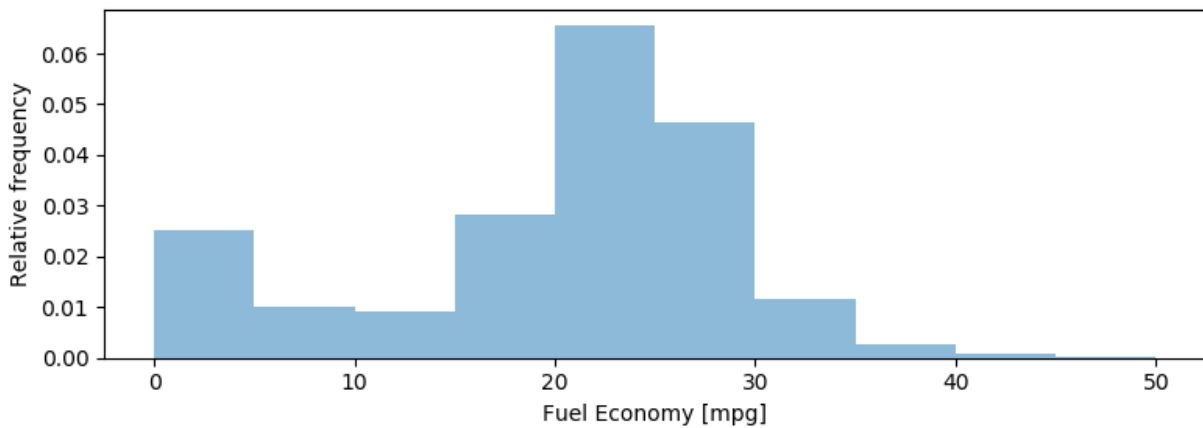


⁴ https://www.fueleconomy.gov/feg/contentIncludes/co2_inc.htm

Azuga trackers unlock the possibility to provide feedback to fleet managers and drivers. This feedback has a great potential for future improvement of the environmental performance of the fleet: Gonder *et. al* [12] examined the effect of improving fuel economy by pushing the limits of driver behavior by eliminating stop-and-go driving, unnecessary idling, adjusting acceleration rates, and cruising speeds to ideal levels and found that even without changing the vehicle powertrain, such extreme adjustments result in dramatic fuel savings of over 30%. Different studies, however, reported mixed results in the effectiveness of feedback to improving driver's eco performance in practice, especially related to speeding [13-16].

The fuel economy of the overall hospital fleet during the early observations is shown in Figure 6. There is considerable variability due to differences in routes and vehicles.

Figure 6. Overall Fleet Fuel Economy in the Early Observation Period



This section briefly introduced a subset of commonly employed metrics in fleet management, based on data obtained using the devices installed during the project performance period. The baseline information can serve to improve the data in the future.

3 Requirements Development

The feature requirements collected during the data-gathering phase were consolidated and added to a worksheet for ranking by RRH personnel (see Figure 7). Some of the features were based on existing tools, some were raised as sources of process problems, and others were noted as items desired for future use. The worksheet was sent out as pre-work to all project stakeholders before a workshop designed to rank features. At the July 24th workshop, each feature was reviewed, and any ranking differences were discussed.

Figure 7. Sample of Requirements Ranking Worksheet

Ranking	Value	Features	Notes/Comments
0 to 5	\$/mo	Scheduling	
		Planning of a route. Routes can be planned on a daily basis or static for weeks/months at a time.	
		1. Sources of Stops	
		a. Standing reoccurring weekly stops	
		b. Interface to On Demand request for future pickups.	
		i. Scheduler entering customer calls for future pickup.	
		ii. RRH request web form.	
		iii. ACM request web form.	
		c. Input list of stops from patient scheduling software.	
		i. File upload of CSV/spreadsheet.	
		ii. PDF	
		2. Stop can have more than one pickup at location. i.e. building with multiple departments.	
		3. Time per Stop Categories - A stop type has a time allocation for planning.	
		a. Multi-pickup at same location can get a shorter stop time allocation.	
		4. Reoccurring Weekly Schedules	
		a. Run has optional stops on certain days of week or day of month	
		b. Tie to On Demand request system to indicate required on demand stop.	
		i. Some stops are dependent on customer calling into system and making request.	
		5. Daily run planning	
		a. Grouping of stops by geographic area or zip.	
		b. Assignment of driver	
		i. Drivers pre-assigned geographic territory.	
		6. Territory analysis and planning	
		a. Ability to pull historic stop information to feed optimization.	
		7. Stop load leveling	
		a. Ensure drivers do not get overloaded.	
		b. Can handle part time and full time drivers.	
		Dispatch	
		Handling on demand request from customer. Visualization of driver location, completed and remaining stops.	

The team leaders completed the feature-ranking form and submitted it to RIT, whose staff then consolidated the rankings, values, and comments as illustrated in a sample provided below in Figure 8. The full consolidated results are provided in appendix C of this report.

Figure 8. Sample of Consolidated Feature Ranking

ACS 0 to 5	ACS \$/mo	RRH 0 to 5	RRH \$/mo	MP 0 to 5	MP \$/mo	Ranking 0 to 5	Value \$/mo	Features	Notes/Comments
								Dispatch Handling on demand request from customer. Visualization of driver location, completed and remaining stops.	
4	1080			0	N/A		1080	1. Ability for customer request to appear in system - Interface for either customer to directly enter request or an	
4	1080	5		0	N/A		1080	2. Semi-automated queuing of on demand for driver.	ACS:Takes the "thinking" off dispat
5		5		0	N/A			a. Find closest.	ACS:Great for stats
5		5		0	N/A			b. Time window for pickup	ACS:Many offices lock doors,etc
5	720	5		0	N/A		720	3. Assign on demand to driver or 3rd party.	
5		5		0	N/A			a. Specific time or place in stop list.	
5		5		0	N/A			b. Automatic assignment.	
5		5		5				4. Display list of vehicle/driver stops and route	ACS:We have Azuga GPS currently -
5		5						a. List driver completed stops, current/next stop, and in	
5		5						b. Time estimate for arrival of incomplete stops.	
4		4		5				5. Map view of groups drivers/vehicles.	ACS:We have Azuga GPS currently -
4		4						a. Vehicle ID, assigned driver, Position	ACS:We have Azuga GPS currently -
2		3		5				6. Geo-fencing of vehicles	
1		3						a. Alert dispatch if vehicle is outside of geo-fence.	

On July 24, 2019, a workshop was held at RRH with the full project team, including both the supervisors of the sub-fleets and operational subject-matter experts (SMEs), to review the requirements and determine any need for additional features. In attendance were ACM Labs (manager and dispatch SME), ACM Labs' MP unit (manager, dispatcher, and phlebotomist), RRH couriers (manager), plus two corporate-level managers from RRH. During the workshop, the team reviewed the desired and required features in detail and provided preliminary ranking of the requirements. This was the first time that the project's extended group met in person. After the meeting, the input of the group was used to update the feature list, remove some items, and boost the importance of others.

Figure 9. Sample of Assessment Scorecard

RRH-RIT Transportation Software Assessment Scorecard

Introductory Statement:
 We are assessing different transportation software packages to meet the needs of large hospital system in Rochester NY. Organization has 3 business units with about 80 vehicles.
 The package will be used by:

- Hospital Couriers that move hospital supplies between set of stops predominately on a fixed schedule, with random on demand requests.
- Lab Couriers with medical samples that need to go to different lab depots with time sensitive and tracking requirements
- Home Visit Technicians that need to visit patient's homes, collect samples and drop off at different lab depots. Samples are tracked and are time sensitive. Each day is different set of stops.

Features listed below came from a discovery process looking at current processes and needs.

Existing business operations systems

- Lab Information System (LIS) - details on specimens, test and results.
- Patient specimen collection schedule. Patient address, what/when to collect. LIS reference numbers.
- Vehicle tracking and driver score card (for insurance company) by Azuga
- Vehicle Maintenance tracking provided by Enterprise
- Home grown on demand web based request system.
- Hourly employees time tracking system.

Has Feature	Scheduling/Routing
	Sources of pick ups
	User interface
	List of prior delivery addresses. Limited to business group.
	File Upload i.e. spreadsheet from external system with today's stops.
	API for external system to send stop request.

The refined feature list was simplified, as shown in Figure 9 (the complete listing is provided in appendix D), and was sent to each of the software vendors most likely to be contracted, providing background on the organization and highlighting the features required. Since most packages had the features desired, the next step was to learn how well they are implemented in each platform.

4 Commercial Software Selection

Finding the best set of packages for a detailed evaluation was a three-step process. First, a broad search for transportation packages was completed. Second, a down-selecting activity based on the features listed on the vendors' websites was performed, along with creating a short list of 10 packages ranked in order of ability to meet feature requirements. Third, the shortlist was reviewed, and three vendors were selected for demonstrations.

4.1 Broad Search

To collect information on existing solutions, the RIT team conducted internet searches using initial search terms like "courier routing scheduling" and "bus routing scheduling." The search results were investigated, and information for valid companies with a current product offering was added to an assessment spreadsheet (See Table 9). As requirements were gathered from RRH, RIT further refined the list of software packages with a comparison matrix. The assessment spreadsheet grew to 67 perspective vendors with transportation software packages.

Table 9. A Snippet from the Existing Solutions Spreadsheet

Vendor	Product	Link	Major Features	Notes	Possible Solution
Breath King LLC	Real Time GPS	https://realtimegps.us/	Task Management Connect ERP Scheduling Driver Management Routing	Provider for rebranding	Partial
Vantiq Corporation	Vantiq	https://vantiq.com/vantiq-use-cases/real-time-fleet-management/	Vehicle tracking Auto assignment Shipment tracking/signoff		Partial
TruxTrax, Inc.	TruxTrax	https://www.truxtrax.com/real-time-tools/	Vehicle Tracking Communication Alerts and Reminders		Partial
Geotab GPS	GPS to GO	https://www.gpstogo.com/fleet-tracking/real-time-gps/	Vehicle Tracking Basic Route Planning.		Partial
iTRAK	iTRAK	https://www.itrak.com/EN/	Vehicle Tracking Remote codes		Partial
Rhino	Rhino Fleet Tracking Systems	http://www.rhinofleettracking.com/gps-fleet-tracking/	Vehicle Tracking		Partial

Table 9 continued

Vendor	Product	Link	Major Features	Notes	Possible Solution
Global Resource Group	GRG Fleet Solutions	https://www.grggps.com/	Driver Safety Productivity Fleet Optimizations Expandability Compliance GPS Hardware	Plug in module. Similar to existing.	Partial
Safety Track	ServicePlus	https://www.safetytrack.net/	Vehicle Tracking and Video Monitoring	No	
NexTraq	NexTraq	https://www.nextraq.com/	Vehicle Tracking Driver Behavior Maintenance Tracking Routing Dispatching Driver Management Fuel Management Geofencing	Full featured package. List Transportation as a sector.	Yes

4.2 Down Selection

The data-gathering and requirements-development phases established RRH’s baseline needs, enabling quick assessment of the major features provided by each software vendor. The assessment revealed that most packages only support one or two major features. As part of the down selection, RIT staff reviewed software review websites, visited vendor websites, read general articles, and watched YouTube videos. RIT staff also considered the public-facing content (i.e., support documents, blogs, and articles) that each vendor published. With this information, they generated a short list of packages, as shown in Table 10, for review by the extended group.

Table 10. Short List of Candidate Packages

Vendor, State	Major Features	Notes
NexTraq, GA https://www.nextraq.com/	Vehicle Tracking/Driver Behavior/Maintenance Tracking/Dispatching/Driver Management/Fuel Management Geo-fencing	Full featured package. List Transportation as a sector.
Bringg, IL https://www.bringg.com	Dispatch/Dispatching/Driver Application/Package Tracking/Warehouse	Courier and health care industries.
Samsara, CA https://www.samsara.com/	Dispatch Management/Driver Management/Fuel Management/Maintenance Tracking/Dispatching/Vehicle Tracking	
Silent Passenger, NY http://info.silentpassenger.com/	Dispatch Management/Driver Management Fuel Management/Maintenance Scheduling/Maintenance Tracking/Dispatching/Vehicle Tracking	Delivery and transportation industries.
Prism Virtual Software, NY www.prismvs.com	Dispatching/Dispatch service request (on demand)	
Route Optix, ON, Canada www.routeoptix.com	Dispatching/Dispatch/driver application service requests (on demand)	Targets service industry.
RoutingBox, NY www.routingbox.com	Dispatching/Dispatch/Tracking/Billing	Targets medical transport.
C2Logix, FL www.c2logix.com	Dispatching/Dispatch driver application	
TrackRoad, VA www.trackroad.com	Dispatching/Dispatch driver application	

4.3 Shortlist Review

During the July 24, 2019 workshop, RIT staff reviewed the short list of potential vendors and discussed the top ranked. One vendor was dismissed as being cost prohibitive from a prior quote received by one of the team leaders. The group choose three likely vendors for RIT to approach:

- NexTraq⁵
- Samsara⁶
- Silent Passenger⁷

The next step was to work with the vendors to understand their ability to meet the high-value needs identified in the workshop.

⁵ <https://www.nextraq.com/>

⁶ <https://www.samsara.com/>

⁷ <http://info.silentpassenger.com/>

5 Demonstrations

RIT contacted the three vendors selected and provided an initial briefing on the needs of RRH. RIT coordinated demonstrations of the software with the vendors and RRH team members. Prior to the demonstrations, RIT provided the vendors with a consolidated list of important features to ensure that each vendor would focus on RRH's needs.

During the demonstrations, RIT took screenshots and notes to use as follow-up documents (see appendix E). The first round of demonstrations also helped to start the process of refining the list of desired features down to the most critical. The demonstrations revealed that some features initially identified as critical have become a standard offering, such as a fleet map with traffic overlays. One vendor distinguished themselves by offering a weather overlay that was found to be a very valuable feature by the team, even though it was not part of the original list. During a follow-up meeting on September 9, 2019, the extended group reviewed the three products and could not eliminate any of the three vendors based on their software solution. However, concerns were expressed about the display of route status with a high frequency of stops and tools for optimized planning of routes that change daily. These became critical features for product assessment. For example, below are two screenshots that depict how the fleet is performing for the planned stops (Figure 10 and Figure 11).

Figure 10. Samsara Routes Status

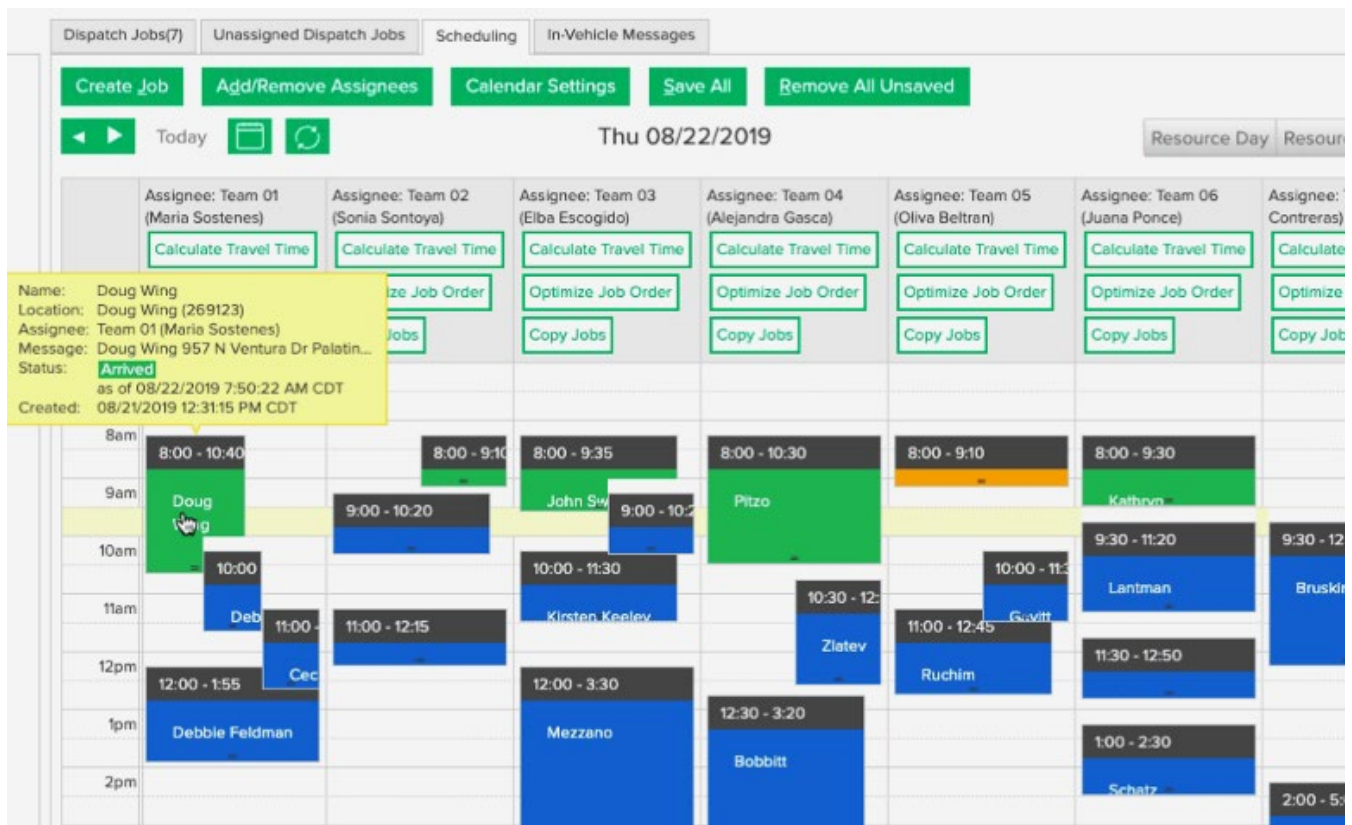
Overview Assets Drivers Dispatch **Routes** Proximity Reports Maintenance Drivers (Admin) Day ▾

All 114 Scheduled 20 **En Route 85** Completed 2

🔍 Search routes 85 routes from Aug 11, 2019 10:47

ASSIGNED TO	ROUTE	SCHEDULED START ▲	ROUTE TIMELINESS	CURRENT STATUS	CURRENT DESTINATION
144532 (Vehicle)	00317344-AU205	Aug 12, 2:45 AM	43m 16s late	ARR 10:43 AM	AT Hillside Restauran
217322 (Vehicle)	00317341-AU203	Aug 12, 2:45 AM	On time	ETA 10:43 AM	TO HealthTrust-Meth Ambulato
217325 (Vehicle)	00317346-AU202	Aug 12, 2:45 AM	32m 3s late	ARR 10:32 AM	AT La Cosecha
217326 (Vehicle)	00317347-AU206	Aug 12, 2:45 AM	21m 33s late	ETA 10:51 AM	TO Army RC - #2382i
220303 (Vehicle)	00317335-AU216	Aug 12, 2:45 AM	2h 43m late	ETA 12:43 PM	TO Omni Corpus Chri Bayfront
220303 (Vehicle)	00317343-AU208	Aug 12, 2:45 AM	57m 16s late	ETA 10:57 AM	TO Hyatt Hill Country S.A.

Figure 11. NexTraq Route Status



Both figures depict similar information, but at this point, were difficult to assess as the stop density and time requirements are not the same as RRH's.

The three vendors were sent information detailing the areas that are most challenging for the different business units. For example, one unit had slow-changing routes, but a single route could have up to a hundred stops. It may send out 36 drivers per day who make a total of 3,000 stops per day. Another unit, ACM MP, has routes that change daily with technicians that typically stay in a geographic area and become familiar to the patients they visit. These technicians have a time constraint on some of the stops (e.g., the fasting patients go first), so this unit's managers were most interested in the ease of uploading stops, the visibility of timing requirements, and having the ability to plan a route for a set of technicians that balanced stops between them.

One of the critical features mentioned above was the ability to optimize routes that change on a daily basis. Upon closer inspection of this requirement with each of the vendors, RIT staff realized that none of the three software packages support the level of complexity needed for this situation. One vendor,

Silent Passenger, suggested a demonstration with a partner company, Route4Me, which could handle the more complex routing requirements. Route4Me is a product that can intake a stop address, validate it, and optimize routes to it for a set of vehicles. The three vendors can optimize the path for one vehicle but cannot optimize for a set of vehicles. After looking at the capabilities of Route4Me, the group felt that it could also be used as a standalone package.

