Market Guide for Vehicle Routing and Scheduling

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Managers of private fleets and for-hire carriers are seeking enhanced tools to improve vehicle routing in a volatile transportation environment. Supply chain leaders overseeing fleet management can use the VRS trends, solutions and vendors presented in this research to make better system decisions.

Key Findings

- There is an increased need for real-time, dynamic technology to help tackle the current challenges of the transportation industry such as reduced capacity, driver shortage, increased traffic congestion and a significant increase in last-mile deliveries.
- There is a pressing need to bring vehicle routing and scheduling (VRS) into the cloud as the "speed of doing business" is increasing and VRS solutions need to keep pace by evolving their capabilities.
- Vendors of VRS continue to enhance their vehicle routing solutions to allow a single platform for private and third-party fleets while also extending their capabilities and services.
- The VRS market remains fragmented, and vendors focus on specific fleets, industries and geographies. Few vendors offer a global solution and support.

Recommendations

Supply chain leaders and fleet managers looking into routing and scheduling technology:

- Fully assess your requirements, especially in the areas of route optimization, to narrow your choice of vendors. Understand your needs for all types of fleets being used as well as the different movements of inbound, outbound, intercompany or last mile.
- Review solutions cautiously for functionality offered, industries covered and geographical presence when assessing VRS solutions.

- Consider emerging VRS capabilities, such as real-time dynamic routing, real-time slot booking and real-time visibility, to see if their benefits warrant adoption or replacement for your business.

Market Definition

Vehicle routing and scheduling (VRS) is a mature market. Fleet routing and scheduling solutions are specialized transportation management applications aimed at organizations that directly (e.g., private fleet) or indirectly (e.g., a dedicated contract fleet) control and manage shipping assets (e.g., tractors and trailers) and resources (e.g., drivers). These tools are typically used to develop route plans that meet the delivery objectives at minimal cost/mileage based on the firm's input (such as from orders), rules and constraints. The aim is to minimize transportation costs while satisfying feasibility constraints as to when and where stops are made, what can be loaded in each vehicle, and what routes drivers can serve.

When first introduced, fleet routing and scheduling applications focused principally on planning and optimization. However, as these solutions have matured, we find vendors broadening the application footprints of these solutions to support more fleet management capabilities, such as dispatching, automatic vehicle location, driver mobility capabilities (such as real-time communication, proof of delivery or appointment scheduling), integration with onboard vehicle telematics and real-time visibility. More recently, they have started experimenting with blockchain. There are three types of routing and scheduling (see Table 1).

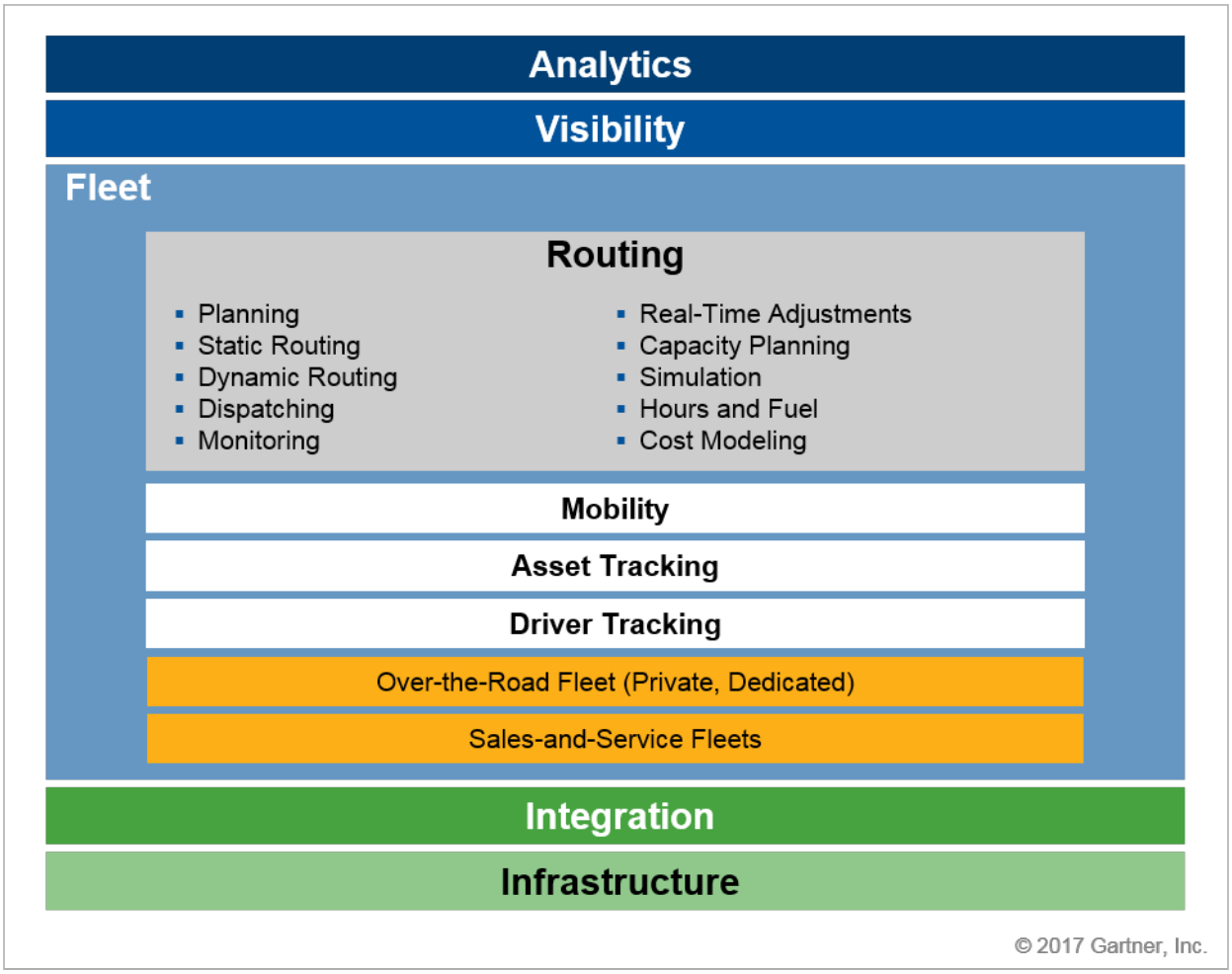
Table 1. The Three Types of Routing and Scheduling

Routing Type	Description
Static Routing	The static routing tool uses a forecast of daily/weekly volume to build the appropriate path a driver would take on each day/shift during the course of the week. Static routing would be used by organizations that schedule visits with specific locations. Static routing is used by beverage and snack food companies for selling to convenience stores and by uniform companies dropping off and picking up employee uniforms at factories or hospitals, for example. As the driver is, in many cases, also the customer contact, the salesman and the merchandiser, it is key to route these customers in a way to keep that established relationship with the customer whole.
Dynamic Routing	In dynamic routing, daily orders are entered into the system and dropped into the application for building delivery routes for the next day or next several days. This could be based on real orders from the order management applications or forecast and placeholder orders. Industries like retail and grocery would take daily store demands in the form of orders and build optimal routes for the next day.
Real-Time Dynamic Routing	In a supply chain where same-day orders and rapid changes are prevalent, such as the e-commerce or healthcare sectors, systems need to adapt much faster to last-minute changes. As technology has advanced, some VRS solutions have become more able to respond to changes throughout the day. For example, as real-time information gets passed back to these systems from either the mobile apps or telematics solutions, plans are continuously refined based on these feeds. In addition, when new orders come in for same-day delivery and/or service, these are added to the existing plan and reoptimized. The ability to reroute and create new plans throughout the day provides fleets with bigger flexibility and better insights. Where traditional systems used batch solver engines, real-time dynamic routing is not simply about running these engines more frequently. They also have the ability to run this very fast (using the cloud and machine learning to improve and speed up the algorithmic optimization).