5.1 Realistic Data for Demonstrations

During product demonstrations, vendors usually rely on a prepared set of data that is geographically removed from Rochester, NY and not a good representation of the environment RRH works within. Focusing on ACM Labs' couriers and MP unit (as they have more complex routing requirements), the two groups provided sample data that could be used for routing demonstrations.

The ACM Labs couriers provided a single courier's route. The data had stop address (doctor offices, draw centers), contacts, and supporting notes and codes (31 stops and 12 columns of data). The MP unit dataset is more complex and changes daily. It has a patient's name and address information associated with the diagnostic, draw codes, and test codes—a total of 15 columns of data. MP provided two files, one of a typical day with 112 stops, and another for a busy day with 191 stops. The MP dataset was de-identified before the demonstrations.

5.2 Route4Me Demonstrations

Using the demonstration data mentioned above, Route4Me provided a demonstration to the ACM Labs courier unit on November 22, 2019. During the demonstration, the unit's representatives were interested in seeing how the stops were depicted on stop scheduling and status screens. They wanted to make sure that supporting notes and codes could be imported correctly and be made available to the drivers on the mobile application.

Route4Me provided a demonstration to the MP unit on December 12, 2019, using the demonstration data mentioned above. MP routers discussed their current process and how the Route4Me would fit into the data flow. Route4Me assumes drivers are all available for the same period of time when routing (i.e., constraining the maximum number of stops per driver). However, the MP unit's assignments for technicians are highly varied due to a large percentage of part-time staff. Route4Me did not have the capability to load a driver-availability table nor could it provide automated assignments for each driver.

6 Assessment and Requirements Gap Analysis

After the last round of demonstrations, the group met online on February 6, 2020 to review the four vendors and to discuss how well they each met the critical features criteria that the extended group had determined.

6.1 Feature Evaluation

RIT staff conducted a line-by-line evaluation of the features generated during the work described in section 5. A sample of the results are shown in Figure 12. (The complete sheet is provided in appendix F.) The Assessment column notes the factors that impacted the decision, and the Best Tool column denotes which vendor provides the best implementation of the feature. The Best Tool determination is somewhat subjective, since all the packages support the requirement; however, implementation was key. If all vendors had implementations that were equivalent, then the column was left blank. The same applies if none provided the feature.

Figure 12. Sample of Feature Evaluation Spreadsheet

Features	Assesment	Best Tool
Scheduling		
Planning of a route. Routes can be planned on a daily basis or static for weeks/months at a time.	Note: R4M = Route4Me, NT = NexTraq, SS = Samsara, SP = Silient Passanger	
1. Sources of Stops		
a. Standing reoccurring weekly stops	R4M and NexTraq could schedule stops into the feature.	NT
b. Interface to On Demand request for future pickups.	All had a dispatcher view to add stops.	R4M, NT
i. Scheduler entering customer calls for future pickup.	Manually schedule stop, drag/drop into run.	NT, R4M
ii. RRH request web form.	Via web service	
iii. ACM request web form.	Via web service	
c. Input list of stops from patient scheduling software.	Yes, but requires mapping column names.	R4M
i. File upload of CSV/spreadsheet.	Yes	
ii. PDF	No	
2. Stop can have more than one pickup at location. i.e. building with multiple departments	Yes, as distinct stops.	R4M, NT
3. Time per Stop Categories - A stop type has a time allocation for planning.	Can set time at a stop, but no categories.	-
a. Multi-pickup at same location can get a shorter stop time allocation.	Manually set as part of upload spreadsheet	-
4. Reoccurring Weekly Schedules		
a. Run has optional stops on certain days of week or day of month	All can schedule stops into the future, or can copy (Master) route . R4M is working on a feature to automate repeated routes.	R4M
b. Tie to On Demand request system to indicate required on demand stop.	Would need to custom program or use dispatcher to enter	

6.2 Commonalities

All four packages cover the basic requirements. They all import stops, make and schedule routes, and track vehicles and stop completions. All have dispatch screens to add on demand, and each provides reports and dashboards for management. None of the packages were designed for the hospital-courier industry, instead they were made for general transportation. All worked on laptops and tablets and used contemporary cloud-based, browser-based designs with no need for installing applications on PCs or software on RRH servers. The packages offer Android- and iPhone-ready driver applications and have an application programming interface (API) for interfacing to other systems.

6.3 Critical Requirements

During the demonstration certain features were brought up by the users as gaps that the products did not readily meet. These are summarized below.

- Daily routing (ACM Labs’ MP unit)—This unit needs flexibility to account for part-time workers, a large percentage of the staff, and zip-code territories, where drivers are assigned to a set of territories so they become familiar with patients and roads.
- Visualization of tightly scheduled stops (ACM Labs’ couriers)—ACM Labs have several routes that contain medical office parks, which have pickups within minutes of each other, such as different doctor offices in the same building.
- Adding on-demand (RRH couriers)—RRH is challenged when it comes to finding the closest courier to a new request that has available bandwidth and deciding when to outsource.

6.4 Vendor Information Comparison

Information regarding the four vendors considered is provided in Table 11. A cost comparison of their software package offering is provided in Table 12.

Table 11. Vendor Information for Comparison

	NexTraq	Route4Me	Samsara	Silent Passenger
Website	nextraq.com	route4me.com	samsara.com	silentpassenger.com
Headquarters	Atlanta, GA	Hackensack, NJ	San Francisco, CA	Commack, NY
Established	2000	2009	2015	2002
Company Size*	125		140	50
Annual Sales*	\$21M		\$155M	\$12M
YouTube Channel Videos	5	200	80	54
	Owned by Michelin NA			Vehicle Tracking Solutions

*Size/Sales data sourced from D&B Hoovers is always inaccurate for private companies.

Table 12. Vendor Cost Comparison

	NexTraq	Route4Me	Samsara	Silent Passenger
Cost Model	Flat \$19.95/mo/vehicle	3 Levels depending on sophistication of route planning	\$400/Year/Vehicle	Flat rate \$27.99/mo/vehicle + \$52/mo/user for Route4Me
Fleet Cost per month*	\$1616	\$3597	\$2700	\$2267 + \$4472
Hardware installation	\$0 (self-install)	\$0 (no hardware)	\$129/vehicle	Optional - \$75/vehicle
Vehicle Telematics	Included	Uses third-party (Azuga)	Included	Included
Source	Website/Rep	Website/Rep	Website	Quote
License Basis	Vehicles	Users	Vehicles	Vehicles + Users

* Cost is based on 81 vehicles and five dispatchers.

The assessment revealed that Route4Me supported the complex routing needs of the MP unit. It could also import the existing vehicle trackers from Azuga, making it a strong contender. NexTraq provided a comprehensive set of features at a very reasonable cost point.

6.5 Gaps and Possible Solutions

Based on the assessment, requirements gaps were identified and analyzed by the team. The gaps and possible solutions are provided below.

Gap

Daily routing for ACM Labs' MP unit: Handling part-time workers and zip code territories

Possible Solutions

Vendor: *Route4Me*

The route planner can manually split routes based on total run time to accommodate part-time workers with different start times and durations. With territories, Route4Me supports territories drawn on a map user interface (which would cover multiple zip codes). The vendor pointed out, however, that some inefficiencies would be experienced when using the auto balancing routes tools.

Vendor: *NexTraq, Samsara and Silent Passenger*

The dispatcher can manually lay out the routes (current process for ACM Labs).

Gap

Visualization of tightly scheduled stops for ACM Labs' couriers: Office park with pickups within minutes of each other.

Possible Solutions

No vendor had an ideal solution.

Vendor: *Route4Me* has “operation matrix” view, which shows the progress through the series of stops, but provides no information on the particular stop without going to another screen.

Vendor: *Samsara* has “progress bar” that is color coded. However, the user would need to click through to see information for particular stops.

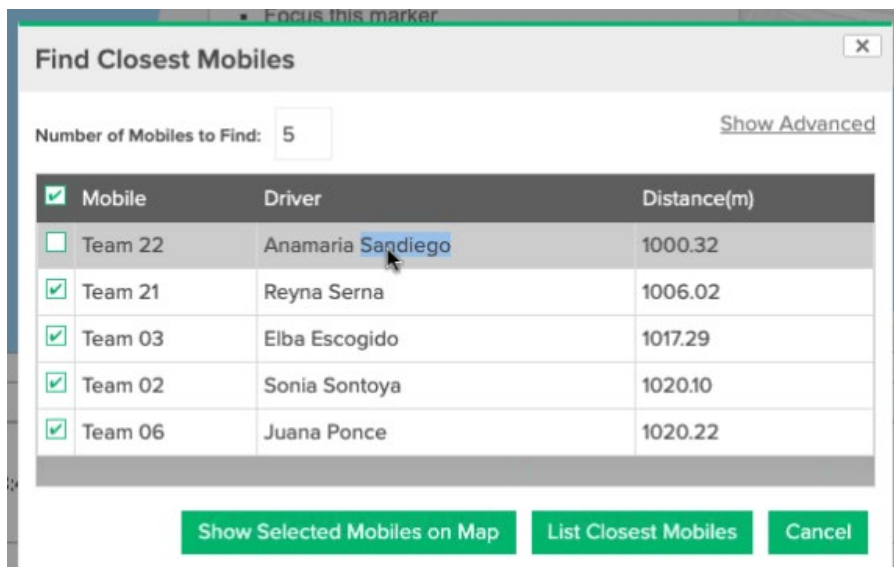
Gap

Adding on-demand feature for RRH couriers: Finding closest courier, deciding when to outsource.

Vendor: *NexTraq* has a program that located the closest cellphones to a stop, which will allow the dispatcher to quickly locate a driver (shown in Figure 13), but gives no indication that the person has bandwidth for picking up the on-demand work.

No vendors provided tools to model an outsourcing decision model.

Figure 13. Closest Cellphone



The screenshot shows a web application window titled "Find Closest Mobiles". At the top, there is a search bar with the text "Focus this marker" and a close button (X). Below the search bar, there is a label "Number of Mobiles to Find:" followed by a text input field containing the number "5". To the right of the input field is a link labeled "Show Advanced". Below this is a table with three columns: "Mobile", "Driver", and "Distance(m)". The table contains five rows of data. The first row is highlighted in grey and has a mouse cursor over the "Driver" cell. At the bottom of the window, there are three buttons: "Show Selected Mobiles on Map", "List Closest Mobiles", and "Cancel".

<input checked="" type="checkbox"/>	Mobile	Driver	Distance(m)
<input type="checkbox"/>	Team 22	Anamaria Sandiego	1000.32
<input checked="" type="checkbox"/>	Team 21	Reyna Serna	1006.02
<input checked="" type="checkbox"/>	Team 03	Elba Escogido	1017.29
<input checked="" type="checkbox"/>	Team 02	Sonia Sontoya	1020.10
<input checked="" type="checkbox"/>	Team 06	Juana Ponce	1020.22

7 Final Selection and Implementation Recommendations

While the RIT team can provide recommendations based on the information gathered throughout the project and analysis of product compatibility with RRH needs, ultimately, RRH is responsible for the final selection of the package and for preparing a business justification. Thus, the February 6, 2020 meeting served as a review of the final four packages and RIT's assessment on how well the different packages meet the required features.

During the meeting, the following options were presented to RRH staff:

- Full featured, top of the line: Samsara and Route4Me
 - Samsara has a very complete system, visually appealing and clear graphics, and the best on-board telematics system. Route4Me offers the best group routing solution. Samsara and Route4Me have pre-existing API integration. This is the most expensive combination.
- Sophisticated routing: Route4Me
 - RRH currently uses Azuga for vehicle tracking, a functionality not native to Route4Me. Route4Me does, however, have a pre-existing API integration to Azuga's position data via its application store. This solution would be a very complete tool for dispatchers and routers to use. Although, managers would still need to go to Azuga for driver reports and Enterprise for vehicle maintenance.
- Low cost and simple routing and dispatch: NexTraq
 - NexTraq is the most economical solution of the set. Its user interface is well designed, with distinctive iconography for discrete functions. Information panel fields are well spaced and easy to read. The native route planning is done vehicle by vehicle which does not support automating ACM MP route planning. The router has to assign stops to a route, and the software then optimizes the sequence of stops and provides turn-by-turn directions. NexTraq would require the addition of a second in-car telematics device if RRH continues to use Azuga, as NexTraq does not have an integration API with Azuga.

At the time of writing this report, ACM Labs and RRH couriers were pursuing the second option mentioned above. Working directly with Route4Me to do a trial and to develop the business justification. The disturbance caused by the COVID-19 virus will likely impact their timeline for doing trials and proceeding with implementation.

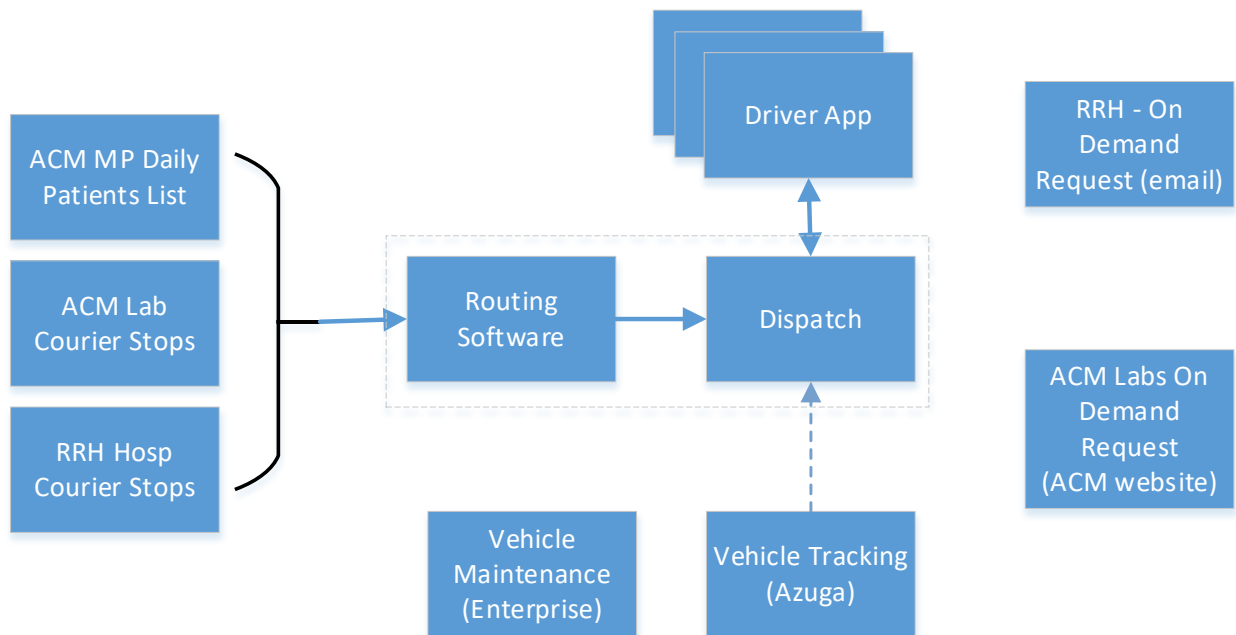
7.1 Architecture Approaches

Adding a new product into an already complex IT infrastructure can be challenging, especially when it is cross-departmental. All four vendors under consideration support APIs to speed up the integration process if RRH chooses to have programmatic interfaces for their on-demand and laboratory information system (e.g., for tracking medical samples). The designs below depict two approaches for implementing the new software into RRH's IT infrastructure, single system and data hub.

7.1.1 Single-System Approach

Currently RRH uses Azuga for vehicle tracking, and ACM Labs' MP unit has RoadNet for route planning. ACM Labs and RRH couriers use spreadsheets for route planning. Figure 14, below, depicts how a single package used by all three groups would be architected with all the routers, dispatchers, and drivers using the same application. The on-demand requests would still be standalone inputs that can be entered into the transportation tool manually by the dispatchers. This approach is quickest to implement and leverages group training and cross-departmental coverage.

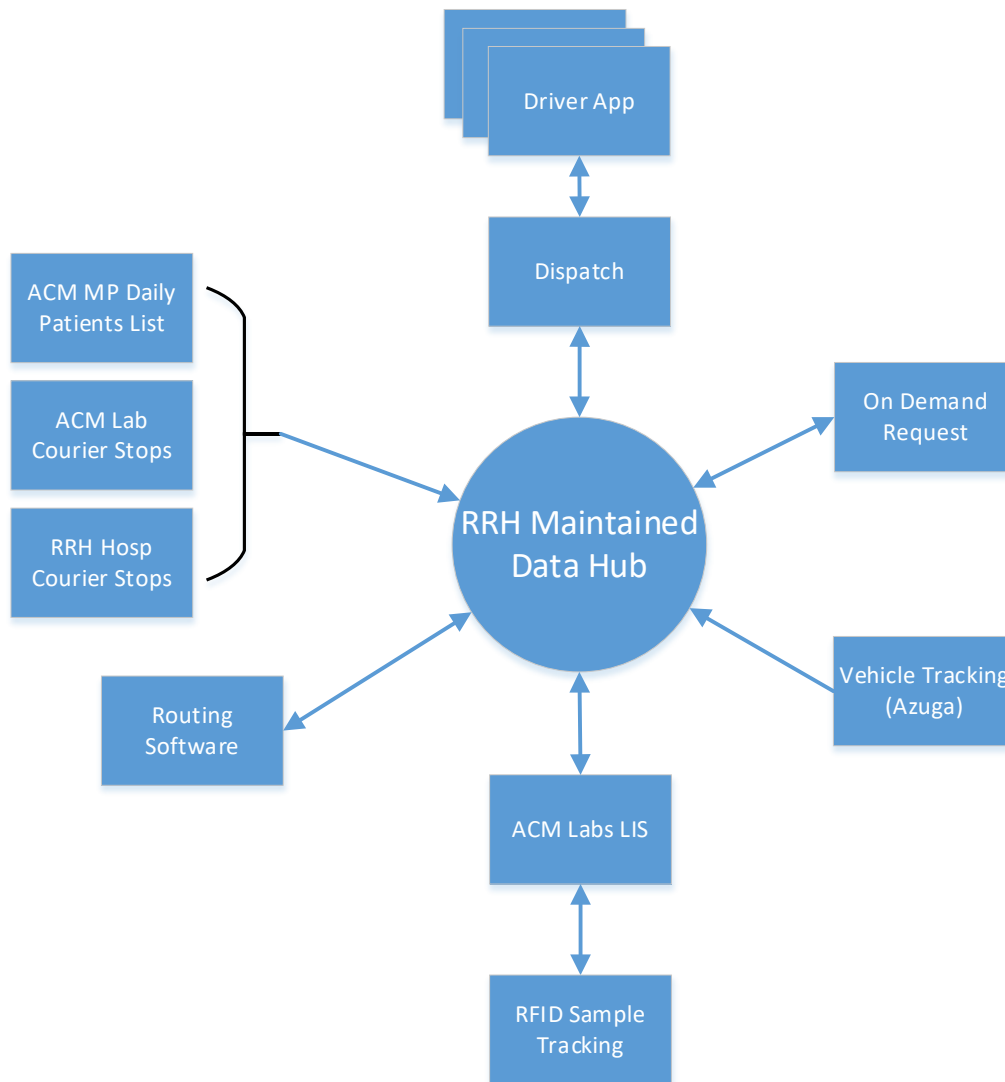
Figure 14. Single-System Architecture



7.1.2 Data Hub Approach

One of the challenges for large, integrated systems is making a change. When big businesses have applications that need to exchange information, it becomes a spider web of interconnectivity. Making the change out of any one system is very expensive as it impacts all the other systems. An approach to mitigating cost and complexity would be to create a central data hub that RRH can use to control all intersystem data, as shown in Figure 15. This approach has the advantage of allowing any one system to be changed out without impacting the others. A disadvantage is that it is a single point of failure and would shut down the entire system—although this could be mitigated by using server redundancy and failover technology.

Figure 15. Data Hub Architecture



8 Enhance Replicability Statewide

In order to make this process available to a wider set of organizations, RIT has developed a toolset that can be used to replicate the process outlined above. There are three tools:

1. A guide that outlines the process.
2. A set of feature questions developed during the project.
3. A list of potential transportation software vendors curated during the project.

These tools can be used as a starting point for an organization exploring transportation package options. The tools utilize data gathered during this project, with modifications from lessons learned.

Please see appendix G for the guidance document and Microsoft Excel spreadsheet, which provides the starter list of features, as well as the current list of vendor packages.

9 Project Challenges

The team faced challenges throughout the project, mainly due to constrained resources. RRH, like all health organizations, must put patients first. Thus, the time available to dedicate to improvement projects, such as a fleet optimization project, can quickly be consumed by more urgent demands. Partnership with an applied research organization, like RIT, can shift most of the work required to execute such a project, but practical knowledge of the end-users is essential to develop accurate criteria to identify feasible solutions. Consequently, the RRH team involvement in the project was critical. The solution was to be more flexible and adjust the planned work to accommodate RRH's availability as well as to push the project end date out so that all the critical inputs could be collected.

10 Conclusions

RIT partnered with RRH to assess its transportation needs with a goal to optimize its system using commercial software. The project began with the hypothesis that fleet redundancy could be addressed by consolidating stops and sharing functionality across the overlapping territories of RRH's transportation system. However, this approach proved untenable when the RIT researchers found that each fleet serves a unique purpose and requires different specialized driver skills and capabilities. Subsequently, the project was refocused with an objective to consolidate the array of tools used by different units to manage their individual transportation needs and realize any efficiencies possible through a suitable transportation software package. Through analysis of the units' current practices, an opportunity was identified to share vehicles between the units and rotate them periodically in order to equalize utilization, since some units use vehicles considerably less than others. More importantly, the team also found a considerable intersection within the set of software requirements for fleet management among all sub-fleets. RIT and RRH successfully completed an evaluation process to scope out what a potential software package would require to meet existing needs as well as to find completed packages that meet those requirements. They then engaged with vendors to see software demonstrations and to specify critical features. Software packages were presented to RRH that can meet the organization's goals of consolidating all available tools into one system, saving users time, providing actionable data to managers, and improving the resilience of the whole transportation network.

At the time of writing this report, RRH was set to work directly with the best candidate to setup a trial and potentially purchase and implement the new system.

11 Rochester Regional Health Testimonial

Michael Potter—Manager, Parking and Fleet Operations—and Paul Staub—Sr. Director Safety and Security—provided the following feedback on the program and partnership:

Participation in this NYSERDA project was extraordinarily beneficial to Rochester Regional Health: not only did we learn about new possibility for automating various processes associated with operations of our diverse fleet, but we also learned a good deal about ourselves.

Some of our initial thoughts and ideas were further reinforced, such as the benefits from installation of trackers on the vehicles and streamlining the types of vehicles where possible; others, such as the potential for sharing the functionality, were unfortunately proven wrong.

RIT was a great partner. They brought in a fresh and impartial perspective and led the development. They were patient but persistence and managed to keep the project moving even when our daily priorities stood in the way.

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Appendix A. Questionnaire

Health Care Fleet Optimization

Site Visit Data Collection

Visit at Carter St. Garage

Location
Address

Date of visit: 9/18/2018 1:00 AM

People

Name	Role	Interviewer
Mike Potter	Manager of parking and fleet operations	NN & SN
Sarah	Dispatcher	NN & SN

Look Fors

Wednesday, September 5, 2018 4:07 PM

Note to interviewers. The main objective of this questionnaire is for you to learn about the operations at this site. Tools they use to do their job and make decisions. What causes friction in their process. Ask questions, listen. Do not try to formulate answers then and there.

Look Fors

Existing software and paper tools

Systems and tools the parties* interact with.

Communication paths between parties

How different parties are incentivized.

What are the problem areas for different parties in the process

*parties - all the people: clients, those doing work and managing work.

Group Lead

Person

Name

Title:

Years managing group?

General

Please give as a 90 second overview of how a request comes in to a driver arriving at the destination.

Please list your customers and how they make requests.

Any special cases that disrupt the normal process?

How many hours day are drivers sitting idle?

Do you see your customers using the scheduling technology for self service?

Phone call tree/voice recognition?

Mobil App?

Website?

Do you have any safety concerns with staff using tablets and phones on the job?

Any data security/limitations?

What computer applications does the dispatchers & drivers use?

What paper based systems does dispatchers & drivers use?

Current Operations Budget

Support Staff (dispatchers/schedulers/customer reps) #/\$:

Drivers #/\$

Vehicle Replacement \$/yr

Vehicle Maintenance \$/yr

How would you envision your staff using a new system?

What kind of ROI does your organization require?

What kind of budget is available for a new system?

Any trade groups/magazines

Metrics

How many delivery stops day?

How many vehicles?

How many drivers

Full Time

Part Time

Driver's license requirements (like CDL)

New hire training requirements?

How is this group measured for performance by upper management?

How are drivers & dispatchers measured for performance?

What aspects of your operation do you collect data on?

What aspects of your operation do you wish you could collect data on?

What do you consider a failure of the system and what causes it?

What is your wish list for features that the new system could do?

Routers/Dispatchers/Schedulers

Thursday, August 9, 2018 9:43 AM

Person

Name

Title

Years doing Routing/Dispatch/Schedulers

Process

Any process documentation on how to do your job?
(get copy)

Describe Current Process

Any special cases that disrupt the normal process?

Current software tools

Current paper tools

Any other computer systems you use?

Sources of pickups

How far out do you know of them?

Sources of drop offs.

How far out do you know of them?

How often do you build a routing plan?

How far out do you plan. Days/Hours??

How do you know which vehicles are available?

How do you know which drivers are available?

Any limitations on which driver to which vehicle?

How often do you make ad hoc changes for a driver?

How do you notify them?

How do you know which driver to pick?

How do you get special directions and how do you pass them on to the driver. (i.e. pick up point is on west side of building).

What is bad data for you? What causes errors?

How do you know where the vehicles are?

When and how often do you use 3rd party drivers/vehicles?

Pain Points

What is boring and repetitive?

On a busy data what stresses you out.

How do you define a busy day?

How can we make your job easier?

What gets you in trouble?

Any thoughts on how to fix?

Metrics

How is this group measured for performance?

Drivers

Need at least one driver, try to Interview at least 1 for each vehicle category.

Person

Name

Title

Years driving for (organization)?

Can we record the audio of this interview?

Your work

Describe a typical day

How do you get your vehicle Assignment?

Where do you get vehicle?

Do you do a vehicle inspection report?

Paper or electronic?

What happens if you find a problem?

How do you get your route assignments?

Paper? Mobil Device? Vehicle Device?

How do you know a stop is time critical?

How do you acknowledge a pick up and drop off?

Does customer need to sign off?

Does the customer directly pay you?

How do you track your time?

What happens when you go on break/lunch/bio stop?

How do you communicate with dispatch?

What do they tell you?

What do you tell them?

How do you report mileage and any fuel purchases?

How often can't you find the pick up or destination?

Due to bad address (written wrong/misread)?

Due to bad mapping software?

What do you use?

How do you get special directions? (i.e. pick up point is on west side of building)

How many hours a day are you between runs?

Metrics

How are you measured for performance?

Pain Points

On a busy day what stresses you out.

How do you define a busy day?

How can we make your job easier?

What gets you in trouble?

Any thoughts on how to fix?

IT & Security

Person

Name

Title

Years doing IT

Servers available to courier group

Server OS Types

Do you use cloud computing?

Any applications hosted by 3rd parties?

In house application development programmers that can make API bridges? (i.e. routing package needs data from the vehicle maintenance package)

Clients

What kinds of devices to you support?

Tablets? OS?

Phone? OS?

Desktop? OS?

Wi-Fi

Coverage in facility i.e. driver's lounge?

Coverage in yard where vehicles are stored?

Other Radio

Any regional transmission capability?

Who are cellular carriers for corporate devices?

Security

What is your authentication system?

Active Directory, LDAP, other:

Do you allow outside vendors to access your systems?

Any security concerns with this new system?

Applications/Vendors

Patient system?

Existing scheduling system?

Existing Maintenance system

Existing Personnel scheduling system

[Additional Notes](#)

Vehicle Maintenance

Thursday, September 6, 2018 8:54 AM

Software package:

How does dispatch know which vehicles available for the day?
(Paper report, Electronic Report, software API)

Can we please have an example?

How alert dispatch vehicle is down?

How does driver report a problem?

How does a vehicle swap out occur?

How do they report mileage and any fuel purchases?

Does vehicle storage and maintenance occur in the same facility?

VIRs

Does driver do a Vehicle Inspection Report?

Is it paper based or electronic?

Is the vehicle maintenance software the system of record?

If paper based, who enters into maintenance software?

Data Requests

Thursday, August 9, 2018 2:55 PM

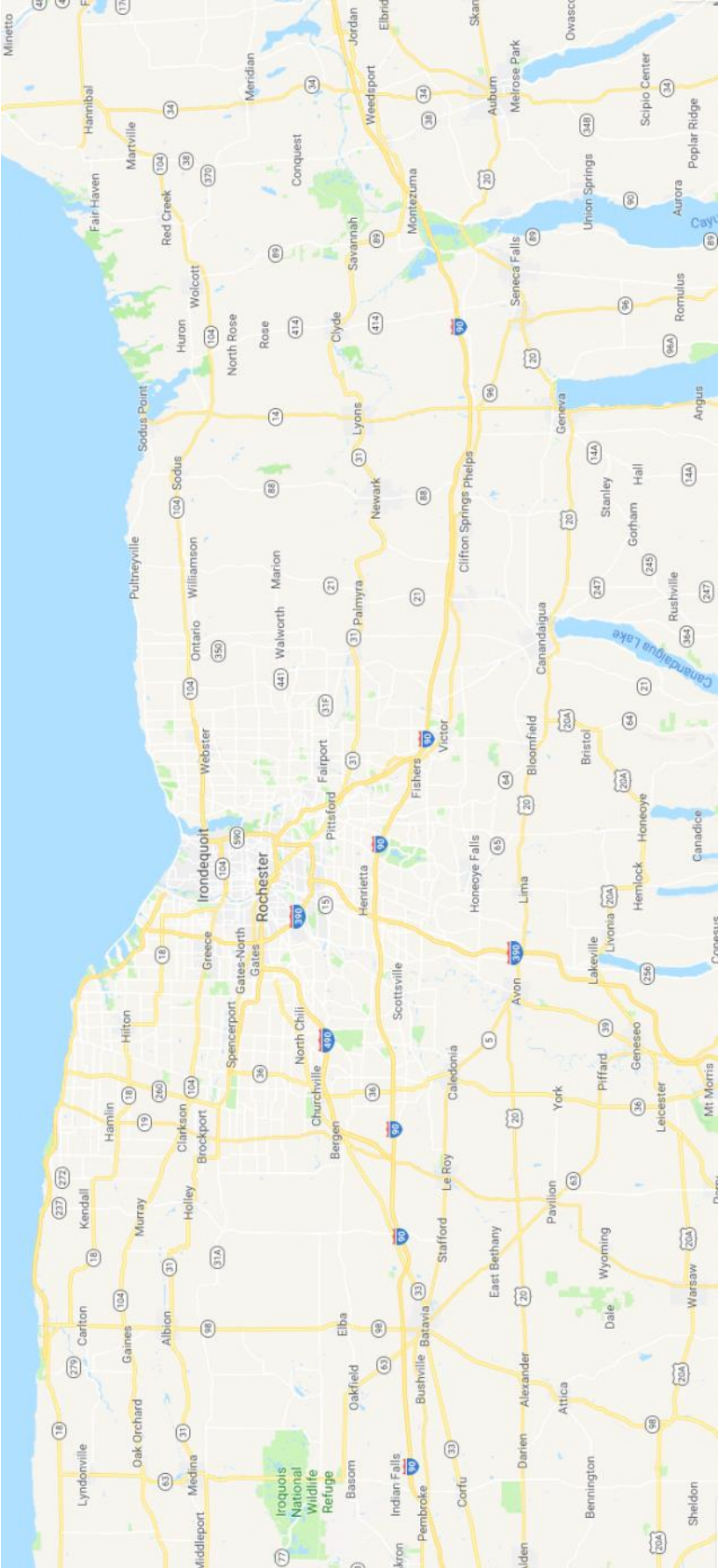
Data dump of Route/Stops as planned for the last 6 months

Data dump of Route/Stops as executed for the last 6 months

Data dump of Vehicle tracks?

Service Area

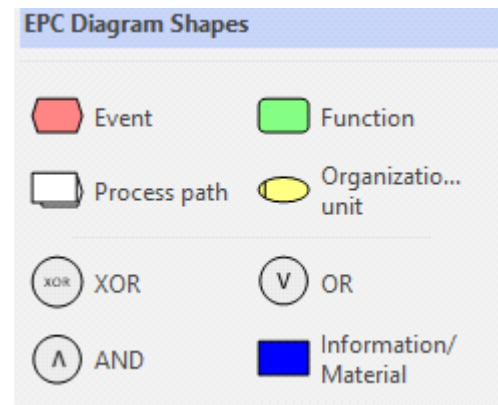
Any limitations on where you can travel within the service area?



Current Process Sketch

Ask for copies of any process documents. Try to do first cut at end of site visit with parties. Back at office, update and send back for review.

Sketch Current Process



Customer Types

Thursday, August 9, 2018 2:00 PM

Type	How Often/Many	Cost to Customer	True Cost

Vehicles

<u>Name/Type/Use /Special License</u>	<u>Location/Count /Age/Miles/yr</u>	<u>Operating Cost \$/mi, \$/yr</u>	<u>Telematics Capabilities (GPS/Radio -Cell data/Driver display)</u>

Pickup/Drop Off Sites

Name/Type	Location	Frequency	Operating Hours	Delivery Constraints (time/temp)

Terminology

Thursday, August 9, 2018 10:03 AM

Route

Stop

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Appendix B. Site Visits Summary

RGH Couriers Site Visit

Tuesday, September 18, 2018 1:00 PM

RGH provides a courier service to hospital departments to move physical items between buildings. They have a set of fixed stops with that they cycle between. They can also respond to on demand stat request that interrupt the normal route.

Current Software/Tools

Spreadsheet with list of stops and route assignments.
Spreadsheet with On Demand tracking (includes outsourced).
On Demand request portal.
Verizon vehicle tracking.
Azuga vehicle tracking.
Enterprise Maintenance tracking.
Driver has flip phone.

General Process

Fixed Routes.

- Assigned to drivers. No changes. Some days locations are skipped.
- Example spreadsheet to be sent.
- Spreadsheet has rough sequence of pickups. Drivers have flex to pick route between stops.

On Demand

1. Customer goes to RRH portal and signs in.
2. Link on portal brings user to form.
3. User fills in form ([paper example](#))
4. Most fields are required.
5. User submits, Request ID assigned by server.
6. Email sent to dispatch DL (3 dispatchers and Mike)
7. Email handled by who is on duty.
 - a. Dispatchers hand off who is primary on handling request.
 - b. Manual state tracking, using email boxes for queue.
 - c. Dispatcher sometimes contacts requestor for clarification (rare).
8. Dispatcher tries to get closest person or outsource.
 - a. Look on map, get closest, ask driver to fit in. Some drivers always say no.
9. When assigned email sent out to DL and (sometimes) requestor.
10. Enter into Excel spreadsheet, with web form data plus who assigned.
 - a. If outsourced, dispatcher name.
 - b. New tab each month.

Special Cases

- Elder Care home care supplies get typically sent to 3rd party.
- Some based on size need to be outsourced due to being on pallet.
- Cannot find driver then outsourced to [Pdq](#) or Custom Carrier, Med Delivery.
- Few told no, i.e. move furniture.

Route Types

For RGH couriers, set sequence of stops with occasional stats that disrupt cycle.
Outsourced shipments direct to individual address.

Drivers

Vehicles at set locations

Unity
RGH

Day starts at first pickup OR Day starts when picking up vehicle.

Communicate with dispatch via company mobile phone (flip). Text and voice.

Vehicles

9 - small vans.

Newer.

Have Verizon Telematics

Vehicle assigned to driver long term.

Product Being Moved

Types

Meds, dialysis liquids, sterilized equipment, other equipment, cash, forms/documents

Tracking

- Money has chain of custody.
- Some equipment is barcoded.

Most does not require. Would be nice for tracking MIA packages.

How to track transfers?

Problem Areas

- Forms filled out wrong.
- Packages occasionally lost.
- Finding willing driver to take on demand package.
- Occasional double booking couriers to same pickup.

Metrics

Verizon Telematics shows position, speed, stop locations. Shows speed against time so can see when parked/idle spots.

Enterprise portal provides mileage, fuel, maintenance reminders

For upper management, number of trips per month

\$220k/yr for 3rd party courier services.

\$12k/yr fue

Wish list

What location, how long at stops.

Tracking packages.

ElderOne Site Visit

Wednesday, October 10, 2018 1:00 PM

ElderOne provides daycare for elderly as a Programs of All-Inclusive Care for the Elderly (PACE). It has 4 facilities that act as daycare centers to improve the quality of life of elderly. The centers have rooms that users can do group activities, have food etc... They also provide space for basic medical needs and physical therapy. Patrons are bussed to the daycare centers and also to medical appointments. ElderOne has a small suite of buses, some with wheel chair lifts to transport patrons.

ElderOne's transportation management is outsourced to Medical Motor Service (MMS). MMS staff co-locate in ElderOne's Hudson Ave facility and run dispatch. ElderOne buses are stored on site.

MMS provides Elder One branded buses as part of the outsourcing agreement. Buses are tracked individually for maintenance etc.. RRH owns and has RRH driver employees for 9 buses, that are dispatched by MMS.

MMS does the maintenance and repairs on the buses. They have a depot with 4 mechanics.

MMS will coordinate if additional buses are required to handle the patron request. Using MMS branded buses or a 3rd party bus. MMS will coordinate with 2 other vendors, AMT and RMT. Enough extra stops that AMT has 2 dedicated buses to cover work.

Current Software/Tools

Main scheduling software: RouteMatch (<https://www.routematch.com/>)

- Full featured package

- Cloud hosting

- Use cell data to push pickups to drivers.

- Billing/Scheduling....

Maintenance Package: Fleet Manager

Time tracking for drivers: Paylocity <https://www.paylocity.com/>

Patron data: TruChart <http://www.mediture.com/products/truchart-life/>

Driver Tablet (Android)

Tablets are used for driver interactions. Has 2 apps one for time tracking the other stops and routes.

Not all drivers keep tablet on at all times.

No consistent mounting location.

Current vehicle location/speed/state is reported via tablet to backend system.

- States: trip, passenger loading, unloading, complete trip.

- General-purpose functionality disabled.

General Process

Appointment Maker

Schedules doctor visits for patrons and puts them on schedule. Interfaces with TruChart product.

Scheduler/Router (1 full time person)

Has list of re-occurring patron visits.

Has list of medical appointments for patrons.

Enters in new patrons

Pickup/drop requests are manually assigned to a bus. They do not use the built in optimizer. Region/Routes assigned in the system to a fixed set of virtual buses. Later driver & real bus is assigned to the virtual bus stops.

Tries to keep customers with same driver and bus.

Routes assigned to MMS vehicles first, then if extra use 3rd party to meet service needs. Want to have all stops planned for next day by 2PM if using AMT, 4P for RMT(both 3rd party).

Dispatch (2 or 3 full time people)

Handle on demand request

Pick which driver is available or make request over the radio for available driver.

Assign request in software, which pushes request to tablet.

Call over radio to confirm.

Route Types

- Re-occurring daily visit of patron to daycare center.
- Request to take patron to doctor facility .
- On Demand, via call to manager or dispatch: Request to change order of pickup/drop off to accommodate medical issue. (Patient was running low on O2 and nurse requested an early pickup and first drop off.)

Approximately 780 stops a week (156 stops/day) .

Approximately 60 to 90 doctor appointments/day.

Drivers

Drives car or minibus. Some minibuses have wheelchair lifts.

Has tablet with route plan.

Can get changes via tablet or via UHF Radio or mobile phone.

Dispatch can send short text messages, get a simple responses (yes/no).

Driver performs a paper VIR in a log book.

Vehicles

24 buses, 9 RRH owned, rest leased.

Plus 3rd party buses, and X stops outsourced/week.

Product Being Moved

Types

People, some with wheel chairs or walkers.

Tracking

- Address and time when bus stops for pickup, leaves when done with pickup.

Volume

Approximately 780 stops a week (156 stops/day) .

Approximately 60 to 90 doctor appointments/day.

24 buses, 9 RRH owned, rest leased.

Plus 3rd party buses, and X stops outsourced/week.

Problem Areas

High outsourcing costs. About \$500k year.

No data feed for appointment maker/scheduler from TruChart. Working off of print offs.

Some drivers not leaving tablets on, so no position reports.

Un-reliable driver notifications of route change when using RouteMatch push technology.

Metrics

Outsourcing costs.

Wish list

RouteMatch to be more reliable, less glitchy.