Source: Gartner (November 2017)

Companies commonly use more than one type of routing, whether it is a combination of static and dynamic routing or a combination of dynamic and real-time dynamic routing. For example, a company focused on creating repeatable routes such as a direct store delivery company needs delivery forecasts by day, while a different company looking at dynamic routing would require that daily orders are integrated to the VRS. The underlying algorithms and data to support each routing type are different, although many vendors support these capabilities with their solutions in varying degrees and with varying performance (see Figure 1).

Figure 1. Holistic View of Vehicle Routing and Scheduling



Source: Gartner (November 2017)

Market Direction

The market for VRS continues to evolve from both an economic perspective and a capabilities perspective.

Logistics Strategy Trends

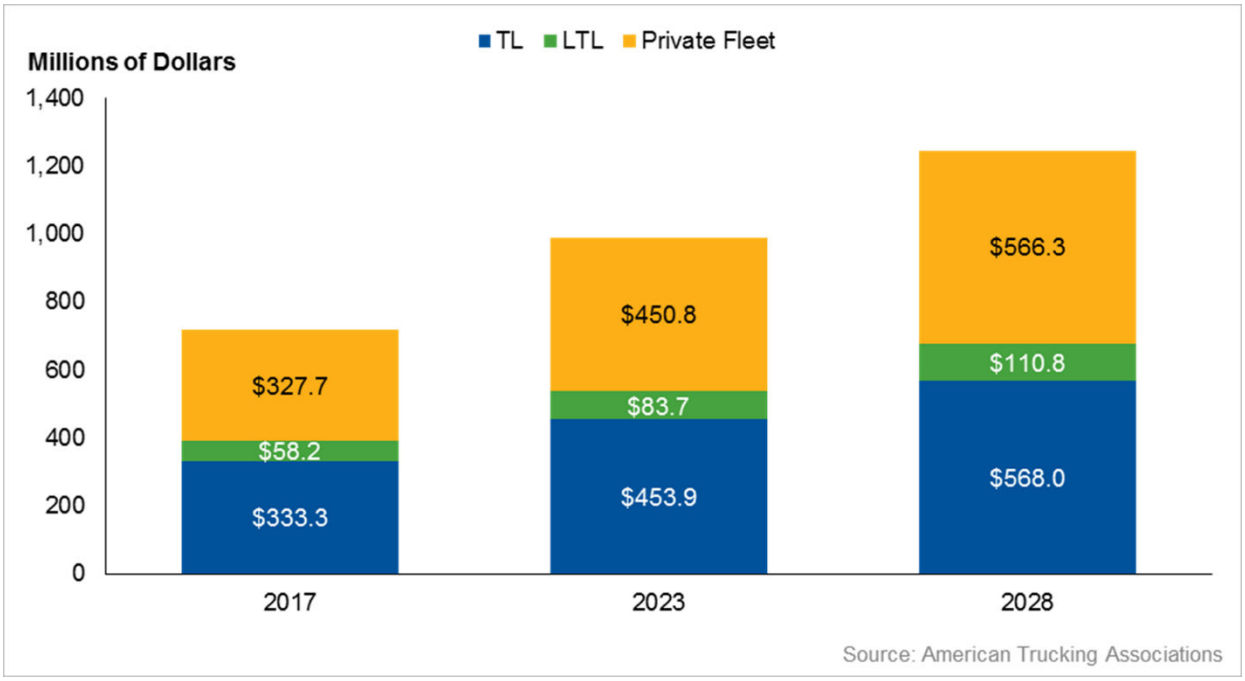
Many leading organizations are now including VRS in their technology portfolios and strategies for a variety of reasons. These include an increased requirement for final-mile service visibility, agility and flexibility in the e-commerce sector and a pressing need to more effectively manage assets to combat growing capacity challenges in key markets. The improved operational visibility these systems offer coupled with the ability to optimize the preplanning of cargo movements are enabling organizations to improve the overall utilization and management of their assets and navigate some of these challenges.

As outlined in Gartner's framework for logistics development (see "Gartner's Framework for Developing Logistics Capabilities"), technology is one of the most fundamental enablers of maturity progression. So, as companies are working on establishing their logistics strategy, technology and the investment in new solutions that can support these new strategies are growing in importance.

Transportation Industry Trends

The American Trucking Associations (ATA) released its U.S. Freight Transportation Forecast for 2028 (see Figure 2). The ATA projects a 36.6% increase in freight tonnage and an increase in freight revenue of 78% to $1.603 trillion in 2028 (compared with 2017).[1] Trucking will still be the dominant mode of freight transportation, although the share of tonnage it hauls dips slightly from 70.7% in 2017 to 67.1% in 2028. The largest part of trucking is still truck load (TL) or third-party hauled freight, although private fleet is only very slightly behind it. The number of Class 8 trucks in use in the U.S. will grow from 3.33 million in 2016 to 4.07 million by 2028.

Figure 2. ATA 2028 Forecast: Growth in Transportation Revenue in the U.S.



Source: American Trucking Associations (ATA)

We notice similar developments in the European market where transportation revenue is growing and is confronted with similar challenges. Capacity in the U.S. and Europe keeps shrinking because of trucking company failures due to an increasingly difficult transportation industry. The transportation industry is facing several challenges:

- Increased expenses (more expensive trucks, increased insurance rates, higher wages)

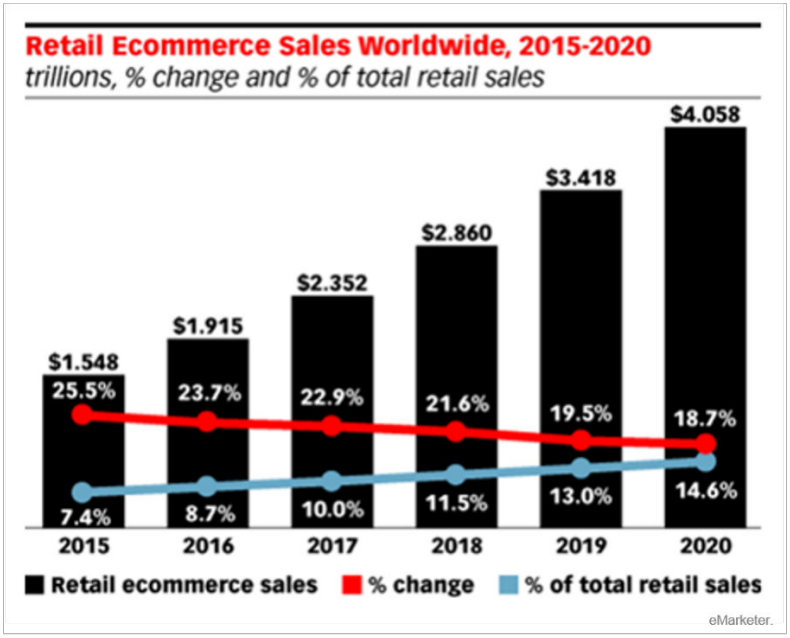
- The prohibitive costs of adding drivers (driver pay is now the highest part of the cost of transportation)
- Increasing driver turnover
- Driver shortages due to an aging driver population
- The effects of the ELD mandate for the U.S.

The hours of service rules are taking a bigger bite out of fleet productivity. As a result, fleets are looking at technology to make up for this loss in productivity (see "What Is Behind the Rise in U.S. Transportation Costs?").

Increase in E-Commerce Volume

Online shopping in 2016 increased by 15.2% over 2015. Annual growth rates are expected to remain at 10% to 15% over the next 10 years (see Figure 3). This impacts the way retailers route their vehicles, their vehicle makeup (as in a much more varied trucking fleet with over the road [OTR] as well as final-mile fleets) and a greater need for real-time routing capabilities enhanced by real-time visibility.

Figure 3. Growth in E-Commerce Volume



Source: eMarketer

Delivery appointment scheduling capability is essential for last-mile fulfillment. The ability to schedule the order delivery at the point of sale, while considering the cost of delivery and existing delivery routes, requires orchestration with inbound lead times and outbound route planning. Route planning and optimization capabilities lie at the core of effective last-mile delivery. Adopting

solutions that create more deliveries and fewer vehicles that drive fewer miles helps companies achieve positive results.

Vehicle Routing and Scheduling Technology Trends

Cloud

Vendors are increasing support for cloud-based delivery platforms. While a majority of the vendors support both on-premises and SaaS-based platforms, we also see a growing number of cloud SaaS deployment models. The market leaders for these solutions, such as Omnitracs (Roadnet Telematics), TMW Systems, Descartes, Ortec and Quintiq, all see a growing part of their customer base on the cloud. There continues to be strong potential ahead for cloud-based vehicle routing solutions, mainly due to the lower cost of entry presented by the on-demand software delivery option.

In addition, vendors are increasingly providing solutions for smartphones on Apple's iOS operating system, as well as Google's Android, making routing tools available on tablets and smartphones. These applications are used for monitoring drivers as well as for electronic bills of lading, electronic signature capture and product scanning. Some vendors also distribute these applications via app stores.

Improved Optimization Algorithms

Vendors employ a variety of algorithms to solve complex routing problems. They continue to improve the performance of their optimization engines through the use of the cloud and machine learning in the algorithmic computations. In some cases, the use of machine learning has helped vendors increase their optimization times ninefold (see "Disruptive Technologies in Transportation: The Impact of Artificial Intelligence and Machine Learning").

This improved speed helps retailers, for example, offer real-time available delivery slots and speed up the optimization of same-day orders. Vendors benchmark their solutions. One of the most known benchmarks is Gehring and Homberger's 1,000-customer benchmark for Vehicle Routing Problem with Time Windows (VRPTW). The vendors are asked to compute a sample of 50 routes, 1,000 stops and two-hour hard-time windows. The average time for routing the optimal solution was six minutes, with some vendors reporting more than 15 minutes and some vendors reporting a few seconds.[2]

Convergence Between TMS and VRS

Initially, VRS applications typically focused on routing planning. Now, however, the focus has shifted more toward execution, and vendors are broadening their capabilities to offer support for proof of delivery, tracking and compliance. VRS solutions now also offer capabilities in the area of last-mile delivery.

As many large shippers leverage for-hire carriers as well as operate their own private fleets, many vendors have expanded their solutions to support both modes. Historically, third-party and private fleet movements would have been routed separately using different solutions: transportation management solutions (TMS) for the for-hire carrier moves; and vehicle routing and scheduling for the private fleet. Many shippers now seek solutions where they can solve for both in a single optimization so opportunities such as backhaul with private fleet can be realized.

When addressing private fleet operations, managers must consider a range of areas such as:

- Asset utilization
- Driver and vehicle availability
- Driver skills
- Driver performance management
- Pay
- Compliance issues, hours of service, vehicle inspections and fuel tax reporting

These are all significant factors in the planning and execution process. Having access to the detailed information and procedures for managing the people and assets required to operate the fleet is the basis for successful optimization and execution of fleet-based deliveries. For purchased transportation, the asset management considerations are typically not a significant concern (as this is done by the carrier), with the possible exception of specialty transport. The primary basis for optimizing and executing for-hire transport activities is ensuring that suppliers on the transport lanes meet contract conditions. These include pricing agreements, coverage areas, equipment types (but not necessarily quantities) and, in some cases, volume agreements. Having a set of reliable carriers on a lane ensures availability when volumes spike or a carrier is short of equipment and has to turn down a tendered load.

Enterprise TMS solutions are providing more extensive fleet capabilities (in some cases, the TMS vendor did not have any private fleet capabilities) and VRS solutions are including capabilities for solving for-hire carriers by extending their solution set or partnering with a TMS vendor. Bringing these two functions together can be very complex as the requirements for pricing, planning and executing private fleet and for-hire assets involve different information and different business processes.

New Technological Advances Are Extending Mature Systems

Vendors with mature technologies are increasing the scope and effectiveness of vehicle routing systems. Embedding advanced real-time intelligence into such solutions continues to be one of the leading improvements. Through the use of artificial intelligence (AI) and machine learning, these solutions can provide algorithms that track the real-time movement of shipments and calculate their estimated time of arrival, factoring in the impact of weather conditions, port congestion and natural disasters. Embedding real-time intelligence enables companies to identify negative trends in costs and performance — and identify root causes — as early as possible so they can take corrective action.

This use of AI and machine learning is also changing the way traditional optimization engines plan transportation. They are evolving into software-based systems that are programmed to learn and adapt, rather than being programmed only for a finite set of prescribed actions. This provides companies with a new set of capabilities never before available (see "Disruptive Technologies in Transportation: The Impact of Artificial Intelligence and Machine Learning").

Combined loading and routing, integrated traffic congestion optimization, real-time visibility, and transportation modeling are other capabilities that more vendors are offering and that allow fleets to make important strategic decisions. Some vendors such as Ortec and Quintiq have combined routing with other supply chain planning applications such as inventory planning, production planning and demand forecasting, and order generation (see "Converging Supply Chain Planning With Transportation Planning Provides Efficiency Opportunities").

Blockchain is another technology that has big promises for the transportation industry. Although most of the use cases are still in the conceptual stage, some vendors have built several offerings for blockchain into their transportation suite. TMW, for example, has one product already in production and several to follow in 2018. Technology vendors continue to work with carriers and shippers on how blockchain can provide the industry with new and revolutionary capabilities. In August 2017, the Blockchain in Trucking Alliance (BiTA) was formed for the transportation industry with the goal to collaborate and create standards for blockchain in transportation (see "Supply Chain Brief: Is the Use of Blockchain in Transportation Hype or Reality?").

We continue to see acquisitions in the market such as Descartes' acquisition of MacroPoint and Trimble's acquisition of 10-4 Systems. We also continue to see partnerships between TMS and VRS providers to expand their solution footprint (e.g., TMW and 3Gtms). This is all part of vendors broadening their solution sets. VRS is, in most cases, no longer a stand-alone solution; it is an integral part of the transportation process from planning to analysis.