ACM Labs Site Visit

Tuesday, October 16, 2018 1:00 PM

ACM Labs couriers collect samples from draw locations all across western New York from Syracuse to Buffalo to Jamestown. There are 3 types of courier runs, Patient Service Centers (PSC) runs which just cycle between the large draw facilities, fixed routes that visit smaller draw facilities and doctors' offices, and stat runs for time critical analysis. Samples also have 3 different temperature requirements for storage while in transport: ambient, refrigerated with cool packs, and refrigerated with dry ice. They are transported in standardized packages -- red boxes for PSCs or client samples are transported in coolers. Each red box is labeled and the label consists of the PSC name and a number (1-4).

ACM labs is expanding into other markets (NYC and CT). But Rochester region is biggest market.

Current Software/Tools

Lab information system (LIS) sample tracking software. Soft (ACM and RGH implementations) and Epic vendors.

Route sheets done in Excel.

Routes sheets are by the week. Filled out drivers during course of day. Scanned and stored on server at end of week.

Starting to build a master sheet with all stops

Vehicle Tracking software Cal/Amp (<https://www.calamp.com/>)

Enterprise manages maintenance tracking however Logistics office team has to manage daily issues, oil changes, etc.

On demand request entered into paper log and computer log.

Driver can get on demand list when at drop off location or gets phone call for on demand request.

Driver also needs to acknowledge On demand on PC at a drop off location.

Driver tools:

Flip phones

Paper route document

Storage bins

General Process

Picks up vehicle and clocks in.

Drivers over to ACM labs.

Gets route assignment (typically same one for long periods of time)

New tracking sheet every week.

Gets phone assigned to route.

Gets supplies (bins/ice packs/dry ice)

Heads out for route.

Performs route loop, drops off samples at lab(s).

Route Types

Coverage is 7 days a week. 6:30 AM to 2:30 AM.

Route takes 4 to 8 hr+.

3000 stops/weekday

Some drivers cycle between service centers and labs.

Some drivers have mix of smaller centers and doctor offices.

On demands - only a stop if they have something to pick up. Doctor office call dispatch to say there is a pickup. Drivers call dispatch.

Some drivers do just stats. Some stats outsourced to PDQ.

Drivers

54 drivers, mix of full and part time

36 couriers out a day during the week.

10 Sat & 5 Sunday

Vehicles

53 Jeep Patriots & Chevy Equinox

2 Vans – GM ProMaster

All leased in future state, phasing out older owned Patriots and an old Van

Currently some w/o trackers, awaiting approval on new GeoTab devices to refresh entire fleet

Product Being Moved

Types

Samples of blood, tissue and excrement. All considered a biohazard. Some with storage temperature requirements.

Tracking

All Product has an identification for the LIS.

Products are not checked in/out of vehicles.

Some products have chain of custody requirements.

Red boxes are moved as a lot when picked up from Patient Service Centers (large draw centers)

Small sample sites (Drs. Offices) individually bagged and need sorting when back at vehicle. Sort by destination and refrigeration requirements.

Problem Areas

Manual process to track sample route.

No electronic tracking of receipt and discharge of samples.

Distances couriers need to walk to drop off samples. No convenient parking.

Some timing issues with pickup/drop offs. Sample centers want late pickups, labs early drop offs so more time to process samples. 4 hour window from draw to results.

Metrics

Errors in sample handling - wrong location, wrong storage.

Vehicle accidents - driver at fault, not at fault

Count of Stats and Will Calls

Wish list

Interface to LIS system.

Tools to find person going closest to pickup request.

Integration of location with dispatch.

Tracking of product where it is, when to arrive. Scan lot boxes or individual samples.

Tool to help batch product by location and temp. (Coding of individual samples with location code and storage color?)

Driver phone/tablet

Outdoor rated

Sunlight readable screen.

Route planning tool that accounts for stop times.

Service Center Sample Transport

Below are the 'Red Boxes' that are used to transport samples for larger service centers. A center is assigned 4 boxes and the drivers rotate them through center and lab.



Sign off sheet for handoff between center and driver.

ACM
Global Laboratories

DOCUMENTATION OF RED PSC TRANSPORT BOX CHECK

This log documents the Specimen Processing and Logistics staff conducting a quality check of Red Courier PSC Transport Boxes which have been emptied. After completion of the log Quality Control staff must date, sign and initial the log and place the log back into the sleeve for that Red Box. Quality Control staff must date, sign and initial the log after final quality check. Log is placed into sleeve for designated Red Box Processors and Couriers must document TIME of box check.

My LIS initials documented on the checklist below indicate that all specimens were transported properly and have been completely removed from the interior compartments of the red transport box. Any specimens improperly transported are brought to the attention of management.

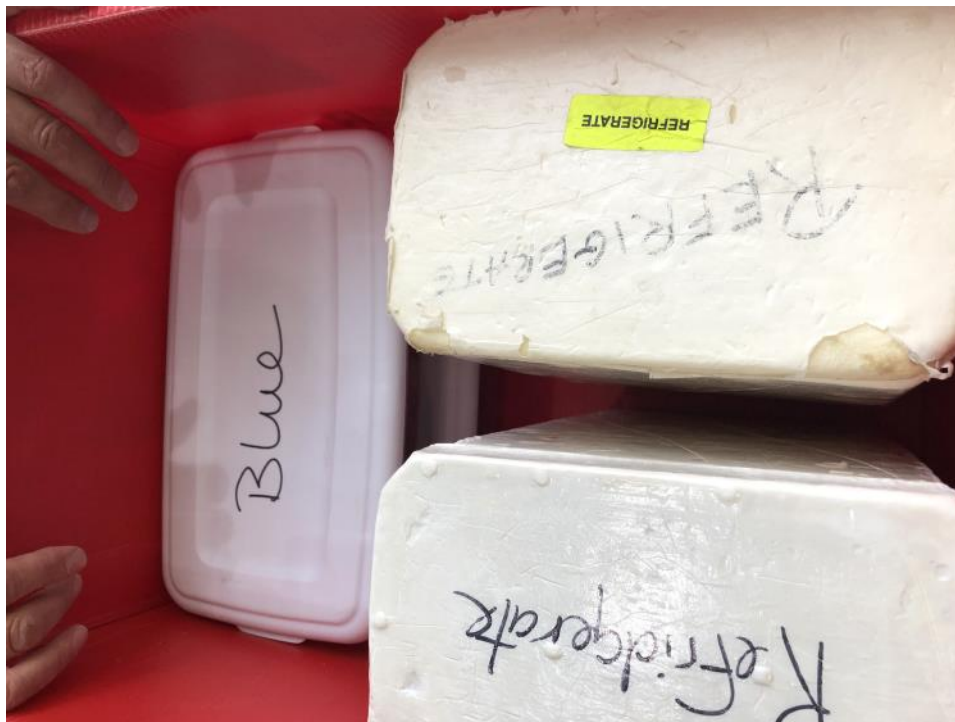
PSC # BOX#

DATE	Specimen Processing LIS user initials	TIME	Courier LIS user initials	TIME
9/26	RT	12:02	SM	2:01
9/26	RT	12:07	SM	18:08
9/27	RT	14:01	SM	2:05
9/28	RT	13:22	SM	2:05
10/1	RT	14:10	SM	2:40
10/1	SM	13:47	SM	2:30
10/5	SM	13:50	SM	2:20
10/9	SM	14:00	SM	2:11
10/9	RT	14:03	SM	2:05
10/9	SM	14:53	SM	2:00
10/9	SM	13:45	SM	1:50
10/10	SM	13:45	SM	1:50
10/11	SM	13:47	SM	1:50
10/15	TO	13:57	SM	2:00
10/15	TL	13:57	SM	1:55

Form: DOC TEMPLATE-0008.01
Effective Date:

Page 1 of 1

Document Number: FORM-0743 Revision: 02
Effective Date: 03 Jan 2018



Care Management Site Visit

Wednesday, October 17, 2018 2:00 PM

Care Management ([more info](#)) has a fleet of vehicles for use by Health Home Care Managers. Care Managers help people at risk interact with the social support system. The Care Manager might take a person to doctors' appointments, mental health appointments, court dates, finding housing etc... a wide range of social services. The Care Manager uses a car from the Care Management pool and does site visits and transportation.

A Care Manager is assigned a person (client) that needs at least monthly visits (frequency ranges from weekly to monthly).

Most visits planned out. Small percent on demand.

Some homeless hard to find, or in a different location each month.

Each day is a unique combination of stops.

Current Software/Tools

Case management software has address, visit plan.

Vehicles tracking Azuga: <https://www.azuga.com/products/fleet-tracking/>

Drivers have iPhones

General Process

Care managers (CM) are assigned cases.

CM organizes visits for clients to social and medical services.

CM plans days visits to pick up and transport client(s) to appointments.

CM signs out vehicle and visits/transport clients.

CM returns vehicle to storage lot.

Drivers

Care Manager are the primary drivers.

32 Rochester Mental Health

21 Unity

They manage the appointments for the day.

They handle route planning and navigation.

They start and end in the office.

Vehicles

Owned by RRH

Ford Fusions & Jeep Patriots

35 at Kings Highway staff

25 at Unity

Enterprise used for vehicle maintenance

Use local garage for repairs.

Product Being Moved

Types

People, Care Manager and Client

Tracking

None

Metrics

Mileage

Problem Areas

Aging fleet of cars

No history of client interactions locations. Possible safety of Care Manager issues.

Wish List

Change out cars. Go to lease like other groups.

Have a pool of shared vehicles.

Try other model of support, with bus and Care Managers doing work while traveling.

Mobile Phlebotomy Site Visit

Friday, October 19, 2018 9:30 AM

MPs visit home bound patients to collect samples for processing by ACM labs. At the beginning of their day, they get a list of stops and sample labels. They visit patients, make the draw/collections and then move on to the next patient. At the end of the day's stops they visit an ACM lab to drop off the samples. MPs start and end their day at the Kings Highway location. Each day is a unique combination of stops.

Software/Tools

Patient medical records sample scheduling/requests (Med-Right)

Lab information system (LIS) sample tracking software. Soft and Epic are vendors.

Route Planning: Roadnet <https://www.omnitracs.com/products/omnitracs-roadnet-routing>

Mobile app: MobileCast (Android, iOS available) companion app to Roadnet

Vehicle Tracking software Cal/Amp (<https://www.calamp.com/>)

General Process

Dispatcher

- Gets list of visits from patient medical records system

- Does address imported into Roadnet

- Address are group by geographic region based on zip codes

- Driver assigned to region

- Route manually planned, fasting draws first.

- Print out of route plan and labels

Driver

- Gets route plan and labels

- Gets supplies (dry ice, ice bags....)

- Departs

- Visits patients and does sample collections

 - Driver spins/stores samples as needed.

- Stops at lab(s) to drop off samples.

- Returns to office, tops off supplies.

- Clocks out.

If a new stat order comes in dispatch assess who is best and pushed to Mobile app, call driver. Driver needs to stop by Service Center to pick up labels. Two drivers are stat drivers.

Driver overloaded/leave early, dispatch will shift some work to another, need to meet and hand off labels.

Drivers

Route Sheet

- Person/patient info, address

- Special notes.

- Draws, sample destinations

Labels for samples

Sampling supplies (vials, bags, needles...)

They start and end in the office.

Drivers are hourly and clock in/out at office. Lunches are called/texted in and added later.

Dispatchers

3rd shift route planner

Gets list of patients for the day as a PDF from system Sample Request system

Imports PDF into Route Planning software

Manually groups locations, typically by zip code.

 Tries to keep tech in same zip code set and balance time required.

Generate labels for samples, needs to be done after midnight, which, due to amount of labor, requires that the shift planner be on a night shift.

Day dispatchers

Try to balance the work load, shifting some work to other driver.

 Requires meetup to transfer labels.

 Shift stops in route planner, which updates mobile app.

 Calls driver to tell of new stops.

Adds on demand requests.

 Requires stop at HQ or service center to get labels.

 Adds to route planner

 Calls driver to tell of new steps.

Monitor drivers.

Vehicles

Owned by RRH

19 Jeep Patriots.

Includes mobile centrifuge ([example](#)).

Enterprise used for vehicle maintenance

Use local garage for repairs.

Problem Areas

Aging fleet of cars. >> Replaced with leases next year.

Geocoding of stops inaccurate. MobilCast sends a range of address vs. particular house number.

Wish List

Better system integration for route planning and vehicle telematics.

Better route planning tool. Currently optimizes for maximum travel time.(Setting??)

Tracking of samples. Scan in/out of vehicle.

Ability to print labels when on the road.

 Bluetooth printer.

 App with hook to LIS

Appendix C. Consolidated Feature Ranking

ACS ACS RRH RRH MP MP Ranking Value Features
 0 to 5 \$/mo 0 to 5 \$/mo 0 to 5 \$/mo 0 to 5 \$/mo

Notes/Comments

Scheduling

Planning of a route. Routes can be planned on a daily basis or static for weeks/months at a time.

1. Sources of Stops

5		5		0	N/A		
5	420	5		0	N/A		420
4				0	N/A		
3		5		0	N/A		
5				0	N/A		
				0	N/A		
5				0	N/A		
0	0			0	N/A		0

- a. Standing reoccurring weekly stops
- b. Interface to On Demand request for future pickups.
 - i. Scheduler entering customer calls for future pickup.
 - ii. RRH request web form.
 - iii. ACM request web form.
- c. Input list of stops from patient scheduling software.
 - i. File upload of CSV/spreadsheet.
 - ii. PDF

ACS:3 reams paper/mo. 20hr Labor to manage edits, print, scan completed ppwk
 ACS:This could save Dispatch labor - providing we can get clients to utilize
 ACS:N/A Courier services RRH:n/a
 ACS:Reporting, statistics, live data for investigations - add much safety value
 ACS:Could convert excel to PDF

5		5		0	N/A		
				0	N/A		

2. Stop can have more than one pickup at location. i.e. building with

ACS:Would also want comment area for stops, i.e. Box in rear vestibule
 RRH:Comments for type of p/u's \$, Mail, Supplies, Instruments

4		4		0	N/A		
4				0	N/A		

3. Time per Stop Categories - A stop type has a time allocation for

ACS:Helpful with route planning
 ACS:Helpful with route planning

5				0	N/A		
5		5		0	N/A		
5		4		0	N/A		
4		4					

4. Reoccurring Weekly Schedules

- a. Run has optional stops on certain days of week or day of m
- b. Tie to On Demand request system to indicate required on d
 - i. Some stops are dependent on customer calling into s

5		5		0	N/A		
5		5		0	N/A		
5		5		0	N/A		
4		4		0	N/A		

5. Daily run planning

- a. Grouping of stops by geographic area or zip.
- b. Assignment of driver
 - i. Drivers pre-assigned geographic territory.

ACS:Would need to be able to input time parameters for certain pick-ups

4				5			
5		5					

6. Territory analysis and planning

- a. Ability to pull historic stop information to feed optimization

4							
4		4		0	N/A		
5				0	N/A		

7. Stop load leveling

- a. Ensure drivers do not get overloaded.
- b. Can handle part time and full time drivers.

ACS:They will give feedback
 ACS:We have a blend of position types RRH:All f/t currently

Dispatch

Handling on demand request from customer. Visualization of driver location, completed and remaining stops.

4	1080			0	N/A		1080
---	------	--	--	---	-----	--	------

- 1. Ability for customer request to appear in system - Interface for either customer to directly enter request or an API to enter request.

ACS	ACS	RRH	RRH	MP	MP	Ranking	Value	Features
0 to 5	\$/mo	0 to 5	\$/mo	0 to 5	\$/mo	0 to 5	\$/mo	
4	1080	5		0	N/A		1080	2. Semi-automated queuing of on demand for driver.
5		5		0	N/A			a. Find closest.
5		5		0	N/A			b. Time window for pickup
5	720	5		0	N/A		720	3. Assign on demand to driver or 3rd party.
5		5		0	N/A			a. Specific time or place in stop list.
5		5		0	N/A			b. Automatic assignment.
5		5		5				4. Display list of vehicle/driver stops and route
5		5						a. List driver completed stops, current/next stop, and incor
5		5						b. Time estimate for arrival of incomplete stops.
4		4		5				5. Map view of groups drivers/vehicles.
4		4						a. Vehicle ID, assigned driver, Position
2		3		5				6. Geo-fencing of vehicles
1		3						a. Alert dispatch if vehicle is outside of geo-fence.

Notes/Comments

ACS:Takes the "thinking" off dispatch BUT in some cases destination & timing play a part
 ACS:Great for stats
 ACS:Many offices lock doors,etc

ACS:We have Azuga GPS currently - free thru insurance

ACS:We have Azuga GPS currently - free thru insurance
 ACS:We have Azuga GPS currently - free thru insurance

Vehicle Telematics

Live and historic vehicle data.

4		5		5				1. Position, Speed, hard stops, idle.
4		4		5				2. Tracker is tamper resistant.
4					N/A			3. Tracker reports every 1 to 5 minutes.
4		4						a. Allowed minimum and maximum
4		4		5				4. Tracker data transferred over Cellular data.

ACS:We have Azuga GPS currently - free thru insurance RRH:important for insurance

ACS:We have Azuga GPS currently - free thru insurance RRH:Send alert if disabled

ACS:We have Azuga GPS currently - free thru insurance
 ACS:We have Azuga GPS currently - free thru insurance

ACS:We have Azuga GPS currently - free thru insurance

Package Tracking

Ability to timestamp packages and associate with unique package i

5		4		5				1. Record acceptance and discharge of packages
4		4						a. Use barcodes on products.
5		4						b. Tie to On demand request.
5		2		5				2. Ability to generate package tracking stickers
5				5				3. LIS Integration with sorting of bodily fluid samples for particular destinations and temperature.

Reporting

User interface that allows running canned and ad hoc reports on di

ACS	ACS	RRH	RRH	MP	MP	Ranking	Value	Features	Notes/Comments
0 to 5	\$/mo	0 to 5	\$/mo	0 to 5	\$/mo	0 to 5	\$/mo		
5		5		0	N/A			1. Reports can be easily exported as Excel files or formatted for	
4		4		0	N/A			2. Flexible report building system.	
5		4		0	N/A			3. Drill down by Driver, Vehicle, Stop	
5		4		0	N/A			4. Where are all drivers for Business Unit.	
5		4						a. Map	
5		4						b. List	
5		5		0	N/A			5. Time/cost per stop	ACS:I'm asked for this often, difficult to calculate
5		5		0	N/A			6. Time/cost per territory or route.	ACS:I'm asked for this often, difficult to calculate
3		3		0	N/A			7. Integration with Enterprise vehicle management.	
3		3		0	N/A			8. Integration with fuel card company.	
Driver App Features									
Drivers carry smart phones that allow them to interact with system. Device has camera, GPS, cellular data.									
5		5		5				1. List view of stops	
4		4		5				2. Map view of stops with routes	ACS:Would be great add - they currently have "in their head" or GPS RRH:Ensure shortest most economical route taken
4		4		5				3. Navigation to next destination	ACS:Would be great add - they currently have "in their head" or GPS RRH:Ensure shortest most economical route taken
4		4						a. Turn by turn directions	ACS:Would be great add - they currently have "in their head" or GPS
4		4						b. Voice prompts	ACS:Would be great add - they currently have "in their head" or GPS
4		4						c. Map view	ACS:Would be great add - they currently have "in their head" or GPS
3		3						d. Bluetooth integration with vehicle	ACS:Entire fleet doesn't have digital screen but most do
5		5		0	N/A			4. Ability to acknowledge receipt of new on demand.	
3		5		5				5. Send/receive free form text message.	
3		3		5				a. Acknowledge receipt of message	
4		4		5				b. Vehicle needs to be stopped for messaging functionality	ACS:NYS Law
4		4		5				6. Track arriving/departing stop.	
4		4		5				a. Automatic tracking of arrival/departures of reoccurring l	
4		4		5				b. Track other modes. Loading, fueling, break, start day, en	

ACS	ACS	RRH	RRH	MP	MP	Ranking	Value	Features
0 to 5	\$/mo	0 to 5	\$/mo	0 to 5	\$/mo	0 to 5	\$/mo	

5		3		5			
---	--	---	--	---	--	--	--

7. Record no-show/no-product at stop.

Notes/Comments

ACS:We need this info for investigations - would prefer alert to Admin team for f/u next AM

5		5		5			
---	--	---	--	---	--	--	--

8. Work on Android or iOS

4		3		0			
---	--	---	--	---	--	--	--

9. Record time tracking punches for payroll system

ACS:Need to set up for Kronos teletime RRH:If an interface w/ Kronos is available

5		5		5			
---	--	---	--	---	--	--	--

10. Integration with traffic conditions

5		3		5			
---	--	---	--	---	--	--	--

11. Vehicle Check in/out

RRH:veh is assigned to driver

5		5		5			
---	--	---	--	---	--	--	--

12. Vehicle Inspections

Software Interfaces

Recommend approach is to have RRH write middle-ware that can pull/push data from existing system and then send/read from future transportation software.