Market Analysis

The VRS market continues to be fragmented with a few large, global vendors and many small-to-midsize vendors that are either regional or industry focused. Vendors differ based on functionality offered, solution platform, fleet type and size, geography and industry focus. Most vendors focus on a specific fleet size (either large or small-to-midsize fleets), a specific region and specific industries. Only a handful of vendors are truly global players.

VRS Functionality

The key functionalities offered by the VRS solutions are territory planning, route planning (static, dynamic and real-time), dispatch, real-time visibility and analytics.

Although most vendors support both trucking fleets and sales delivery fleets, we see a segmentation in the market between the offerings for both types of fleets. Functionality appears similar when looking at it from a high level, and the trucking fleets need more scenarios for more

complex movements that need to align with driving regulations. Sales delivery fleets operate in a more dynamic environment and in last-mile delivery scenarios.

VRS Platforms

More vendors are moving toward cloud-delivered solutions. Traditional systems were typically delivered using the on-premises model. More systems started providing hosted solutions in the last decade, and have more recently evolved to cloud-based solutions. The cloud offers many advantages to the customer, such as inexpensive hosted solutions that are often pay-as-you-go, faster onboarding and ramp up, reduction in the downtime of the solution, and higher reliability. The cloud has made these VRS solutions widely available, especially for a large amount of smaller fleets. We see companies with fleets of even a few vehicles successfully adopting these types of solutions.

Gartner has observed that more large implementations of the VRS solutions have been going into the cloud over the last three years. However, VRS is lagging the TMS market where multitenant cloud solutions have become the de facto platform.

VRS Market Segmentation by Fleet Type and Fleet Size

The VRS market is segmented based on the type and size of the fleets for which it is providing solutions. Gartner research indicates that products are also segmented by industry as well as geography.

This Market Guide focuses on vehicle routing solutions where vehicles are defined as "a thing used for transporting people or goods, especially on land, such as a car, truck or cart." Other solutions exist for other modes, but this Market Guide specifically focuses on road transportation.

The vendors researched for this Market Guide offer solutions for trucking fleets, sales delivery fleets, couriers and, in some cases, service fleets. Some vendors focus more on the private fleets, while other vendors focus more on asset-based carriers. There seems to be some overlap with field service management solutions when it comes to the routing of service fleets. Several of the vendors discussed in this research also provide field service management solutions (see "Magic Quadrant for Field Service Management"). This report does not cover government fleets.

VRS Market Segmentation by Geography

The biggest markets for these solutions are North America and Western Europe. We find the biggest concentration of vendors located in the U.S., the U.K. and the Netherlands. Most of these vendors have offices and a presence in other countries as well. In the U.S., there are over 1.6 million fleets.

Other important markets for VRS are Australia, New Zealand, South Africa and Brazil. Markets with opportunity include Mexico, Argentina, Chile, India, China and Russia. Although the market opportunity in South America and Asia might be smaller than in the U.S. and Europe, so is the competition. One strategy that vendors adopt to penetrate these newer markets is partnering with an already-established company that offers complementary solutions, such as telematics or field service management.

Ninety-eight percent of all fleets have 50 vehicles or fewer. Over 77% of fleets have only one to four vehicles (based on ATA data). The new technologies that are available for VRS allow even the smallest fleets to adapt these solutions at very affordable prices. This allows smaller over-the-road truck fleets to successfully compete against larger — not to mention mega-sized — motor carriers if their owners take advantage of the opportunity to fully leverage the solutions that are available to them.

Although smaller vendors are more focused on their core regions, the leaders in the VRS space offer solutions on a global scale.

VRS Market Segmentation by Industry

VRS solutions are used in multiple industries. The food and beverage industry is a large basis for VRS, where many manufacturers operate private fleets. Transportation companies form another large user base of VRS solutions. Retailers have used routing solutions for home delivery for years and, with the boom of e-commerce, have increased their investments in these solutions.

Most vendors focus on the industries that have large truck numbers. Part of enhancing their solutions is also making them available across multiple industries. Consumer packaged goods (CPG), retail/wholesale, construction, and oil and gas are just some of the industries that have large fleets and, thus, are ideal candidates for these types of solutions.

Although for-hire fleets are shrinking due to driver shortages, private fleets are expanding because more companies see the value of having a private fleet. These companies want to ensure they have capacity and find it easier to attract drivers for private fleets.

VRS Additional Functionality

VRS vendors are increasing the breadth of their solutions by providing more strategic capabilities, such as transportation modeling, real-time executional capabilities, track-and-trace and other mobile solutions as well as future capabilities such as blockchain. By offering these additional capabilities, vendors can offer more value to their customers while differentiating themselves from their competitors.

Representative Vendors

The vendors listed in this Market Guide do not imply an exhaustive list. This section is intended to provide more understanding of the market and its offerings.

In a market where there are many vendors that focus on different customer types, industries and geographies, we see a lot of common traits in the solutions offered.

Most vendors offer planning capabilities, including static routing and dynamic routing. More prominent vendors also offer real-time dynamic routing, allowing last-minute changes and new orders to be dynamically routed in near real time.

There are significant differences in the optimization capabilities of some of the leading vendors compared with the rest of the vendor market. These include the number of scenarios they can solve for and performance. So, depending on the complexity of your fleet network, the solution's optimization engine could be a major differentiator when vendors are compared.

Gartner also recognizes the usability of the solution (and, in particular, the user interface) as a differentiator between some of the older, established vendors and the newer offerings in this market.

Where solutions traditionally used to be on-premises, more solutions are now hosted or managed as a service in the cloud by the respective vendor. There is a push for cloud-based options, allowing companies more rapid adoption and implementation. In our survey, we found that these vendors have customers with fleets as small as one truck. The lower level of complexity of these fleets, compared with a need for more basic capabilities, allows these cloud-based solutions to be implemented in a matter of weeks. As the complexity increases and solutions are implemented on-premises, implementation projects take more time (typically three to six months).

In this Market Guide, the VRS vendors are divided into three categories:

- **Large** vendors that offer solutions from smaller to very large fleets and have a presence in multiple regions. Some vendors are very niche routing vendors and some offer routing together with other solutions such as TMS, field service management or telematics.
- **Medium/Regional** vendors that focus on small-to-midsize fleets and on a specific region.
- **Small/Local** vendors that offer solutions for smaller fleets in a specific local area.

In addition to packaged routing and scheduling applications, there are a variety of local service providers that can take generic algorithms in this area and build a custom routing system (see Table 2).

Table 2. Overview of VRS Vendor Trucking Fleets, Sales Delivery Fleets and Service Fleets

	Website	Geography (Customer Base)
Large Vendors		
Accellos (HighJump)	www.highjump.com	North America, Europe
BluJay	www.blujaysolutions.com	Global
Bringg	www.bringg.com	Global
Descartes	www.descartes.com	Global
Geoconcept	http://en.geoconcept.com	Europe, North America, Asia, ROW
JDA	https://jda.com	Global
Manhattan Associates	www.manh.com/en-in	North America
MercuryGate International	www.mercurygate.com	North America, Europe, Asia/Pacific
Omnitracs (Roadnet)	www.omnitracs.com	Global
Oracle	www.oracle.com	Global
Ortec	http://ortec.com	Global
Paragon	www.paragonrouting.com	Global
Quintiq (Dassault Systèmes)	www.quintiq.com	Global
SAP	www.sap.com	Global
TMW Systems (Trimble)	www.tmwsystems.com	Global
Verizon (Fleetmatics) (Telogis)	www.fleetmatics.com www.telogis.com	Global
WorkWave	www.workwave.com	Global
Medium/Regional Vendors		
AMCS (Transvision)	www.amcsgroup.com/us/	Global
AutoLogic Systems	www.autologic-systems.co.uk/	Europe, Africa
C2Logix	www.c2logix.com	North America
Carrier Logistics	www.carrierlogistics.com	Global

	Website	Geography (Customer Base)
Cheetah Logistics Technology	www.cheetah.com	North America
Civix (FleetRoute)	www.fleetroute.com	Europe, North America
FarEye	www.getfareye.com	Asia, Europe
Gapso (Accenture)	www.gapso.com	South America
Made4net	www.made4net.us	Global
Mapmechanics (Truckstops)	www.mapmechanics.com	Europe, North America
Maxoptra	www.maxoptra.com	Europe, North America
MJC^2	www.mjc2.com	Europe
Mobi	www.mobicorp.com	North America
OptiTool	www.optitool.de	Europe
Optrak	http://optrak.com	Europe
Pantonium	www.pantonium.com	North America
PTV DPS	www.dps-int.com	Europe, South Africa
Route Monkey	www.routemonkey.com	Europe
RouteSmart Technologies	www.routesmart.com	North America
Scientific Logistics	www.scientific-logistics.com	North America
TranSend Solutions	www.transendsolutions.com	Europe
WiseTech Global	www.wisetechglobal.com/	Global
Trapeze	www.trapezegroup.com	North America
TripSpark	www.tripspark.com/	North America
Wide Scope	www.widescope.pt	Europe
Small/Local Vendors		
Cercalia	www.cercalia.com	Europe
Elite EXTRA	www.eliteextra.com/home	North America
MobileIQ	www.gomobileiq.com/	North America

	Website	Geography (Customer Base)
OptimoRoute	https://optimoroute.com	North America
Route4Me	www.route4me.com	North America
RouteSolutions	www.routesolutions.com	North America
RouteStar Solutions	www.routestarsolutions.com/	North America
Routific	https://routific.com	North America
Routing Reparto	www.routingreparto.com	Europe
TrackRoad	www.trackroad.com	North America
UniSolutions	www.unisolutions.com.ar/	South America

Source: Gartner (November 2017)

The vendors described in the next section responded to the Gartner survey that was sent out to 24 VRS vendors, as well as vendors that Gartner does regular vendor briefings with.

Vendors in This Market Guide

BluJay

Product Name: Fleet Management, MobileSTAR

BluJay is a global provider of supply chain management solutions including TMS, parcel, GTM and fleet management. The Fleet Management solution consists of a route planning solution focused on private and dedicated fleets that supports a shipper's blended for-hire and private/dedicated carrier strategy. It offers dynamic planning of daily fleet activity, manages driver regulations, and automates driver assignments and shipment scheduling. The acquisition of Blackbay in 2017 brought a solution to support sales delivery vehicles called MobileSTAR. Fleet Management is fully integrated into the normal planning and execution workflow of the BluJay TMS. This single workflow provides customers visibility to all aspects of their operations, regardless of mode, in one system. BluJay Fleet Management is available globally and has implementations in the U.S. and Australia.

Bringg

Product Name: Bringg

Bringg is one of the newer vendors in the VRS space. Bringg was founded in 2013 and offers a customer-centric logistics solution for enterprises to optimize and prioritize their routes and deliveries more efficiently and in real time. The Bringg platform can accommodate a variety of

delivery modes and providers, like using a mix of in-house and third-party fleets, or expanding fleets with crowdsourced drivers during busier times. It focuses mostly on the retail, CPG, foodservice, and third-party and fourth-party logistics provider industries with customers in more than 50 countries around the world.

Carrier Logistics

Product Name: Facts

Carrier Logistics (CLI) offers freight management solutions for transportation companies (carriers and third-party logistics providers) focused on ground transportation (less than truckload and parcel). Carrier Logistics' transportation management system Facts includes over 20 modules from order entry to driver pay. CLI offers its solution on-premises as well as hosted. CLI has implementations in the U.S., Canada, Europe and Asia.

Cheetah Logistics Technology

Product Name: LOOP

Cheetah Logistics Technology provides real-time logistics and dispatch solutions for first-mile, last-mile, healthcare, retail, intermodal, courier, delivery, freight, truckload and less-than-truckload, third-party carriers, and for-hire and private fleet operations in the United States and Mexico. Its Logistics Operations Optimization Platform (LOOP) includes Cheetah Delivery, a real-time routing, planning, dispatch and delivery software that enables distribution and delivery firms to increase the efficiency of route planners, dispatchers, drivers and customer service representatives with live automatic adaptation to changing operational conditions, including traffic, weather, accidents, customer cancellations, new stop-insertion, relays and driver exceptions. The platform also includes Cheetah Courier; Cheetah Freight, Truckload and LTL; Cheetah Simulation; Cheetah Appointment Scheduler; Cheetah Optimizer; Cheetah Live; and Cheetah Mobile. Cheetah offers its solutions in North America as a software-as-a-service infrastructure model.

Descartes

Product Name: Descartes Route Planner, Descartes Route Planner On-demand

Descartes' routing, mobile and telematics solutions support the end-to-end route management process, including delivery appointment booking, route planning, route execution, GPS-enabled mobile applications, telematics-based driver and vehicle performance management, and mobile field worker management. The solutions support static and dynamic planning. Customers have the choice of cloud and on-premises options. Descartes added innovations in the area of real-time delivery appointment scheduling on the live schedule and dispatch optimization for same-day orders as well as common cloud optimization in a single platform. In 2017, Descartes acquired PCSTrac — a provider of pool distribution management and carton tracking solutions for retail as well as MacroPoint, a leading vendor for real-time transportation visibility. Descartes' VRS solutions have customers of all sizes and are deployed in more than 60 countries.

Geoconcept

Product Name: TourSolver

Founded in 1990, Geoconcept specializes in the design and implementation of cartographic optimization technologies. The TourSolver solution optimizes transport route itineraries, taking into account road traffic and resource constraints of drivers and vehicle fleet. Besides routing the fleets on the road, Geoconcept solutions also handle indoor routing. Further developments are done to handle aerial routing for drones and routing for automated delivery robots. Geoconcept offers cloud, mobile, server and Windows versions of its solution. Customers and partners can also utilize its optimization capabilities via API. Geoconcept continues to expand outside of Europe, with a new office in the U.S. and a growing customer base in Asia and South America.

JDA

Product Name: JDA Transportation Manager, JDA Transportation Planner, JDA Transportation Modeler, JDA Fleet Management (as part of JDA Transportation Management System)

JDA's Fleet Management capability is developed within the company's core Transportation Management Solution. It uses constraint-based optimization to create work plans that minimize the cost of delivery and maximize distribution center and store service levels. Users can create master delivery schedules across extended time horizons, and establish efficient daily route planning based on business requirements and resource availability. JDA also provides a for-hire transportation solution and the ability to optimize both concurrently. JDA supports driver optimization, and the ability to model compartments and solve for drop-and-hook operations. JDA also added capabilities to integrate visibility to the asset and is in the early stages of using artificial intelligence and machine learning to resequence stops and appointments in-transit and push visibility through to the WMS to update dock schedules more real time.