5		5		0			
---	--	---	--	---	--	--	--

1. On demand requests for Couriers and ACM.

5				5			
---	--	--	--	---	--	--	--

2. LIS for tracking of samples.

5							
---	--	--	--	--	--	--	--

a. Sample pickup/drop off time and locations.

ACS:We are asked for this info multiple times/day

				5			
--	--	--	--	---	--	--	--

3. Patient Scheduling

ACS:N/A Courier services

5		5		0			
---	--	---	--	---	--	--	--

4. On demand complete

3		3		0			
---	--	---	--	---	--	--	--

5. Send on demand to 3rd party.

ACS:Only occasionally

3		3		0			
---	--	---	--	---	--	--	--

6. Enterprise vehicle management

3		3		0			
---	--	---	--	---	--	--	--

7. Fuel card company

Version History

2-9-2019 Initial Release

3-1-2019 Move to Excel. Refine/clarify requirements.

7-23-2019 Integrate RRH responses.

Directions

Please fill out the 'Feature Ranking' tab of the spreadsheet.

The ranking and values you fill in should reflect the needs of your business unit.

The list of features were gathered from interviews with the different business units.

If you think of a feature that is not listed, please add it in.

When complete, please send the spreadsheets to Scott Nichols (Scott.Nichols@rit.edu).

We will compile the different rankings and discuss in more details during the workshop.

Thank You,
Scott Nichols
RIT

Category Definitions

Stop - A particular location the courier/tech has to drop off or pick up product or meet with patient.

Route - A series of stops planned in advanced.

On Demand - An unscheduled stop, can be inserted into a planned run or driver sent out specifically. Can be a stat.

Driver - Person responsible for driving their route.

Vehicle - A company owned courier vehicle. Outfitted with tracking and telematics hardware. Some are shared, some assigned to driver for long periods.

Package - What needs to be moved. Could be medical equipment and supplies, medical samples, paperwork.

Feature Ranking Definitions

5 - Must have, very important, can't do job without it.

4 - High value, saves time/money, replaces another tool.

3 - Would make job easier, remove frustration

2 - Limited value, use once in a while.

1 - Nice to have, can do job without it.

0 - Do not need.

Value Column

Your best estimate for dollar savings per month if this feature is in the new software package.

If you need to, you can use a range.

It is better to guess then leave blank.

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Appendix D. RRH-RIT Transportation Features

RRH-RIT Transportation Software Assessment Scorecard

Introductory Statement:

We are assessing different transportation software packages to meet the needs of large hospital system in Rochester NY. Organization has 3 business units with about 80 vehicles.

The package will be used by:

- Hospital Couriers that move hospital supplies between set of stops predominately on a fixed schedule, with random on demand requests.
- Lab Couriers with medical samples that need to go to different lab depots with time sensitive and tracking requirements
- Home Visit Technicians that need to visit patient's homes, collect samples and drop off at different lab depots. Samples are tracked and are time sensitive. Each day is different set of stops.

Features listed below came from a discovery process looking at current processes and needs.

Existing business operations systems

- Lab Information System (LIS) - details on specimens, test and results.
- Patient specimen collection schedule. Patient address, what/when to collect. LIS reference numbers.
- Vehicle tracking and driver score card (for insurance company) by Azuga
- Vehicle Maintenance tracking provided by Enterprise
- Home grown on demand web based request system.
- Hourly employees time tracking system.

Has Feature Scheduling/Routing

	Sources of pick ups
	User interface
	List of prior delivery addresses. Limited to business group.
	File Upload i.e. spreadsheet from external system with today's stops.
	API for external system to send stop request.

	Pick up reoccurrences
	One Time
	Weekly
	Daily
	Daily with day skips

	Pick up data
	Arrival Time Constraint
	Before Time
	After Time
	Deliver By Constraint
	Stop Types (categories for different business units)
	Address
	Person
	Comments/Notes for supporting info i.e. use back entrance...
	Reference code

	Time at stop
	Default value for different stop types.
	What to pickup/drop off
	list of materials/barcodes

	Drop Off Depots
	Product Types
	Operating hours constraint

	Stop Assignment
	Assign to geographic area
	Assign to zip code

	Driver work hours constraint
	Part and full time drivers. Some AM, some PM

	Driver work load assessment
	Estimates for driver travel time, time to complete run.

Dispatch

	Semi-automated queuing of on demand for driver.
	Find closest.
	Time window for pickup

	Assign on demand to driver
	Specific time or place in stop list.
	Automatic assignment.

	Assign on demand to 3rd party.
	Record which 3rd party, reference number, Pickup and Delivery Time

	Display list of vehicle/driver stops and route
	List driver completed stops, current/next stop, and incomplete stops.
	Time estimate for arrival of future stops.

	Map view of groups drivers/vehicles.
	Vehicle ID, assigned driver, position

	Geo-fencing of vehicles
	Alert dispatch if vehicle is outside of geo-fence.
	Route deviation alerts
	Unscheduled stops
	Deviating from best route

Vehicle

	Cellular Module or User Cell Phone?
	Position, speed, hard stops & idle

Report Frequency

Package Tracking

Check In/Out Package

Read Barcodes/QR Codes

Associate with Driver/Trip

Generate package tracking labels.

Driver App Features

List view of stops

Map view of stops with routes

Navigation to next destination

Turn by turn directions

Voice prompts

Map view

Ability to acknowledge receipt of new on demand.

Send/receive free form text message.

Acknowledge receipt of message

Vehicle needs to be stopped for messaging functionality to be operational.

Track arriving/departing stop.

Automatic tracking of arrival/departures of reoccurring locations

Track other modes. Loading, fueling, break, start day, end day

Record no-show/no-product at stop.

Work on Android and iOS

Record time tracking punches for payroll system

Integration with traffic conditions

Vehicle Check in/out

Vehicle Inspections

Reporting

Reports can be easily exported as Excel files or formatted for printing.

Report building system

Driver Report Card (speeding, hard stops, excessive idle)

Drill down by Driver, Vehicle, Stop

Where are all drivers for Business Unit.
 Map
 List

Time/cost per stop

Time/cost per territory or route.

Software Hosting

Cloud based
 Local server installation

Software Interfaces

API available to interface to other systems.
 On demand stop request, with materials description, time constraints
 Import bulk stop request
 Interface to external system to look up package information

Appendix E. Demonstration Notes

Samsara Demo 8/19 Notes

Tuesday, August 20, 2019 9:00 AM

Company

Samsara
<https://www.samsara.com/>
Based in San Francisco CA

Demonstrator

Ryan Harrison
Regional Sales Manager
ryan.harrison@samsara.com
(508) 439-0256

Participants

Michael Potter
Tameka Ball
Mary Boyce
Nenad Nenadic
Scott Nichols

To Dos

Samsara: Example of drivers app >> Scroll to bottom for list of links Ryan sent.
Samsara: Review feature score card.

Samsara suggested another demo to show driver app and how to assign an on demand.
Next demo: Need more details on handling On Demand and Routing.

Demo Notes

Mike Potter has contacted Samsara in the past and has seen demo.

Company Background

Samsara manufactures hardware and software

4.5 years old

COMPANY FACTS

10,000+ customers worldwide

Over 1,000 employees

Offices in San Francisco, San Jose, Atlanta, and London

\$230M in funding raised

Investors: Andreessen Horowitz, General Catalyst

Screen clipping taken: 8/19/2019 1:38 PM

1300 employees now.

Cloud based system, weekly updates to software platform

Hardware they have



CELLULAR GATEWAYS

Real-time telematics solution with GPS tracking, WiFi, and diagnostics



DASH CAMERAS

Internet-connected high-definition cameras with computer vision



WIRELESS SENSORS

Live and historical temperature, cargo, and equipment monitoring



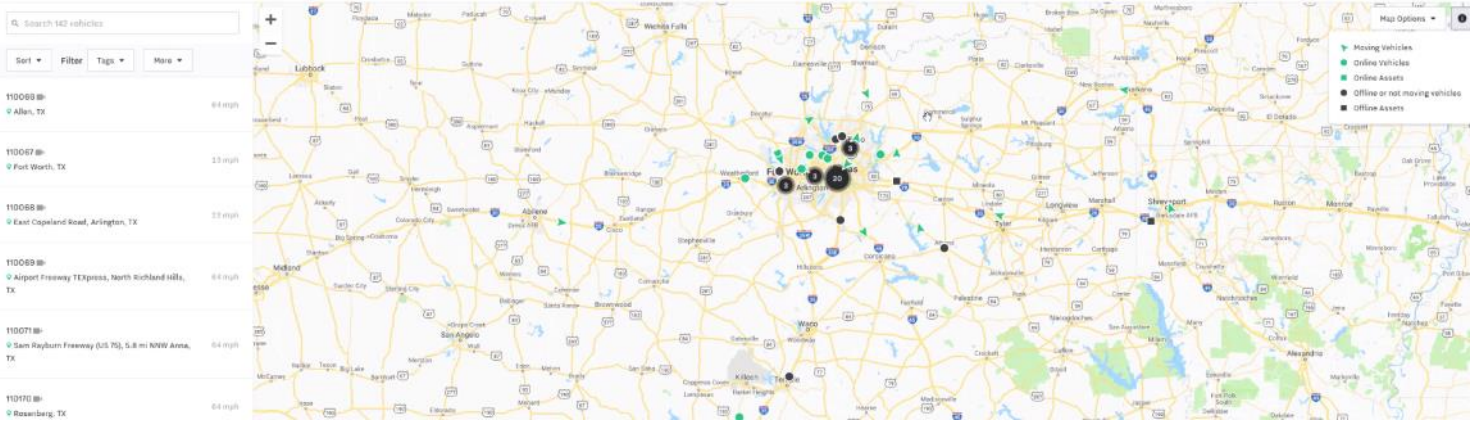
DRIVER MOBILE APP

ELD, routing, messaging, and forms with any Android or iOS mobile device

Screen clipping taken: 8/19/2019 1:41 PM

Fleet Overview

Demo data with existing customer - Hardies Deliveries



Base map is Google maps with overlays such as weather and traffic.

Vehicle Detail

110066 2016 FREIGHTLINER M2 Live Share

Central Expressway (US 75), Allen, TX
(33.09200209, -96.47970089) Street View

64 mph (70 km/h)

(Image from Mon, 1:43PM)

00318432-DA128 11/16 Completed - 4 Skipped
3h late

Current Job MOD Pizza #0499
ETA 2:00PM Mckinney

Connected hotspot clients: 0

VIN: 3ALACWDT5F DSK0210

Fuel: 46%

DEF Level: 71%

Engine check light: Off

Odometer: 239,928 mi

Engine: Running

Ambient Air Temp: 94.8°F

Barometer: 34.36 Psi

Battery Voltage: 15.00 V

Coolant Temp: 195.8°F

Engine Load: 66 %

Engine Speed: 2,163 RPM

Manifold Temp: 224.6°F

Screen clipping taken: 8/19/2019 1:45 PM

Data rates:
Up to the second GPS updates
Dash cam every 2 min

Routing

All 114 Scheduled 20 **En Route 85** Completed 2

Search routes

85 routes from Aug 11, 2019 10:47 AM - Aug 12, 2019

ASSIGNED TO	ROUTE	SCHEDULED START ▲	ROUTE TIMELINESS	CURRENT STATUS	CURRENT DESTINATION
144532 (Vehicle)	00317344-AU205	Aug 12, 2:45 AM	 43m 16s late	ARR 10:43 AM	AT Hillside Restaurant
217322 (Vehicle)	00317341-AU203	Aug 12, 2:45 AM	 On time	ETA 10:43 AM	TO HealthTrust-Methodist Ambulato
217325 (Vehicle)	00317346-AU202	Aug 12, 2:45 AM	 32m 3s late	ARR 10:32 AM	AT La Cosecha
217326 (Vehicle)	00317347-AU206	Aug 12, 2:45 AM	 21m 33s late	ETA 10:51 AM	TO Armv RC - #23827

217325 (Vehicle)	00317346-AU202	Aug 12, 2:45 AM		32m 3s late	ARR 10:32 AM	AT La Cosecha
217326 (Vehicle)	00317347-AU206	Aug 12, 2:45 AM		21m 33s late	ETA 10:51 AM	TO Army RC - #23827
220303 (Vehicle)	00317335-AU216	Aug 12, 2:45 AM		2h 43m late	ETA 12:43 PM	TO Omni Corpus Christi Bayfront
220303 (Vehicle)	00317343-AU208	Aug 12, 2:45 AM		57m 16s late	ETA 10:57 AM	TO Hyatt Hill Country Resort S.A.

Driver Data

Can make driver score cards

Samsara: Driver hours of services? > No. IFTA? > No

No maintenance now - at department level

Maintenance

ASSETS DRIVERS DISPATCH ROUTES PROXIMITY REPORTS MAINTENANCE DRIVERS (ADMIN)

Maintenance Status

142 vehicles

VEHICLE	CURRENT DRIVER	MAKE/MODEL	BATTERY VOLTAGE	ENGINE HOURS	ODDOMETER (MI)	CHECK ENGINE LIGHT	FAULTS
217320	-	HINO/KJC720 / XFC720	6.4	4,201	-	On	P011A - Engine Coolant Temperature Sensor 1/2 Correlation P0299 - Turbocharger/Supercharger "A" Underboost Condition
665574	-	FREIGHTLINER/M2	1	8,706	207,821	Stop, Warning, Protect, and Emissions	Txid: 0 SPN: 3361 - Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit FMI: 4 (Voltage Below Normal) Count: 5 Txid: 33 SPN: 6918 - SCR System Cleaning Inhibited Due to Inhibit Switch FMI: 7 (Not Responding Properly) Count: 126
964971	-	INTERNATIONAL/MAO 25	15.1	5,798	122,262	Stop, Warning, Protect, and Emissions	Txid: 11 SPN: 790 - Wheel Sensor ABS Axle 1 Right FMI: 1 (Low--most severe) Count: 1
971638	2628 - Hector Garcia	-	14.8	16,843	291,816	Stop, Warning, Protect, and Emissions	Txid: 3 SPN: 2003 - Source Address 3 FMI: 31 Count: 127

Screen clipping taken: 8/19/2019 1:51 PM

Dashboard

Overview Assets Drivers Dispatch Routes Proximity Reports Maintenance Drivers (Admin) Filters: all

Month: Aug 20 19

Fleet Summary

Vehicle Trailer Driver

Driving Distance

Avg Distance Driven: 2888.8 mi

TOP VEHICLES	MILES
Tractor 178704	19003.8 mi
Tractor 178705	10446.7 mi
220303	9605.8 mi
169009	9517.8 mi
Tractor 128521	8104.9 mi

Driving Hours

Avg Hours Driven: 75.7 h

TOP VEHICLES	HOURS
Tractor 178704	309.4 h
Tractor 178705	194.3 h
169009	169.0 h
220303	166.4 h
Tractor 128521	143.6 h

Safety Violations

Avg Violations: 5.5

LEAST SAFE VEHICLES	VIOLATIONS
189216	66.0
189008	17.0
174681	16.0
189214	21.0
661280	19.0

Fuel Usage

[View Details](#)

Fuel Efficiency

[View Details](#)

Idle Hours

[View Details](#)

Screen clipping taken: 8/19/2019 1:51 PM

Package tracking - can create document to track. Example of photo of delivery.

Partner with a lot of companies. Likely can send driver report to insurance company.

Offer for free trail with devices installed in a few vehicles.

Reference links Ryan sent 8/21

- Samsara Fleet Overview: <https://www.samsara.com/fleet>
- Samsara Routing & Dispatch: <https://www.samsara.com/fleet/routing>
- Samsara GPS Fleet Tracking: <https://www.samsara.com/fleet/gps-fleet-tracking>
- Samsara Reporting & Alerting: <https://www.samsara.com/fleet/reporting-and-alerts>

- Samsara Fleet Maintenance: <https://www.samsara.com/fleet/maintenance>
- Samsara Customer Success & Case Studies: <https://www.samsara.com/customers/>
- Samsara API: <https://www.samsara.com/api>
- Samsara Driver App Tutorials and Videos: <https://kb.samsara.com/hc/en-us/articles/115004507334-Driver-App-Video-Tutorials->

Silent Passenger Demo 8/20 Notes

Tuesday, August 20, 2019 9:00 AM

Company
Silent Passenger
Commack, NY
<http://info.silentpassenger.com/>

Demonstrators
Pete Desiderio
Fleet Solutions Executive
(631) 492-1148

Tabbatha Marron
Fleet Solutions Executive, Public Sector
(631) 670-1683

Recording of presentation:
<https://vehicletracking.zoom.us/recording/share/1rMUGUvRtVAQv8NmjebhTVLmcEOw3hQKQdsOqBgBlAWwIumekTziMw>

Participants
Mike Potter
Mike Waller
Mary Boyce
Scott Nichols
Nenad Nenadic

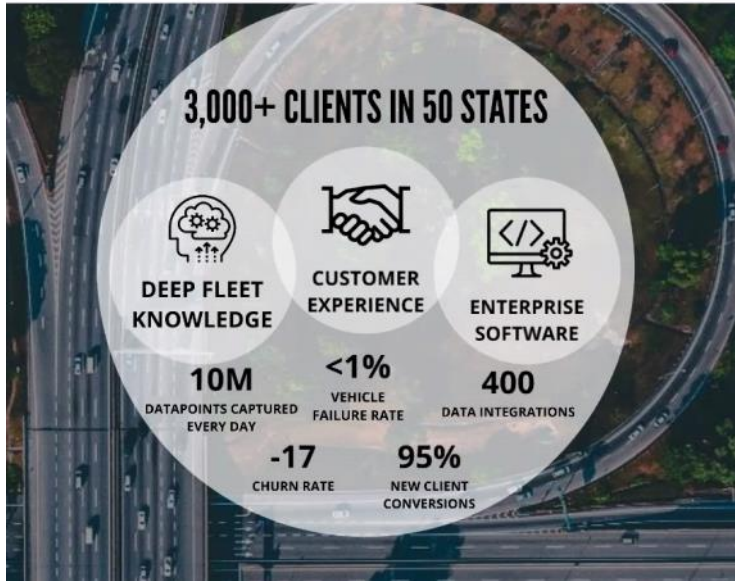
To Do
Send images of driver tool >> Done
Setup demo with dispatch/routing tool
Send link to recording to pass on. >> Done

Demo Notes

Rout planning capability from 3rd party. Pete mentioned they integrate for RoadNet. Recommended Route4Me <https://www.route4me.com/>. Here is a good overview video: <https://www.youtube.com/watch?v=CGFLDc4sA0> It is pretty sophisticated and I could see Mary and Tameka's group using the tool.

Pete learns about different groups and current tools.

Company background

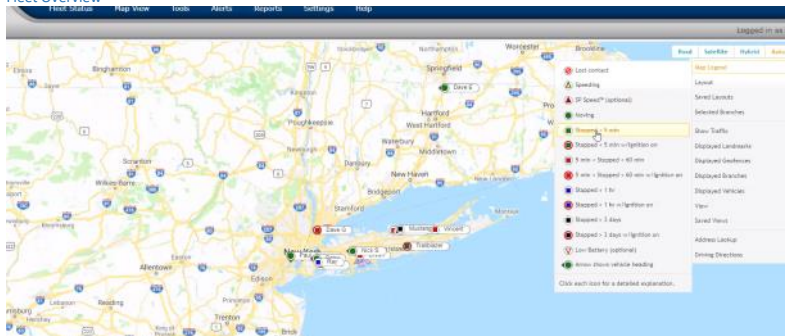


Screen clipping taken: 8/20/2019 9:20 AM

Established in 2002 as a telematics provider
Company core competency is as an integrator of systems
Google maps is base map provider.