Manhattan Associates

Product Name: Fleet Management

Manhattan Associates has deep logistics experience and offers solutions such as warehouse management, transportation management, distributed order management and supply chain planning. Manhattan's single platform TMS solution manages all transportation management activities occurring throughout the supply chain, enabling shippers to effectively manage fleet operations as well as for-hire transport. The Manhattan TMS includes a VRS component called Fleet Management. Manhattan has a strong focus on the retail, grocery and wholesale distribution industries where delivery via private fleet is vital to operations.

MercuryGate International

Product Name: MercuryFleet, MercuryMaestro, MercuryGateMojo

MercuryGate International is a cloud-based TMS technology provider. As part of the solution set, MercuryGate International offers MercuryFleet for businesses using private fleets, common carriers

with large fleets serving multiple customers or logistics providers using a combination of both. The Mojo transportation optimization engine supports optimization for third-party carriers as well as private fleets. MercuryFleet is a newer service offering that will enable supply chain professionals to manage drivers, equipment and operations in a single platform, optimizing both drivers and assets. MercuryGate also introduced MercuryMaestro, the new advanced business intelligence tool.

Omnitracs (Roadnet)

Product Name: Roadnet Transportation Suite and Roadnet Anywhere

Omnitracs acquired Roadnet in 2013. The Roadnet Transportation Suite helps customers solve complex transportation challenges. It includes: Territory Planner, Roadnet Scheduler, FleetLoader, MobileCast, Active Alert, Roadnet Info Center and Roadnet Performance Dashboard. The Roadnet Anywhere platform includes: routing, dispatching, Active Alert, mobile, navigation, telematics and Omnitracs Roadnet Insight. Through a strong telematics, routing and analytics platform, Omnitracs can provide its customers an integrated solution between the Roadnet, XRS, Omnitracs Roadnet Telematics and Omnitracs Analytics offerings. Roadnet has a strong focus on the wholesale distribution and food service sectors. The company has implementations on a global scale and is mostly deployed on-premises.

Oracle

Product Name: Oracle Transportation Management Cloud

Oracle Fleet Management is part of the Oracle Transportation Management (OTM) product suite. It offers static and dynamic routing, dispatch functionality, and equipment inventory tracking. Oracle's solution provides powerful optimization and a broad set of functionalities. Oracle introduced the new Oracle IoT Fleet Monitoring Cloud (using onboard diagnostics [OBD]-II devices) allowing better tracking of trucking assets. Oracle also offers a for-hire transportation solution. Oracle's VRS solution is available as a cloud solution and is integrated with Oracle's Enterprise Asset Management solution (EAM). OTM has been implemented around the world, and Oracle has many implementation partners in all regions.

Ortec

Product Name: Ortec Routing, Ortec for SAP

Ortec is a provider of advanced planning and optimization solutions and services providing a single scheduler solution from demand forecasting to execution. Ortec's products and services provide capabilities to optimize fleet routing and dispatch, vehicle and pallet loading, workforce scheduling, delivery forecasting, logistics network planning, and warehouse control. Ortec provides a stand-alone solution, as well as a solution that operates within SAP. Ortec's solution includes integrated 3D-loading optimization, integrated compartment, contamination and cleaning optimization, integrated traffic congestion optimization, and sourcing optimization. Ortec expanded its focus on last-mile and home deliveries through innovations in the cloud including real-time slot booking through the use of sequential model-based algorithms. Other innovations include platooning

optimizer; integrated routing, loading and dock scheduling; routing and automated warehousing, and workforce scheduling in logistics. Ortec's VRS solution is used in 80 countries.

Paragon

Product Name: Paragon Vehicle Routing & Scheduling Optimiser, Paragon Single Depot, Paragon Multi Depot, Paragon Integrated Fleets, Paragon HDX (omnichannel fulfillment), Paragon Live, Paragon Route Execution, Paragon Resource Manager, Paragon Route Management System (RMS), Paragon Fastnet, Paragon Territory Optimizer, Paragon Multi Period Planner, fleXipod (mobile workflow management and electronic proof of delivery [ePOD])

Paragon has been offering VRS since the 1980s. The solution includes Paragon Single Depot to plan and model delivery routes for vehicles based at one location. Paragon Multi Depot plans routes and schedules for multiple sites in a single planning task. Paragon Integrated Fleets enables truck movements to and from different depots to be combined into efficient distribution routes to reduce overall empty running. It also offers Paragon HDX, a home delivery and order fulfillment management solution. More recently, Paragon introduced new capabilities around route control to look at plans and compliance (reduce fines); Waypoint Mapping to ensure plan and execution are in sync; Live Management: Arrivals Board (display actuals versus plan); fleXipod dashboard reporting and Track My Driver (customer-facing delivery progress). Paragon has a wide customer base in Europe and the U.S., and continues to expand into Asia and other parts of the world. Paragon offers a solution for both large and small fleets.

Quintiq (Dassault Systèmes)

Product Name: Quintiq Application Suite

Quintiq's logistics planning and optimization solution is used to optimize logistics plans through its planning interface, real-time key-performance-indicator-focused reporting tools and automated planning capabilities. Quintiq has a powerful optimization engine that leverages continuous optimization to manage disruptions on the day of operations. The Quintiq solution is widely used by postal and express couriers, and logistics providers for both regional and global operations. It is primarily used as an on-premises solution, although it offers Quintiq on Demand (QoD) with optimization in the cloud and the ability to layer part of the application in the cloud. Quintiq's solution is deployed in more than 80 countries across North America, Europe, South America and Asia/Pacific.

SAP

Product Name: SAP Transportation Management

Vehicle scheduling, routing optimization and automation are part of SAP's Transportation Management offering. The solution optimizes simple routes to extended network optimization with multilevel equipment planning. The solution comes not only with standard integration into SAP, but also with other ERPs. Transportation Management also integrates with enterprise asset management in SAP and includes freight execution and monitoring. SAP added driver scheduling to

the fleet management functionality. The solution integrates with both the SAP ECC and SAP S/4HANA platforms and is also available embedded in S/4HANA.

Scientific Logistics

Product Name: Scientific Logistics Cloud-Based Route Optimization

Scientific Logistics provides automated delivery route planning using cloud computing, as well as strategy and distribution network design using automated what-if simulations, and route planning operations using cloud computing. To provide an end-to-end VRS solution, Scientific Logistics has a partnership with GreenMile for cloud-based, real-time dispatch execution and Gridline for cloud-based telematics. Scientific Logistics' customer base can be mostly found in the food and beverage, building materials, consumer goods, retail, and home healthcare industries. Scientific Logistics offers it solution through direct sales and resellers, including Inventiv, Kerridge Commercial Systems, Blue Horseshoe and a reseller in China.

TMW Systems (Trimble)

Product Name: Appian DirectRoute, Appian DRTrack and Appian Transportation Modeler

Appian Logistics Software by TMW is part of Trimble Systems as part of Trimble Transportation. TMW provides routing solutions (since 1987) with a primary focus on private fleets but also providing solutions for shippers utilizing common carriers as well as 3PL providers. The Appian platform is specifically designed for the last-mile routing and dispatch markets. It incorporates planning tools to design and manage fixed routes, route dynamically or be used for analytical design, all built on the industry standard ALK PC Miler maps platform. The company also provides a web-based dispatching system built for private fleets; the system provides automated dispatch, enterprisewide visibility, tracking of routes in progress, automated customer notifications and business intelligence reporting. TMW continues to innovate in areas of advanced analytics and blockchain. In 2017, it acquired the visibility vendor 10-4 Systems. TMW has a partnership with 3Gtms to provide solutions to the for-hire transportation market.