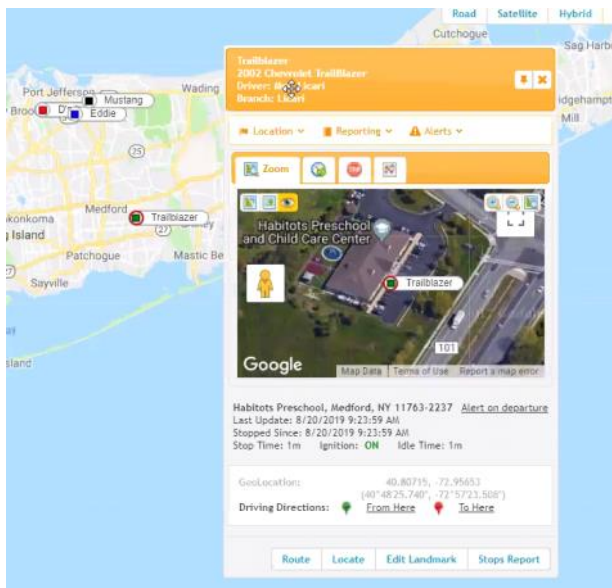
Can view different groups of drivers in different vehicle states.

Fleet Overview



Screen clipping taken: 8/20/2019 9:25 AM

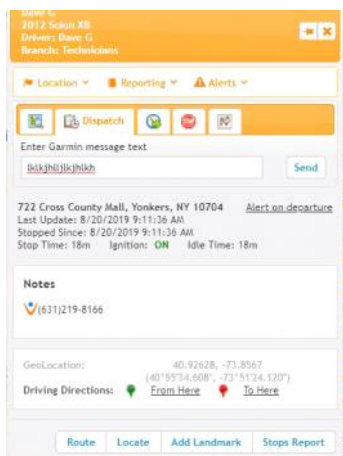
Vehicle Detail Pop Up



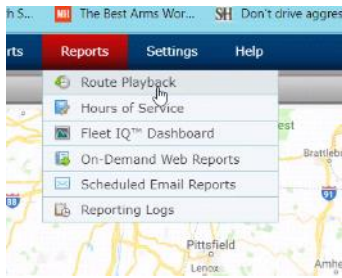
Screen clipping taken: 8/20/2019 9:26 AM



Screen clipping taken: 8/20/2019 9:29 AM



Screen clipping taken: 8/20/2019 9:31 AM



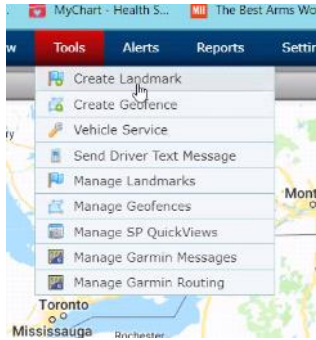
Screen clipping taken: 8/20/2019 9:36 AM

[Map Update Rate](#)

GPS updates - customizable - standard is every 60 seconds
 Events as happens

[Geo-fences](#)

Operator crosses Geo-fence or near landmark - causes alert and email group.
 Geo-fence report can be used to look at historic tracking data to see if anyone went into the newly created geo-fence.



Screen clipping taken: 8/20/2019 9:39 AM

[Maintenance](#)

Vehicle Name	Mileage	Engine Hrs	Service	Scheduled for	Priority	Recurring	# of Jobs for this Vehicle
VTS Test	0 mi	0.1	Trailer - Brakes		Immediate		2
VTS Test	0 mi	0.1	Trailer - Doors		Immediate		2
VTS Test	0 mi	0.1	Truck - Steering		Immediate		2
Patrick's Altima Nissan Altima	779.48 mi	1950.3	Truck - Muffler		Immediate		14
Patrick's Altima Nissan Altima	779.48 mi	1950.3	Truck - Air Lines		Immediate		14
Patrick's Altima Nissan Altima	779.48 mi	1950.3	Truck - Battery		Immediate		14
Patrick's Altima Nissan Altima	779.48 mi	1950.3	Truck - Battery		Immediate		14
Patrick's Altima Nissan Altima	779.48 mi	1950.3	Truck - Brakes, Parking		Immediate		14

Screen clipping taken: 8/20/2019 9:42 AM

Training library videos - Onboarding have access to video library and will make RRH specific videos.

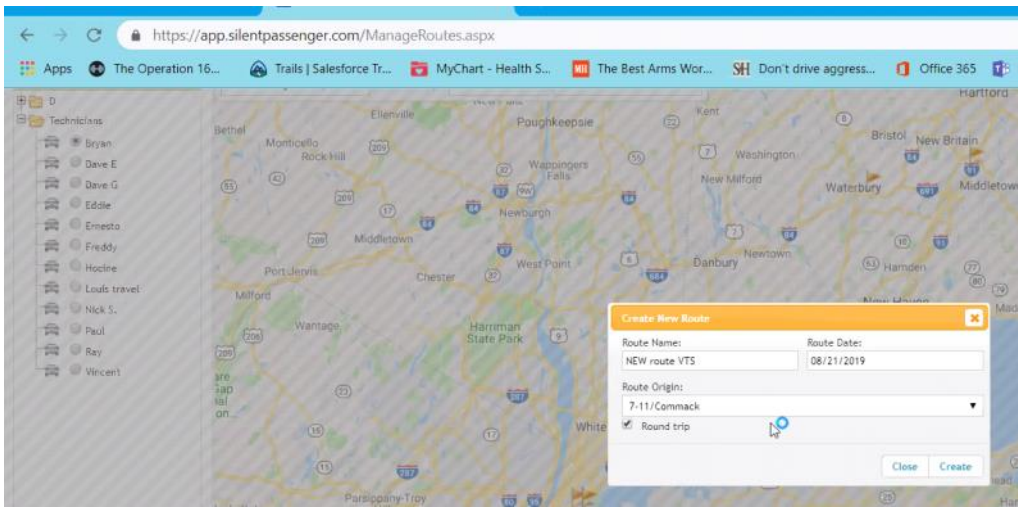
[Drivers App](#)

Driver launch app and logs in.
 Pick from list of vehicles (nearby and available)
 Launch evir app (but can be skipped)

Management can see report of operators not doing EVIRs.

[Built In routing tool](#)

Can use 3rd party routing tool like Route4Me or RoadNet



Screen clipping taken: 8/20/2019 9:49 AM



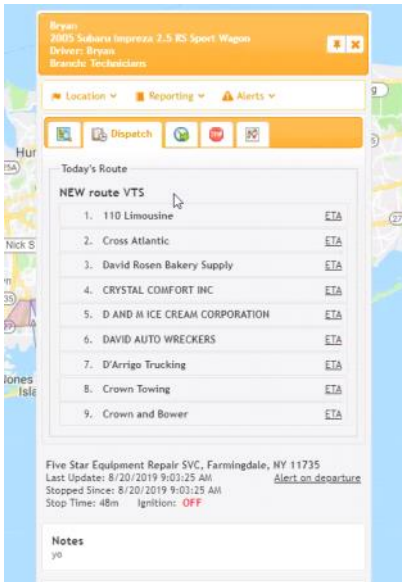
Screen clipping taken: 8/20/2019 9:50 AM

Manual approach. Use 3rd party for more sophisticated routing



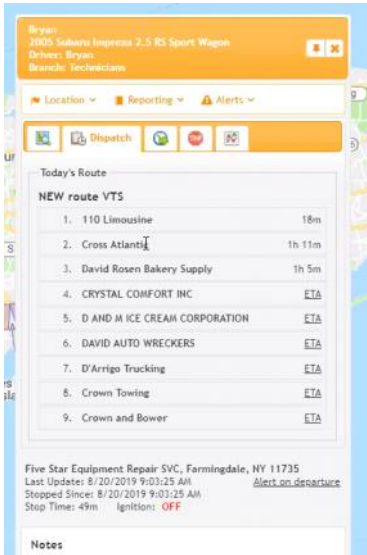
Screen clipping taken: 8/20/2019 9:50 AM

API available for importing stops to unassigned.



Screen clipping taken: 8/20/2019 9:52 AM

Simple ETA estimate, direct from current location



Screen clipping taken: 8/20/2019 9:53 AM

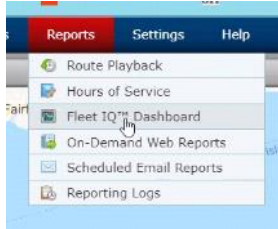
Ability push out links for delivery arrival time.
Send email and map link with live update.

Alerts



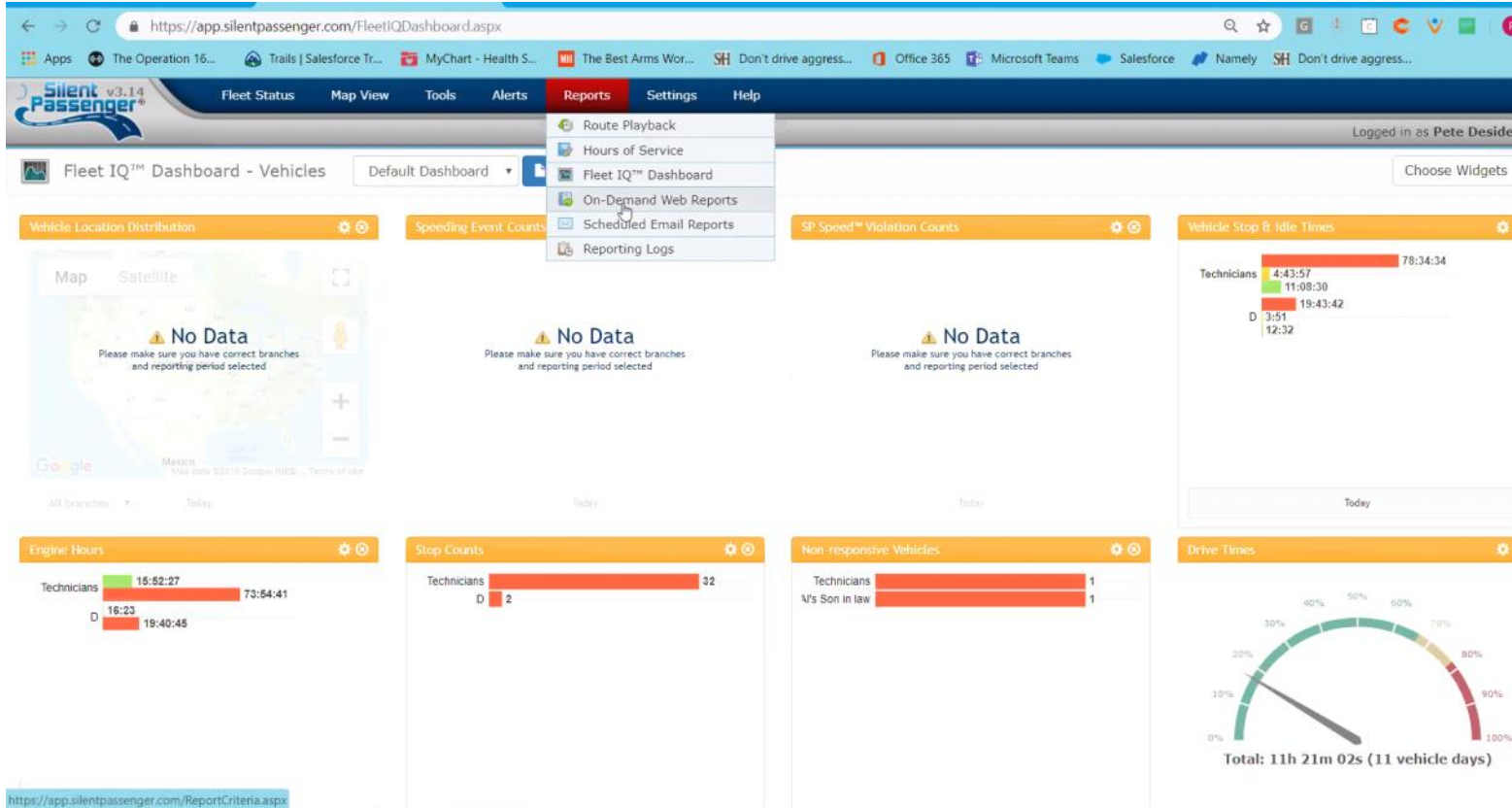
Screen clipping taken: 8/20/2019 9:58 AM

Reports



Screen clipping taken: 8/20/2019 9:58 AM

Dashboard



<https://app.silentpassenger.com/ReportCriteria.aspx>

Screen clipping taken: 8/20/2019 9:59 AM

On Demand web Reports List



Screen clipping taken: 8/20/2019 9:59 AM

NexTraq Demo 8/22 Notes

Thursday, August 22, 2019 9:30 AM

Company

NexTraq
Atlanta, Georgia
www.nextraq.com

Presenter

Joe Rosario
SaaS Regional Account Manager
727-755-4459 - direct
jose.rosario@nextraq.com

Attendees

Mary Boyce
Mike Potter
Nenad N

To Dos

Joe to send screen shots of driver app.
Import new jobs. Associate with driver/region? Need to check.
Joe to send pricing & terms

Joe to check if a demo site available.

Demo Notes

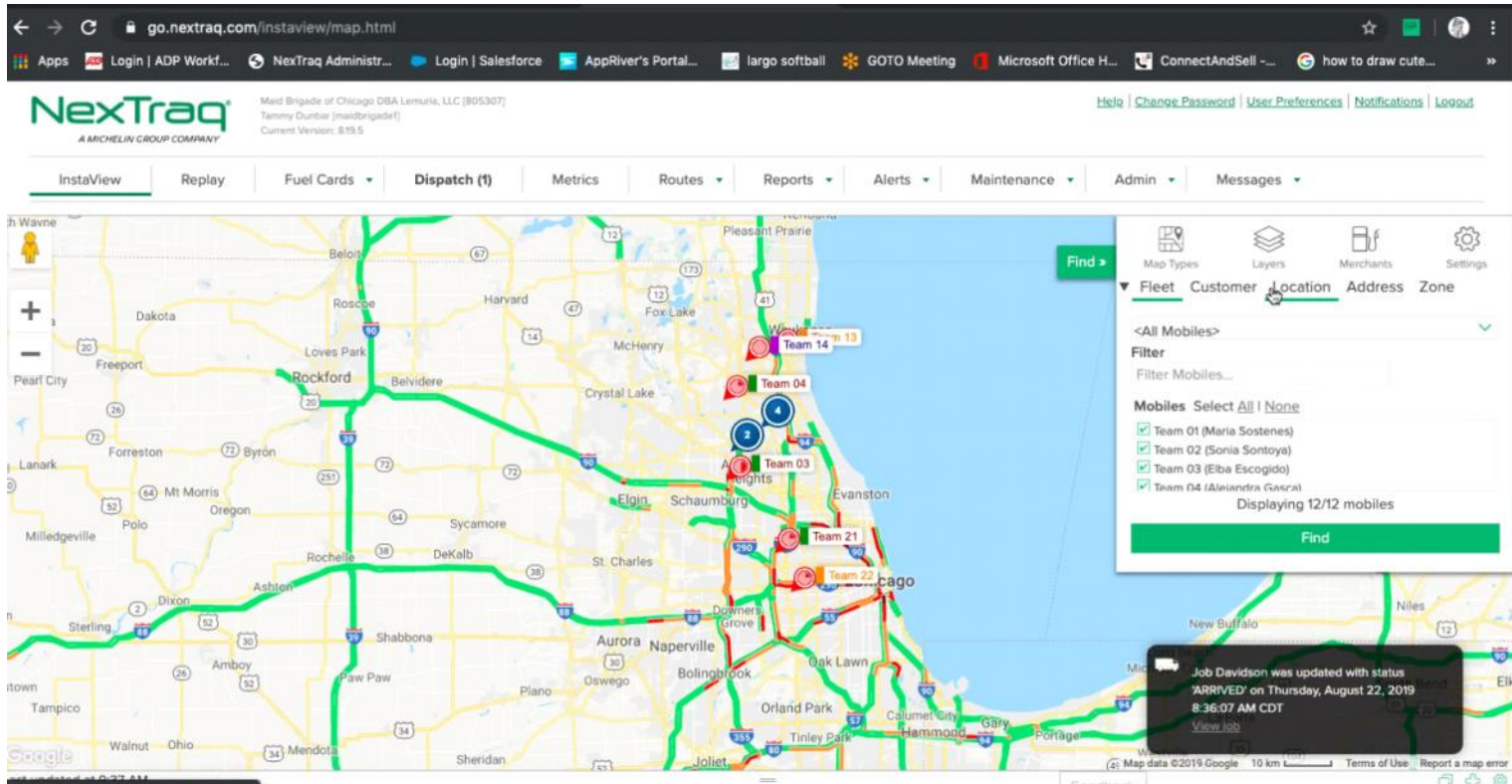
Hardware options for the vehicles - 2 versions.

- Device plug into ODBC port. Made by 3rd party (Auzuga). Has battery to last 3 hours after unplug. RRH would be doing the installations. (Mary> plug in better.)
- Hardwired behind dash, better for anti-tampering. Technicians would need to come on site to do installations for a per vehicle fee.

Example data is with a house cleaning service.

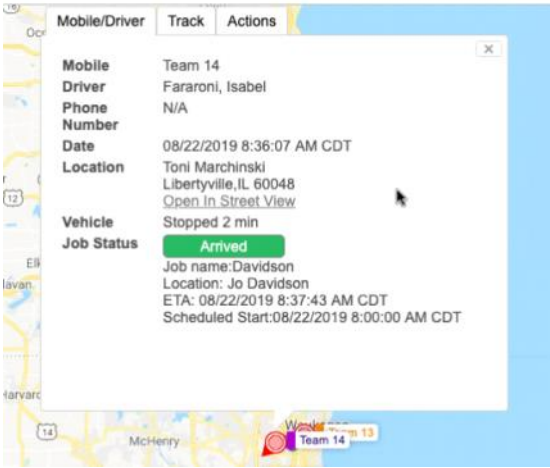
Fleet Overview

Google maps as base map
Weather and traffic overlays.



Screen clipping taken: 8/22/2019 9:38 AM

Vehicle at Stop detail



Screen clipping taken: 8/22/2019 9:39 AM

NexTraQ integrates with WIX fuel card, and would show fuel usage in dashboard.

Dispatch

Dispatch

Mobiles: Team 01 (Maria Sostenes), Team 02 (Sonia Sontoya), Team 03 (Elba Escogido), Team 04 (Alejandra Gasca), Team 05 (Oliva Beltran), Team 06 (Juana Ponce), Team 11 (Ayde Contreras), Team 12 (Gisela Robles), Team 13

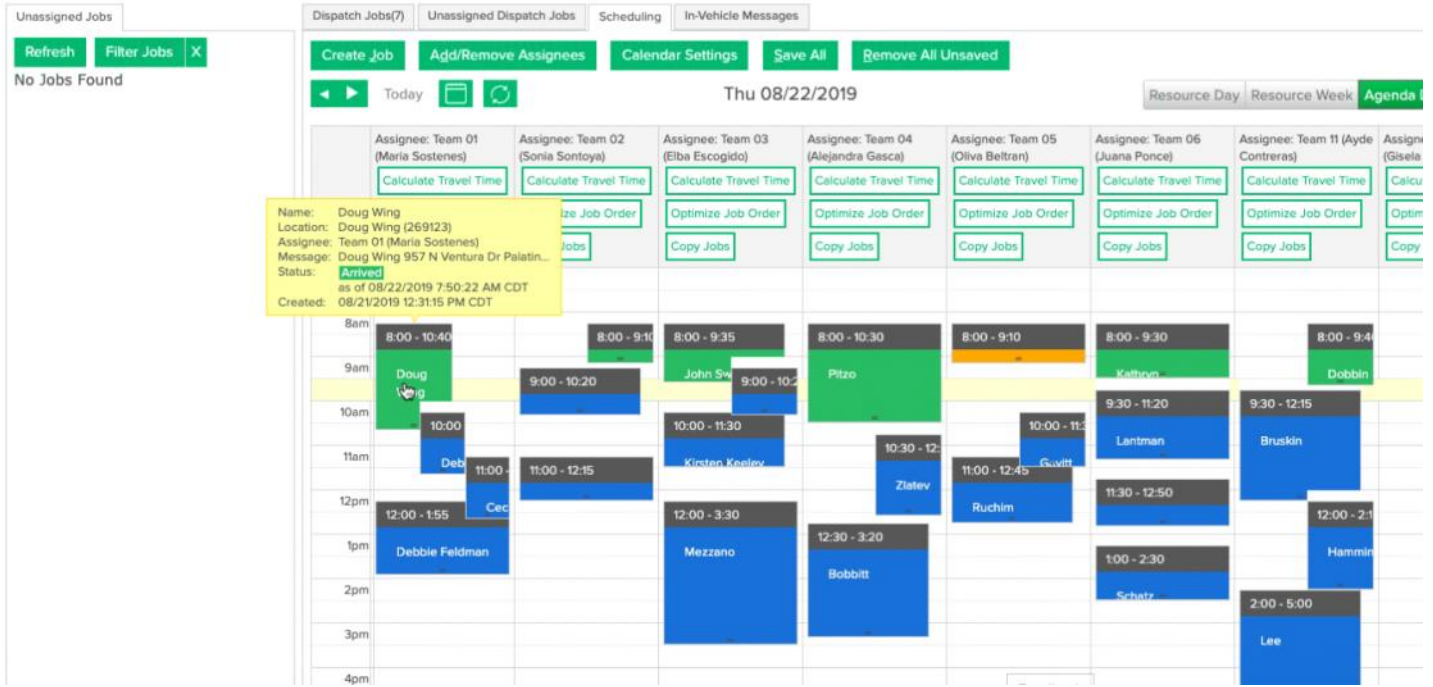
Dispatch Jobs: **Scheduling**

Buttons: Create Job, Filter Jobs, Remove Filters, Refresh Now

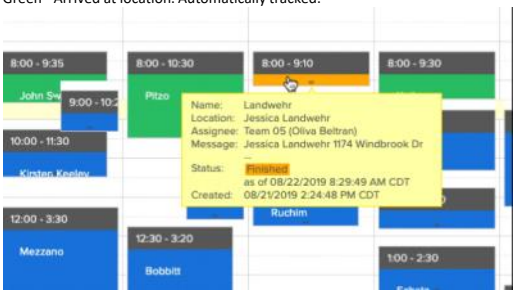
List is currently filtered [Mobile is 'Team 22 (Anamaria Sandiego)']

Copy	View	Edit	Job Name	Assignee	Location	Created	Last Report	ETA	Delivery Status
<input type="checkbox"/>			Tina Lambert	Team 22 (No driver)	Tina Lambert (71912)	01/02/2016 9:45:58 AM CST			Undeliverable-Expired
<input type="checkbox"/>			Jason Dirks	Team 22 (No driver)	Jason Dirks	01/02/2016 9:46:28 AM CST			Undeliverable-Expired
<input type="checkbox"/>			Gina Wietrecki	Team 22 (No driver)	Gina Wietrecki	01/02/2016 9:46:55 AM CST			Undeliverable-Expired
<input type="checkbox"/>			Flesch Gordon	Team 22 (No driver)	Flesch Gordon (63261)	01/02/2016 9:47:28 AM CST			Undeliverable-Expired
<input type="checkbox"/>			Nicole Loftus2	Team 22 (Anamaria Sandiego)	Nicole Loftus 2	03/14/2019 8:22:40 AM CDT			Undeliverable-Expired
<input type="checkbox"/>			Sharon Krudl	Team 22 (Anamaria Sandiego)	Sharon Krudl	04/04/2019 8:37:47 AM CDT			Undeliverable-Expired
<input type="checkbox"/>			Andy Waldman	Team 22 (No driver)	Andy Waldman	02/25/2013 11:00:30 AM CST	02/25/2013 12:09:24 PM CST		Delivered
<input type="checkbox"/>			Shelly Hostetter	Team 22 (No driver)	Shelly Hostetter	02/25/2013 11:01:24 AM CST	02/25/2013 12:10:04 PM CST		Delivered
<input type="checkbox"/>			Charles Willes	Team 22 (No driver)	Charles Willes	02/25/2013 11:02:00 AM CST	02/25/2013 12:27:28 PM CST	02/25/2013 12:19:20 PM CST	Delivered

Stop Assignments



Screen clipping taken: 8/22/2019 9:42 AM
 Orange - Done. Driver uses app to indicate done.
 Green - Arrived at location. Automatically tracked.



Adding a Job/stop

Job

General

Job Name *

Message for Driver *

Message for Driver

Using 0 of 199 characters [Add Destination](#) [Add Start & Duration](#)

Destination

Source * Location

Group All Locations

Search

Location *
 (Tony) JP Investment Realty
 A & A Automotive
 Aaron Azoff
 Abigail Olsen
 ABSA
 Adam Khorshid

1 2 3 4 5

Display Selected Destination on Map

Save Cancel

Screen clipping taken: 8/22/2019 9:43 AM

Question: Import new jobs. Associate with driver/region? Need to check.

Mary: how refine number stop times. Can do a lot of them in

Job

Fleet <None>

Display Selected Mobile on Map

Scheduling

Start 8/22/2019 8 : 05 AM CDT

Duration 0 Hrs. 10 Min.

Send Now

Send Later 8/22/2019 5 : 00 AM CDT

Custom Fields

Bill To

Company

Dollar\$

Save Cancel

Screen clipping taken: 8/22/2019 9:47 AM

Application Help

Online help documents, plus remote live instructor classes. Free and unlimited training classes.

Help

Application How-To

- [New User Quick Start](#)
- [NexTraq User Guide](#)
- [NexTraq Reporting Guide](#)
- [NexTraq Training Courses](#)
- [Fleet InstaView](#)
- [Dispatch Jobs With Deferred Delivery](#)
- [Job Scheduling in NexTraq](#)
- [Using Automatic Driver Assignment](#)
- [Leveraging your Fuel Card](#)
- [QuickBooks Customer Import](#)
- [NexTraq Connect Quick Reference](#)
- [Welcome to NexTraq Connect](#)
- [Hours of Service Compliance with Elogs](#)

Contact Support

NexTraq

Web: [Online Support](#)

Phone: 1-800-358-6178

Hours:

Monday - Friday: 07:00 AM - 08:00 PM ET

Saturday: 08:00 AM - 03:00 PM ET

About NexTraq

NexTraq Fleet Tracking Solution

Current Version: 8.19.5

© 2018 NexTraq. All rights reserved.

Some iconography provided by the [Map Icons Collection](#) and [famfamfam.com](#)

Close

Screen clipping taken: 8/22/2019 9:49 AM

Onboarding

Client ambassador for first 90 days to provide assistances on system setup and data importing.

Existing stops can be upload via excel. They provide template to use.

Reports

90 days ready access via website. After 90 days need to make support ticket. Data is stored for lifetime.

90 days ready access via website. After 90 days need to make support ticket. Data is stored for lifetime.

Print Report Export to PDF Export to CSV Export to Excel

Start/Stop Report for Maid Brigade of Chicago DBA Lemuria, LLC

Dates: 8/21/2019 to 8/21/2019

Fleet: <All Mobiles>, Location: All Locations

Team 01												
Start	Moving Time	Driver	Miles	Stop	Stopped Time	Location	City	St	Zip	Idle Time	Sensor Time	Max MPH
Wed, Aug 21, 2019												
7:29:29 AM CDT	00:00:51	Maria Sostenes	0.0	7:30:20 AM CDT	00:07:49	Maid Brigade Office (rol)	Rolling Meadows	IL	60008	00:02:34	00:03:25	4
7:38:09 AM CDT	00:20:39	Maria Sostenes	8.2	7:58:48 AM CDT	00:56:44	Sangita Trehan (84276)	Barrington	IL	60010	00:00:44	00:21:23	53
8:55:32 AM CDT	00:30:31	Maria Sostenes	11.9	9:26:03 AM CDT	01:11:14	Betsy Kelley	Algonquin	IL	60102	00:00:40	00:31:11	51
10:37:17 AM CDT	00:15:31	Maria Sostenes	7.5	10:52:48 AM CDT	00:56:12	Julia DeWitt	Carpentersville	IL	60110	00:00:41	00:16:12	47
11:49:00 AM CDT	00:15:20	Maria Sostenes	7.8	12:04:20 PM CDT	02:18:14	Helen Handley (154422)	Fox River Grove	IL	60021	00:00:54	00:16:14	62
2:22:34 PM CDT	01:29:24	Maria Sostenes	1.4	3:51:58 PM CDT	00:00:55	Krishana Keelapatta (178622)	Fox River Grove	IL	60021	00:00:55	00:06:54	24
3:52:53 PM CDT	00:27:01	Maria Sostenes	13.8	4:19:54 PM CDT	00:00:00	Celemi Inc	Rolling Meadows	IL	60008	00:00:00	00:26:59	65
Totals for Day			03:19:17							00:06:28	02:02:18	
Totals For Mobile			03:19:17							00:06:28	02:02:18	

Screen clipping taken: 8/22/2019 9:53 AM

Drill down into a timestamp.

Edit Location

Screen clipping taken: 8/22/2019 9:54 AM

Drivers report: accelerations, hard brake and speeding. Alerts to managers cell or email

Add new stop

Screen clipping taken: 8/22/2019 9:57 AM

Find Closest Mobiles

Number of Mobiles to Find: 5 [Show Advanced](#)

<input checked="" type="checkbox"/>	Mobile	Driver	Distance(m)
<input type="checkbox"/>	Team 22	Anamaria Sandiego	1000.32
<input checked="" type="checkbox"/>	Team 21	Reyna Serna	1006.02
<input checked="" type="checkbox"/>	Team 03	Elba Escogido	1017.29
<input checked="" type="checkbox"/>	Team 02	Sonia Sontoya	1020.10
<input checked="" type="checkbox"/>	Team 06	Juana Ponce	1020.22

New stops pushed to driver phone app.
If not smart phones on the driver, can integrate into Garmin Turn by Turn devices

Maintenance Reminders

Create Schedule

Schedule Information

Type: Brakes Enabled

Applies To: <All Mobiles>

Distance Interval: Select an interval Pre-Service Reminder Options

Odometer Next Due: mi Remind via email

Time Interval: Select an interval Remind via email

Date Next Due: Remind via email

Engine Hour Interval: Select an interval Remind via email

Engine Hours Next Due: h

Description:

Other Features

Time and attendance available. Clock in/out from road.

No package tracking now. Not for couriers. Future feature - 1 year.

Dash cams available, version with cab view.

Signature capture available.

Route Optimization available for up to 25 stops in a batch.

Users permissions set access to screens. Can have unlimited users in system.

Cost to setup: \$19.95 plus tax/mo min 12 month commitment for 1st year, month to month there after.

Assumes you are doing your own device install.

Devices: No charge for devices. Replacements: yes. Limited life time warranty. \$100 to replace if RRH damages.

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Funding provided by the New York State Energy Research and Development Authority (NYSERDA). NYSERDA has not reviewed the information contained herein, and the opinions expressed do not necessarily reflect those of NYSERDA or the State of New York.

Appendix F. Feature Evaluation

Features	Assesment		Best Tool
Scheduling			
Planning of a route. Routes can be planned on a daily basis or static for weeks/months at a time.	Note: R4M = Route4Me, NT = NexTraq, SS = Samsara, SP = Silient Passanger		
1. Sources of Stops			
a. Standing reoccurring weekly stops	R4M and NexTraq could schedule stops into the feature.	NT	
b. Interface to On Demand request for future pickups.	All had a dispatcher view to add stops.	R4M, NT	
i. Scheduler entering customer calls for future pickup.	Manually schedule stop, drag/drop into run.	NT, R4M	
ii. RRH request web form.	Via web service		
iii. ACM request web form.	Via web service		
c. Input list of stops from patient scheduling software.	Yes, but requires mapping column names.	R4M	
i. File upload of CSV/spreadsheet.	Yes		
ii. PDF	No		
2. Stop can have more than one pickup at location. i.e. building with multiple departments.	Yes, as distinct stops.	R4M, NT	
3. Time per Stop Categories - A stop type has a time allocation for planning.	Can set time at a stop, but no categories.	-	
a. Multi-pickup at same location can get a shorter stop time allocation.	Manually set as part of upload spreadsheet	-	
4. Reoccurring Weekly Schedules			
a. Run has optional stops on certain days of week or day of month	All can schedule stops into the future, or can copy (Master) route . R4M is working on a feature to automate repeated routes.	R4M	
b. Tie to On Demand request system to indicate required on demand stop.	Would need to custom program or use dispatcher to enter		
i. Some stops are dependent on customer calling into system and making request.			
5. Daily run planning	SP, NT & SM could optimize a single route. R4M best		
a. Grouping of stops by geographic area or zip.	Route4Me could do this.	R4M	
b. Assignment of driver	All did		
i. Drivers pre-assigned geographic territory.	none did.		

Features	Assesment	Best Tool
6. Territory analysis and planning	All had usage reports, ability to replay.	
a. Ability to pull historic stop information to feed optimization.	All had re-play. R4M used historic traffic info.	
7. Stop load leveling	Route4Me only one that did all stops.	R4M
a. Ensure drivers do not get overloaded.	All showed est time	
b. Can handle part time and full time drivers.	none could handle part time	
<p>Dispatch</p> <p>Handling on demand request from customer. Visualization of driver location, completed and remaining stops.</p>		
1. Ability for customer request to appear in system - Interface for either customer to directly enter request or an API to enter request.	None directly submit. All could use API to add with custom programming.	
2. Semi-automated queuing of on demand for driver.		
a. Find closest.	NexTraq had screen for who closest, rest need to look on map to see who is closest.	NT
b. Time window for pickup	Could add to a route and schedule.	
3. Assign on demand to driver or 3rd party.	None supported 3rd parties.	
a. Specific time or place in stop list.	Yes, manually	
b. Automatic assignment.	none.	
4. Display list of vehicle/driver stops and route		
a. List driver completed stops, current/next stop, and incomplete stops.	All did. Which depicted best? R4M, NexTraq	R4M/NT
b. Time estimate for arrival of incomplete stops.	All had estimated ETA.	SS
5. Map view of groups drivers/vehicles.	Yes all used Google Maps	
a. Vehicle ID, assigned driver, Position	Yes.	
6. Geo-fencing of vehicles	Yes all	
a. Alert dispatch if vehicle is outside of geo-fence.	Yes	
<p>Vehicle Telematics</p> <p>Live and historic vehicle data.</p>		

Features	Assesment	Best Tool
1. Position, Speed, hard stops, idle.	Not R4M directly, had add-on. Rest did.	
2. Tracker is tamper resistant.	Depends, all use small modules. Samsara had more advanced units with cab cameras. Could mount under dash. Alerts when disconnected.	
3. Tracker reports every 1 to 5 minutes. a. Allowed minimum and maximum	None said explicitly, but close to real-time.	SS
4. Tracker data transferred over Cellular data.	Yes, all	
Package Tracking Ability to timestamp packages and associate with unique package id.		
1. Record acceptance and discharge of packages	None did nicely. Samsara could add document. R4M take notes.	
a. Use barcodes on products.	Take pictures.	
b. Tie to On demand request.	No	
2. Ability to generate package tracking stickers	No	
3. LIS Integration with sorting of bodily fluid samples for particular destinations and temperature.	No	
Reporting User interface that allows running canned and ad hoc reports on different operational attributes.		
1. Reports can be easily exported as Excel files or formatted for printing.	All had extensive reporting.	
2. Flexible report building system.	no demos	
3. Drill down by Driver, Vehicle, Stop	Yes	

Features	Assesment	Best Tool
4. Where are all drivers for Business Unit. a. Map b. List	Had current position. Also historic data.	
	Yes	
5. Time/cost per stop	Samsara had nice dashboard. All had stop reports.	SS
6. Time/cost per territory or route.	-Did not ask-	
7. Integration with Enterprise vehicle management.	None did, NexTraq had own.	
8. Integration with fuel card company.	NexTraq and SamSara	
<p>Driver App Features</p> <p>Drivers carry smart phones that allow them to interact with system. Device has camera, GPS, cellular data.</p>		
1. List view of stops	Yes, all had an app. All pretty basic.	
2. Map view of stops with routes	Yes	
3. Navigation to next destination	Linked to another app on the device to do turn by turn navigation.	
a. Turn by turn directions		
b. Voice prompts		
c. Map view		
d. Bluetooth integration with vehicle	none	
4. Ability to acknowledge receipt of new on demand.	Driver given push message. Did not ask if receipt	
5. Send/receive free form text message.	All	

Features	Assesment	Best Tool
a. Acknowledge receipt of message		
b. Vehicle needs to be stopped for messaging functionality to be operational.	None	
6. Track arriving/departing stop.		
a. Automatic tracking of arrival/departures of reoccurring locations	Yes	
b. Track other modes. Loading, fueling, break, start day, end day	Not directly. Samsara had hour tracking add-on.	SS
7. Record no-show/no-product at stop.	Yes - in free form notes.	
8. Work on Android or iOS	All	
9. Record time tracking punches for payroll system	NexTraq can record and report.	NT
10. Integration with traffic conditions	Not with driver app.	
11. Vehicle Check in/out	Samsara, NexTraq	SS, NT
12. Vehicle Inspections	Samsara, NexTraq	
<p>Software Interfaces</p> <p>Recommend approach is to have RRH write middle-ware that can pull/push data from existing system and then send/read from future transportation software.</p>		
1. On demand requests for Couriers and ACM.	They all have some form a of a web service that RRH software can send request.	
2. LIS for tracking of samples.		
a. Sample pickup/drop off time and locations.	Customization required.	
3. Patient Scheduling	Customization - could be fully automated data pull	

Features	Assesment	Best Tool
4. On demand complete	Customization	
5. Send on demand to 3rd party.	None	
6. Enterprise vehicle management	Not sure	
7. Fuel card company	Yes for Samsara and NexTraq, Fuel Card dependent	
	Count of Samsara Count of NexTraq Count of Rout4Me Count of Silent Passanger	5 8 9 0

Version History

2-9-2019 Initial Release

3-1-2019 Move to Excel. Refine/clarify requirements.

7-23-2019 Integrate RRH responses.

2-6-2020 update for meeting. Add assesment and best tool columns

3-16-2020 tidy up for report

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Appendix G. Transportation Software Toolset

Transportation Software Selection for Composite Fleets

Introduction

The perfect transportation software for your organization is available.... for \$5M and 5 years of development time. If your organization has the odd \$5M lying about you can stop reading this guide. So the question is, which commercially available software package is close enough so that with some process changes and a little customization it meets 98% of the organization's needs? What? 98%? If 98% is not good enough - you need to re-read the first line of this paragraph.

The goal of the guide is to steer you toward that package, by learning the organization, determining critical business processes and finding commercial packages that meet those needs.

Overview

The general process is to learn the existing transportation needs of the organization - review the data, looking for overlaps in the different groups running transportation systems, learn the financials behind the transportation groups and their metrics (like on time delivery, carbon footprint). This should yield opportunities for saving money and can be part of the ROI justification.

While learning the organization record current tools and processes. This effort will generate a list of features important to the groups. Try to keep the features at a medium level of detail to describe the process. We are not writing a software spec. The companion spreadsheet has an example list of features, you will need to customize to meet your organization's needs.

Once we have a feature listing, look through the companion spreadsheet for likely companies, and do your own searching. Select likely vendors and engage their sales group and schedule demonstrations. To find the best package is a compromise, as you go through demonstrations some processes will become critical due to customer or internal constraints. Which package is closest in meeting these needs?

Finally, once we have down selected to the last one or two packages, work with the vendor for detailed quotes and if possible trials on a subset of the fleet. Analysis of the gaps between the feature listing and actual functionality may yield process changes or customizations that will need to be part of the cost model.

Background

What is transportation software?

Transportation-planning software is a suite of tools used to optimize fleet operation by minimizing delivery expenses and maximizing vehicle and driver utilization. A large number of vendors offer software packages and they tend to focus product features to a target market. For example, the transportation-planning tools of long-haul trucking and flower delivery companies have some overlap in features, but will have many different features unique to their sectors. Current software solutions feature multiple modules: mobile applications for drivers, dashboards customized for managers, dispatchers' displays, and screens for maintainers. Often hardware is installed on the vehicles that reports position and vehicle status to backend servers.

After the system is set up with vehicles and drivers, a route planner will obtain a set of addresses (stops) that will be entered into the system and associated with a driver. How the association occurs depends on the package. It may be done manually by the route planner, while others use algorithms to allocate stops to a territory, level driver time loads, or minimize travel distances.

Once the stops are assigned to a driver as a route, it is sent to the driver app and the driver starts progressing through the stops, providing driving directions if required. When the driver reaches a stop, they select it in the app and complete the delivery. Some apps collect delivery signatures or other data. Meanwhile the telematics hardware on the vehicle is sending back location, speed, and braking data so that a dispatcher can monitor the vehicle and the driver's progress along a series of stops. The telematics hardware reads the traffic on the vehicle Controller Area Network (CAN) bus (J1939/J1708) and sends selected content to the fleet-management modules that typically reside in the cloud, such as vehicle error codes that can be used by maintenance personnel or usage information (cumulative miles and hours) and speed data.

If a new on-demand stop comes in during the day, the dispatcher will select the best driver based on closeness or availability and assign the stop. The driver's app will be updated to show the new stop.

The operators of the vehicles, besides driving the vehicle, have special tasks that sometimes require specific training. For example, this project involved mobile phlebotomists who draw patients' blood. Within an individual business unit, most drivers are interchangeable, though there are advantages if the same one serves the same general area and learns the roads and people at their stops.