Verizon (Fleetmatics) (Telogis)

Product Name: Route Planning Suite; Dynamic Response Suite; Routist

Verizon acquired two companies with routing solutions in 2016: Telogis with Route Planning Suite and Dynamic Response Suite geared toward enterprise clients (clients with more than 100 vehicles); and Fleetmatics with Routist positioned for smaller fleets needing a simpler solution. Route Planning Suite helps to reduce miles and travel times with optimized planned routes and instant reroutes, as well as appointment planning and long-term and daily planning. Dynamic Response Suite provides estimated time of arrival (ETA), plan versus actual, and dispatching and control room functions. The company provides a cloud-based location intelligence software platform that enables businesses to optimize their mobile assets and critical data. The solution is fully web-based, leveraging SaaS and cloud computing. It also offers workforce management, commercial navigation and fleet-tracking solutions. Verizon has implementations around the world.

WorkWave

Product Name: WorkWave Route Manager

WorkWave offers solutions for mobile workforce companies in the field service, last-mile delivery and logistics industries. The WorkWave Route Manager is a SaaS routing optimization solution for fleet management, field service management, mobile workforce management, and pickup/collection and delivery companies. The WorkWave solution provides private and service fleet users with a modern user interface that integrates planning, optimization and tracking to facilitate a cohesive user experience. It has expanded its solution to mobile and telematics. WorkWave has customers in North America, Europe, Asia and other parts of the world.

Further Details of VRS Solutions

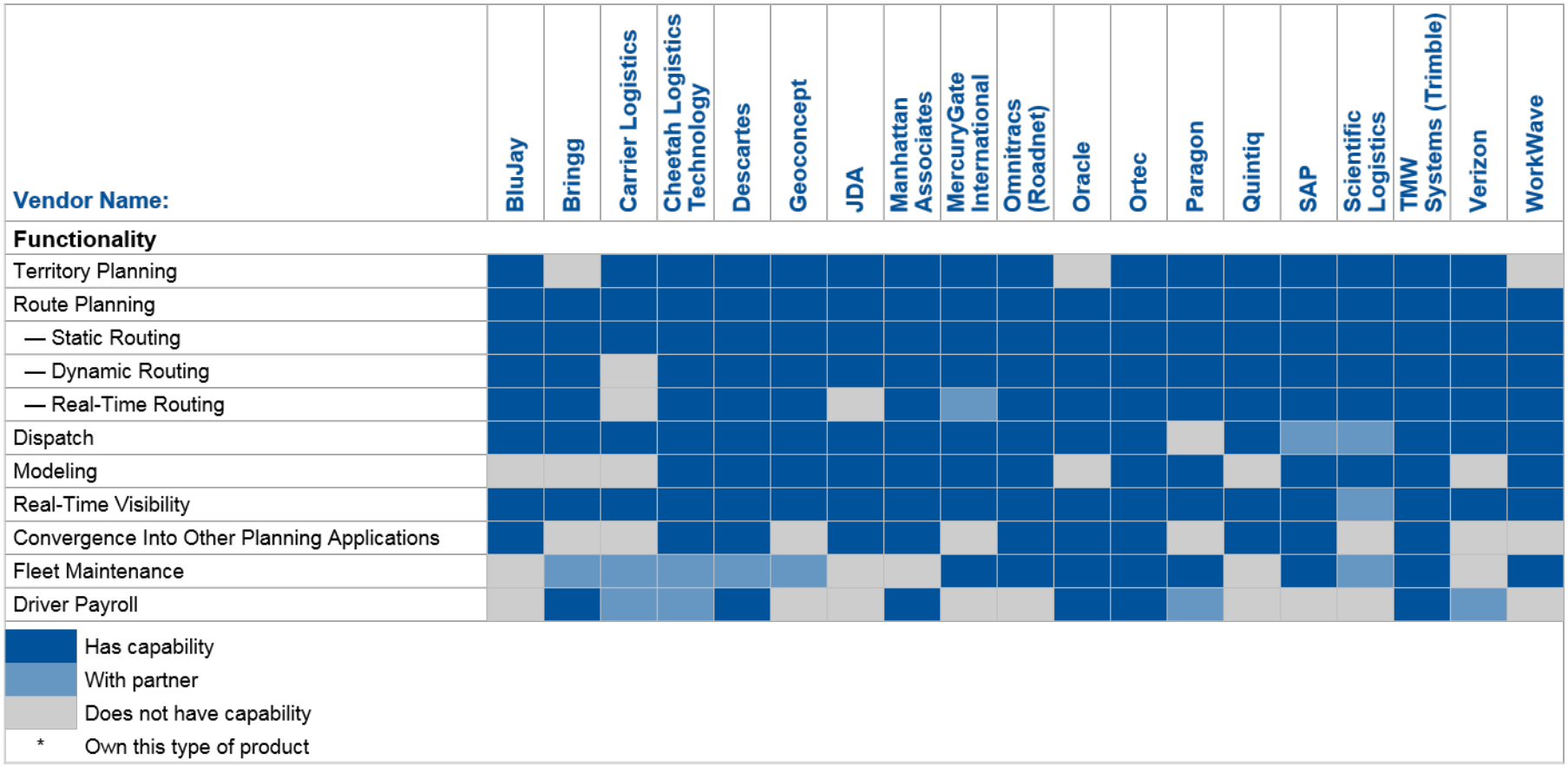
Gartner sent out detailed company surveys and performed vendor briefings with the following vendors, which resulted in further details of the offered VRS solutions (based on third quarter 2017 versions).

The following analysis focuses on functionality, platform, type of fleet, geographic presence, additional functionality and industry coverage offered by the vendors.

Most VRS vendors are able to offer the key functionalities required by the customer. Not all vendors are able to offer dispatch, driver payroll, modeling and fleet maintenance capabilities. Vendors are differentiated more by the complexity of their routing capabilities (see Figure 4), as well as by their focus on fleet type (see Figure 5) and industry (see Figure 6).

Although most of the major players have a presence in the four regions, there is still a predominant focus on North America and Europe, which are the largest markets for these solutions. Few vendors are present in Africa and/or Asia (see Figure 7).