Many transportation-planning software packages support tracking data for vehicle maintenance and fuel usage, either as part of the core software or through a third-party provider like a fuel-card company. The maintenance can be high-level, like reminders for oil changes, or more focused, like detailed tracking of repairs and parts. An organization will need to select the level of detail required, which depends on whether they do maintenance internally or through a service provider.

Definitions

Telematics - Technology from getting vehicle position, operating mode and engine codes from vehicle to back end server. Typically a module that plugs into vehicle OBDII (on board data) port and uses cellular data to send to server.

Stop - a physical location that the courier needs to make a pickup/drop off or perform an action.

Typical Roles

Driver/Courier - Operator of vehicle, interfaces with customer during drop off/pickups. May have special skills or equipment needed for customer.

Dispatchers - Tracks driver progress during day, receives on-demand request from customers and assigns to an available driver. Uses radio/cell phone/app to communicate with drivers and assign new stops. When problems occur, like a vehicle breakdown, organizes replacement vehicles and transfer of work.

Router - Plans the series of stops for a set of drivers. Considers geographic relationship of stops, driver familiarity with customer at stop and roads. Planning might occur daily or as needed depending on how frequently stops change.

Manager(s) - Depending on size of fleet, one or more people that organize work, hires staff, tracks performance, plans vehicle purchases, maintenance and retirements.

Problem Scope Assumption

Local delivery systems. No ties to larger multi-modal transportation.

Multiple departments working for same parent organization.

Supporting document

With this document there should be a companion spreadsheet with a list of started features and list of transportation packages. Currently called *Ap G - Task 4 Features and Vendors.xlsx*

Process

Learn the organization

departments

drivers

vehicles, age, maintenance, fuel

Special equip, training etc...

Stops assessment

Pick a time period that covers weekly or monthly variation

Frequency analysis - for each location - # stops by department

Flag the hubs.

Time critical stops? Set delivery or pickup times?

Assess

- How interchangeable are the drivers and vehicles?
- Do different departments stop at the same locations?
 - Is there special skills/equipment requirements
 - Time critical stops
- Build matrix of stop locations vs driver visits
 - Columns departments & drivers
 - rows geographic stops
 - Cells - counts of visits during time period.
 - Totals for row both total visits and count unique department/drivers
 - Use 80/20 rule, and look for opportunities in the top 20% of stops with multiple department and drivers.
- Visual tool - map of stops and counts.
 - Google maps supports importing spreadsheet with locations and metadata.

Financial Drivers

Outsourcing cost - Does the organizations use any 3rd party delivery services for packages that are in the same geographic territory as their normal stops?

Fuel and maintenance - Reducing stops will impact vehicle miles driven and thus fuel and maintenance expenditures per year. Also as part of the project, to look at older vehicles as they typically require more maintenance and get poorer fuel mileage. <https://greencars.org/greencars-ratings>

Existing transportation software - There will likely be some transportation software already in use, to be able to standardize on one package would save license cost, training cost, interdepartmental staff redundancy.

Business software interfaces - If each department has their own method of tracking on demand requests, there is a consolidation opportunity if using a single package. The same with different sources of stop information.

Operational costs - Such as Cost per Delivery = (monthly vehicle cost + driver cost + office support + overhead)/number of stops in month.

Management Support

Support at C level - You need it. Change of this magnitude needs support from the top. As many project managers know, without high level support your project is doomed!

No support from C level? Work on financial justification or do pirate pilot to prove value.

Software Search

Review the listing of vendors in the supplied spreadsheet. You can also do some general Google searches to find new candidates. Next do a high level evaluation of the organization and remove vendors that do not meet the basic broad categories for the features.

Software down selection

Check out their site in detail, reviews and trade magazine articles. Watch their how-to videos to get a feel for the software. Evaluate vendor's website and YouTube videos - are they current and up to date. Support documents available to review? At this point you should have 5 to 10 packages that can you believe have the ability to meet most of the requirements.

Engage Vendor

Prepare a short description of your organization and the main features you are looking. Contact the vendor through their website, track the responsiveness of organization. Send the short description to them. Set up demonstrations with a core project group to do the initial assessment. Ask demonstrator to give an overview and examples of important features. Evaluate some of the subjective aspects - Feel of software, modern design, works on organizations browsers/smart phones. Eliminate vendors, so you are down to 3 highly likely candidates.

At this point you should have found that most packages support most of the feature requirements, the hard part for the group is to find the handful of critical features your organization need but the packages do not fully support. For example - one driver has 80 stops in a day, how well does the software show the drivers progress through the stop list? Can you tell which stop he is at or are they all jumbled together on the screen?

Prepare some realistic data, the same stops and supporting information that the groups need now. As you do additional demos, use the realistic data, also bring in more real users to get their feedback. Start getting pricing information. Start doing detailed assessments of which packages do the best for your critical requirements.

Final Selection

Assess the features list and particularly the critical features against the capabilities of the last couple packages. This gap analysis of how close does the package meet the critical requirement, and what are acceptable work-around. Work with the vendor, you might get lucky and they add the feature to their development pipeline.

By now you should have one or two very likely packages, time to do the final selection. Do trial installs, get input from users - listen to the drivers, routers and dispatchers! Work on the financial justification, get quotes for any new or changing business interfaces.

Side note on ITS group input - They should be aware of effort to find new packaged, but should have minimal input until the selection process has narrowed the field of possible packages. Their scope should be on technical side, interfaces to other systems, security of data.

Technology Improvements

Software Trends

Most of the newer packages are designed to run in the cloud. Accessed via browsers and apps. There is a significant advantage for having a cloud based package as they are hosted and maintained by the vendor. A disadvantage is that most do not support extensive customization. A typical pattern for customization of cloud packages is to either have an open API (Application Programming Interface - a way for computers to exchange information) which gives your organization a way to transfer, for example, daily stop list to the package. Another way transportation packages are adding capabilities is through an 'app store' approach where 3rd party tools can be easily integrated into the base transportation package to extend its functionality.

Current baseline tech

- Vehicle Trackers
- Transportation software
 - Driver app with stop lists, receipt acknowledgement.
 - Dispatch and routing
 - Fuel and Maintenance
 - Driver monitoring
 - Business integrations to sources of stops or on demands.
- Use of advanced routing tools - AI for optimizing stop sequence and turn by turn routes that accommodate known traffic patterns. Example is Route4Me which can route a group of vehicles.

Future tech

- Predictive Analytics - Analysis of historic stop to stop times with factors for season, weather, traffic and time of day to more accurately model travel times.
- Integration with outsourcing partners.
- Resiliency with adaptive routing to respond to changing conditions - i.e. major storm.
- Future proof integrations - software hub and spoke service.
- 5G service for real time tracking and driver/dispatcher interactions.
- Conversion to electric delivery vehicles as they come onto the market.

Future - future tech

- Driverless cars to forward position supply orders or consolidate pickups.

Other opportunities for improvements

During the site visits, and in any multi-business unit meeting - look for opportunities for cross department idea transfer.

Future reassessments

Technology is changing, plan on doing another re-assessment in 3 to 4 years. Starting several months before your software is up for renewal.

Scott Nichols
Rochester Institute of Technology
3/31/2020

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Feature Ranking and Vendors

Directions

Please fill out the 'Feature Ranking' tab of the spreadsheet.

The ranking and values you fill in should reflect the needs of your business unit.

The list of features were gathered from interviews with the different business units.

If you think of a feature that is not listed, please add it in.

When complete, please send the spreadsheets to _____.

We will compile the different rankings and discuss in more details during the workshop.

Thank You,

After gathering possible features from individual groups, send Directions and Feature Ranking tabs to user base so they can rank importance (and you will see what is common and different

Category Definitions

Stop - A particular location the courier/tech has to drop off or pick up product or meet with patient.

Route - A series of stops planned in advanced.

On Demand - An unscheduled stop, can be inserted into a planned run or driver sent out specifically. Can be a stat.

Driver - Person responsible for driving their route.

Vehicle - A company owned courier vehicle. Outfitted with tracking and telematics hardware. Some are shared, some assigned to driver for long periods.

Package - What needs to be moved. Could be medical equipment and supplies, medical samples, paperwork.

Feature Ranking Definitions

- 5 Must have, very important, can't do job without it.
- 4 High value, saves time/money, replaces another tool.
- 3 Would make job easier, remove frustration
- 2 Limited value, use once in a while.
- 1 Nice to have, can do job without it.
- 0 Do not need.

Value Column

Your best estimate for dollar savings per month if this feature is in the new software package.

If you need to, you can use a range.

It is better to guess then leave blank.

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Feature Ranking

Ranking	Value	Features	Notes/Comments
0 to 5	\$/mo	Scheduling and Routing	
		Planning of a route. Routes can be planned on a daily basis or static for weeks/months at a time.	

Ranking Value Features

		1. Sources of Stops	Starter list of features. Customize to meet your organization's needs.
		a. Standing reoccurring weekly stops	
		b. Interface to On Demand request for future pickups.	
		i. Scheduler entering customer calls for future pickup.	
		ii. [company] request web form.	
		c. Input list of stops from patient scheduling software.	
		i. File upload of CSV/spreadsheet.	
		ii. PDF	

		2. Stop can have more than one pickup at location. i.e. building with multiple departments.
--	--	---

		3. Time per Stop Categories - A stop type has a time allocation for planning.
		a. Multi-pickup at same location can get a shorter stop time allocation.

		4. Reoccurring Weekly Schedules
		a. Run has optional stops on certain days of week or day of month
		b. Tie to On Demand request system to indicate required on demand stop.
		i. Some stops are dependent on customer calling into system and making request.

Ranking Value Features

		5. Daily run planning
		a. Grouping of stops by geographic area or zip.
		b. Assignment of driver
		i. Drivers pre-assigned geographic territory.

		6. Territory analysis and planning
		a. Ability to pull historic stop information to feed optimization.

Ranking Value Features

- 7. Stop load leveling
 - a. Ensure drivers do not get overloaded.
 - b. Can handle part time and full time drivers.

Dispatch

Handling on demand request from customer. Visualization of driver location, completed and remaining stops.

Ranking Value Features

--	--

- 1. Ability for customer request to appear in system - Interface for either customer to directly enter request or an API to enter request.

- 2. Semi-automated queuing of on demand for driver.
 - a. Find closest.
 - b. Time window for pickup

- 3. Assign on demand to driver or 3rd party.
 - a. Specific time or place in stop list.
 - b. Automatic assignment.

- 4. Display list of vehicle/driver stops and route
 - a. List driver completed stops, current/next stop, and incomplete stops.
 - b. Time estimate for arrival of incomplete stops.

- 5. Map view of groups drivers/vehicles.
 - a. Vehicle ID, assigned driver, Position

- 6. Geo-fencing of vehicles
 - a. Alert dispatch if vehicle is outside of geo-fence.

Vehicle Telematics

Live and historic vehicle data.

Ranking	Value	Features
		1. Position, Speed, hard stops, idle.
		2. Tracker is tamper resistant.
		3. Tracker reports every 1 to 5 minutes.
		a. Allowed minimum and maximum
		4. Tracker data transferred over Cellular data.

Package Tracking

Ability to timestamp packages and associate with unique package id.

Ranking	Value	Features
		1. Record acceptance and discharge of packages
		a. Use barcodes on products.
		b. Tie to On demand request.
		2. Ability to generate package tracking stickers
		3. Integration with _____ system.

Reporting

User interface that allows running canned and ad hoc reports on different operational attributes.

Ranking	Value	Features
		1. Reports can be easily exported as Excel files or formatted for printing.
		2. Flexible report building system.
		3. Drill down by Driver, Vehicle, Stop
		4. Where are all drivers for Business Unit.
		a. Map
		b. List

Ranking Value Features

		5. Time/cost per stop
		6. Time/cost per territory or route.
		7. Integration with Enterprise vehicle management.
		8. Integration with fuel card company.

Driver App Features

Drivers carry smart phones that allow them to interact with system. Device has camera, GPS, cellular data.

Ranking Value Features

		1. List view of stops
		2. Map view of stops with routes
		3. Navigation to next destination
		a. Turn by turn directions
		b. Voice prompts
		c. Map view
		d. Bluetooth integration with vehicle
		4. Ability to acknowledge receipt of new on demand.
		5. Send/receive free form text message.
		a. Acknowledge receipt of message
		b. Vehicle needs to be stopped for messaging functionality to be operational.

Ranking Value Features

		6. Track arriving/departing stop.
		a. Automatic tracking of arrival/departures of reoccurring locations
		b. Track other modes. Loading, fueling, break, start day, end day
		7. Record no-show/no-product at stop.

Ranking Value Features

- | | | |
|--|--|--|
| | | 8. Work on Android or iOS |
| | | 9. Record time tracking punches for payroll system |
| | | 10. Integration with traffic conditions |
| | | 11. Vehicle Check in/out |
| | | 12. Vehicle Inspections |

Software Interfaces

Recommend approach is to have [company] write middle-ware that can pull/push data from existing system and then send/read from future transportation software.

Ranking Value Features

- | | | |
|--|--|---|
| | | 1. On demand requests for _____ from _____. |
| | | 2. _____ for tracking of _____. |
| | | a. Sample pickup/drop off time and locations. |
| | | 3. Customer Scheduling |
| | | 4. On demand complete |
| | | 5. Send on demand to 3rd party. |
| | | 6. _____ vehicle management system |
| | | 7. _____ fuel card company |

Vendors and Packages

Vendor	Product	Link	Major Features	NYS Company?	Notes	Possible solution
ArcLogistics		www.routesolutions.com	Routing. Combine with TomTom get dispatch. Push driver. Tracking/Telematics			
ARI		https://www.arifleet.com/	Account Management Driver Management Fuel Management Maintenance Management Vehicle Management			
Breath King LLC	Real Time GPS	https://realtimegps.us/	Task Management Connect ERP Scheduling Driver Management Routing			
Bringg		https://www.bringg.com	Dispatch Routing Driver App Package Tracking Warehouse			
C2Logix		www.c2logix.com	Routing, dispatch, driver app			
CACI	AllMapData TruckStops OptiSite	https://www.caci.co.uk/location-planning/geospatial-data-log	routing source data			
Cell Control		https://www.cellcontrol.com/technology-platform-to-elimina	Driver Management			
Cheetah Logistics		www.cheetah.com	Routing, driver app, dispatch automation.			
ClearPath GPS		https://clearpathgps.com/	Driver Management Fuel Management Routing Vehicle Tracking			
Connexion Media LTD	CXZ Telematics	http://www.cxztelematics.com	Location Behavior Distance Engine Speed			
Descates		www.descartes.com/solutions/dms/daily_planning.html	Routing, driver app, telematics			
Dispatch Science		www.dispatchscience.com	Routing, tracking, scheduling			
eTran		https://etransoftware.com/	Semi-custom trans management. Routing, tracking, dispatch etc..	Yes		
Fleet Commander		http://info.agilefleet.com/capterra-automated-fleet-and-mot	Dispatch Management Driver Management Fuel Management Maintenance Scheduling Maintenance Tracking Vehicle Tracking			
Fleetio	Fleetio Drive	https://www.fleetio.com	Driver Management Routing maintenance			
Fortigo Freight Services		www.fortigo.com	Routing driver app, tracking.			
Gajema			An LSI system. Acquired by Cerner which offers healthcare solutions.			
Geotab GPS	GPS to GO	https://www.gpstogo.com/fleet-tracking/real-time-gps/	Vehicle Tracking Basic Route Planning.			
GeoTab		https://www.geotab.com/	vehicle tracking, routing, 3rd party dispatch			
Global Resource Group	GRG Fleet Solutions	https://www.grggps.com/	Driver Safety Productivity Fleet Optimisations Expandability Compliance GPS Hardware			
GPS Insight		https://www.gpsinsight.com/landing/bpc/gps-insight-solution	Vehicle Tracking			
ILOG Transportation Analyst		https://www.ibm.com/customer-engagement				
IMB	Sterling Transportation Management System	www.sterlingcommerce.com				
Infor		www.infor.com/transportation-logistics/				
IntelliRoute		www.randmcnally.com	Routing, telematics			
iTRAK	iTRAK	https://www.itrak.com/EN/	Vehicle Tracking Remote codes			
JDA (Red Prairie)		https://www.accelogix.com/				
Keubix		https://www.keubix.com/				
Logisplan		http://logisplan.com/				
Manager Fleet		https://www.managerplus.com/lps/fleet-maintenance-softwa	Fuel Management Maintenance Scheduling Maintenance Tracking Vehicle Tracking			
MCE		http://medicalcourier.com	Routing Dispatch Driver App Product tracking Vehicle Tracking			
NexTraq	NexTraq	https://www.nextraq.com/	Vehicle Tracking Driver Behavior Maintenance Tracking Routing Dispatching Driver Management Fuel Management Geofencing			
Omnitracs	RoadNet	https://www.omnitracs.com/products/omnitracs-roadnet-rou	Routing Dispatching Driver App Navigation			
Paragon Software Systems		www.paragontruckrouting.com/	Routing, package tracking, driver app			
Pathfinder Logistics Solutions, Inc		www.pathfinderlogistics.com				
Path-Tec		https://www.path-tec.com	Routing Dispatching Driver App Product tracking			
PC*Miller		www.alk.com	Routing, Driver app,			
Prism Virtual Software		www.prismvs.com	Routing, dispatch, service requests (on demand?)			
Prophesy		https://mile.com/	Dispatch, driver app			
PTV Route Optimiser		www.routeoptimiser.com/	Routing, driver app			
Rhino	Rhino Fleet Tracking Systems	http://www.rhinofleettracking.com/gps-fleet-tracking/	Vehicle Tracking			
Route Optimix		www.routeoptimix.com	Routing, dispatch, driver app, service requests (on demand)			
Route Planning		www.apssystem.com				

Vendors and Packages

Vendor	Product	Link	Major Features	NYS Company?	Notes	Possible solution
RouteMatch	RouteMatch	https://www.routematch.com/	Routing (fixed and demand) Driver App Tracking Telematics			
Routematic		https://www.routematic.com/	Routing driver app, tracking.			
Routeware		https://routeware.com/	Routing.			
RoutingBox		https://routingbox.com/	Routing, dispatch, tracking, billing	Yes		
Runzheimer		https://www.runzheimer.com/	Trip planning			
Safety Track	ServicePlusSimple Tracking SystemComplete G	https://www.safetytrack.net/	Vehicle tracking & video monitoring			
Samsara		https://www.samsara.com/	Dispatch Management Driver Management Fuel Management Maintenance Tracking Routing Vehicle Tracking			
ServMan	Route based business	www.servman.com	Routing, self service, driver app			
Sierra Data Systems		https://www.sierradata.com/software/	Dispatch Routing Product Tracking Driver app			
Silent Passenger		http://info.silentpassenger.com/	Dispatch Management Driver Management Fuel Management Maintenance Scheduling Maintenance Tracking Routing Vehicle Tracking	Yes		
Spireon	FleetLocate	https://www.spireon.com/	Driver Management Geofences and Landmarks Mobile Access Speed Monitoring			
Swan Leap		https://swanleap.com/				
Titan GPS		https://titangstracking.com/lp/titan-gps-reviews/	Vehicle Tracking			
TomTom Telematics	WebFleet	https://telematics.tomtom.com/en_us/webfleet	Vehicle Tracking Fleet Optimisation Workforce Management Green & Safe Driving Business Integration Mileage Logbook Professional Navigation Traffic Avoidance			
TrackRoad		www.trackroad.com	Routing, dispatch, driver app			
Trimble		www.trimble.com/	Tracking, Fleet management			
TruxTrax, Inc.	TruxTrax	https://www.truxtrax.com/real-time-tools/	Vehicle Tracking Communication Alerts and Reminders			
UPS Logistics Technologies	Logistics Technology	https://www.ups.com/us/en/services/professional-services/te				
VAI		www.vai.net				
Vantiq Corporation	Vantiq	https://vantiq.com/vantiq-use-cases/real-time-fleet-managem	Vehicle tracking Auto assignment Shippment tracking/signoff			
Veresy	Veresy Fleet Tracking Support	https://veresy.com	Real Time Tracking Route History Playback Fuel Management System			
Verizon		https://www.verizonconnect.com/	Driver Management Fuel Management Maintenance Scheduling Routing Vehicle Tracking			
Whip Around		https://www.whip-around.com/	Digital VIR			
Zonar		https://www.zonarsystems.com/	Tracking, driver reporting, VIRs, hours			

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