Figure 4. Functionality



Source: Gartner (November 2017)

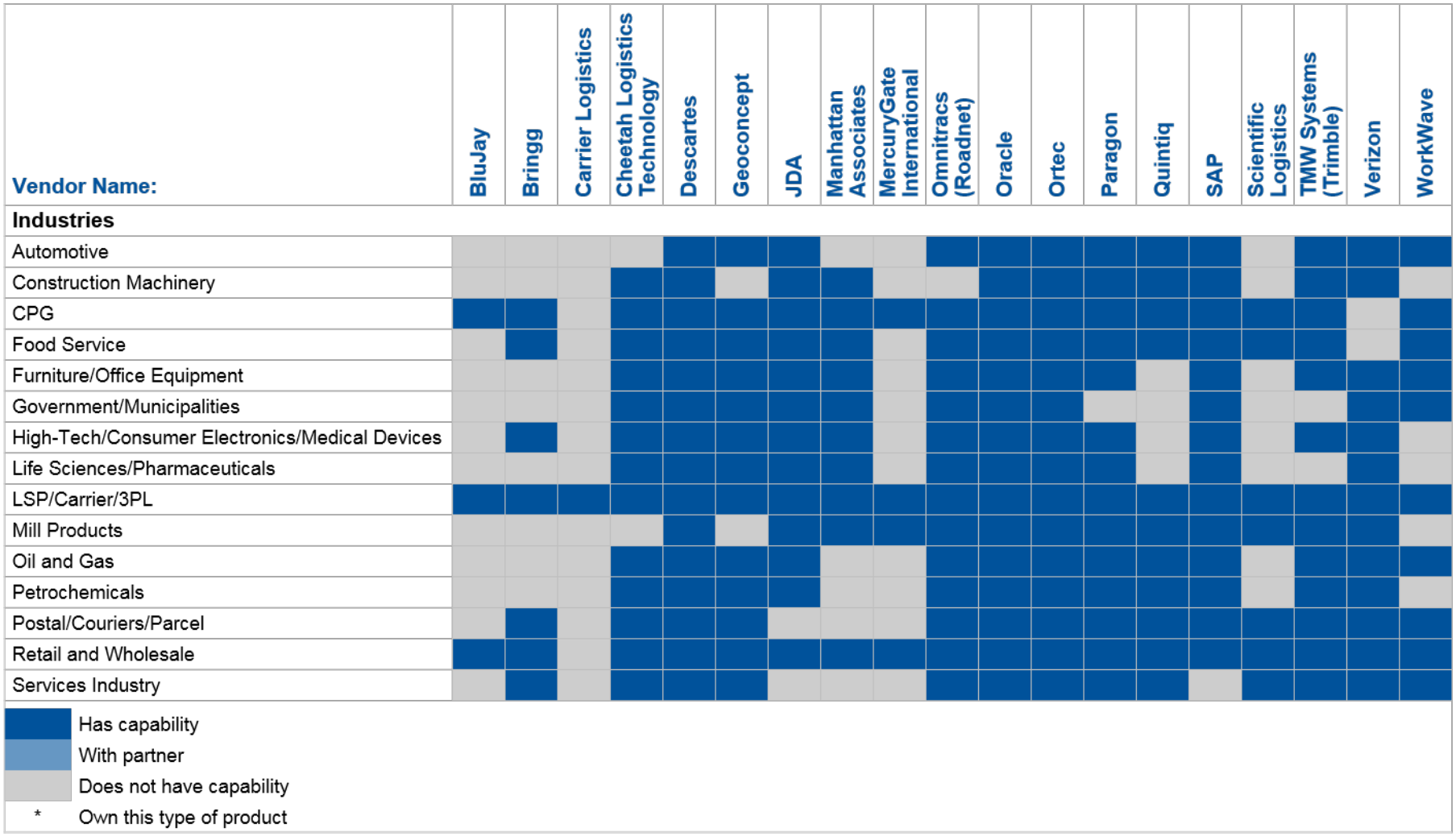
Figure 5. Type of Fleet

Vendor Name:	BluJay	Bringg	Carrier Logistics	Cheetah Logistics Technology	Descartes	Geoconcept	JDA	Manhattan Associates	MercuryGate International	Omnitracs (Roadnet)	Oracle	Ortec	Paragon	Quintiq	SAP	Scientific Logistics	TMW Systems (Trimble)	Verizon	WorkWave
Fleets Supported																			
Supports Sales Delivery Fleets	■	■	■	■	■	■			■	■	■	■	■	■		■	■	■	■
Supports Service Fleets		■	■	■	■	■			■	■	■	■	■	■		■	■	■	■
Supports Trucking Fleets	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	

■ Has capability
■ With partner
■ Does not have capability
* Own this type of product

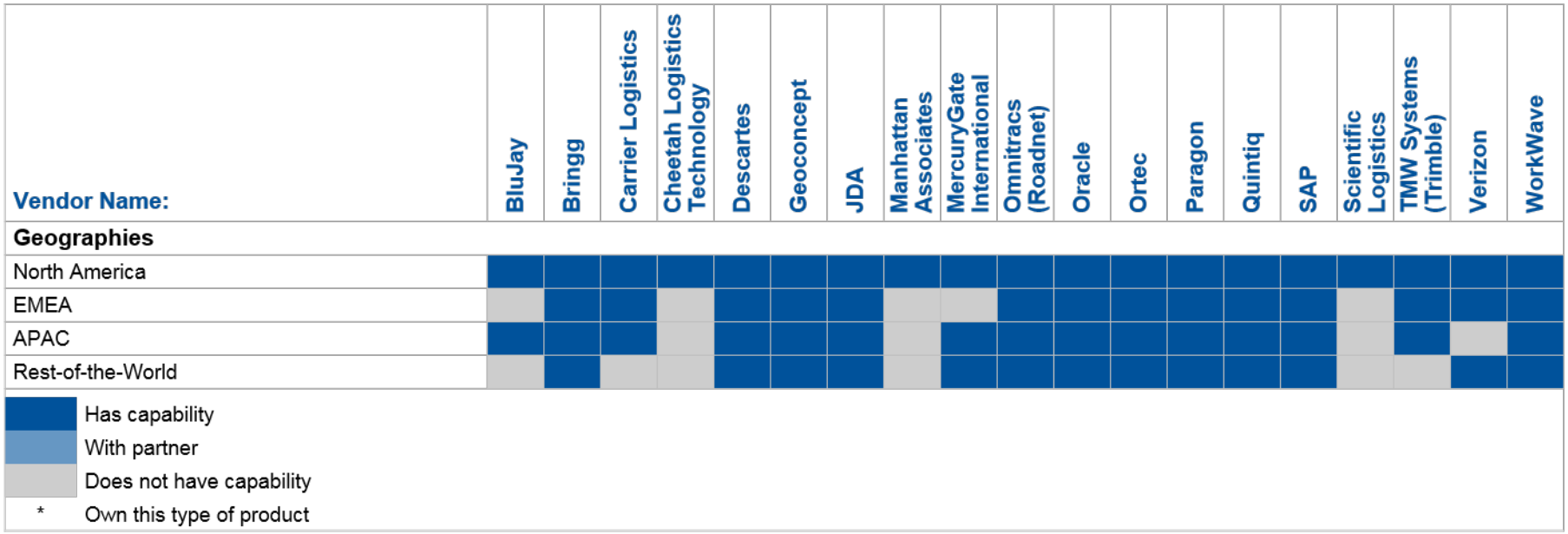
Source: Gartner (November 2017)

Figure 6. Industry Coverage



Source: Gartner (November 2017)

Figure 7. Geographic Presence (Based on Customer Implementations)



Vendor Name:	BluJay	Bringg	Carrier Logistics	Cheetah Logistics Technology	Descartes	Geoconcept	JDA	Manhattan Associates	MercuryGate International	Omnitracs (Roadnet)	Oracle	Ortec	Paragon	Quintiq	SAP	Scientific Logistics	TMW Systems (Trimble)	Verizon	WorkWave
Geographies																			
North America	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
EMEA		■	■		■	■	■			■	■	■	■	■	■		■	■	■
APAC	■	■	■		■	■	■		■	■	■	■	■	■	■		■		■
Rest-of-the-World		■			■	■	■		■	■	■	■	■	■	■			■	■

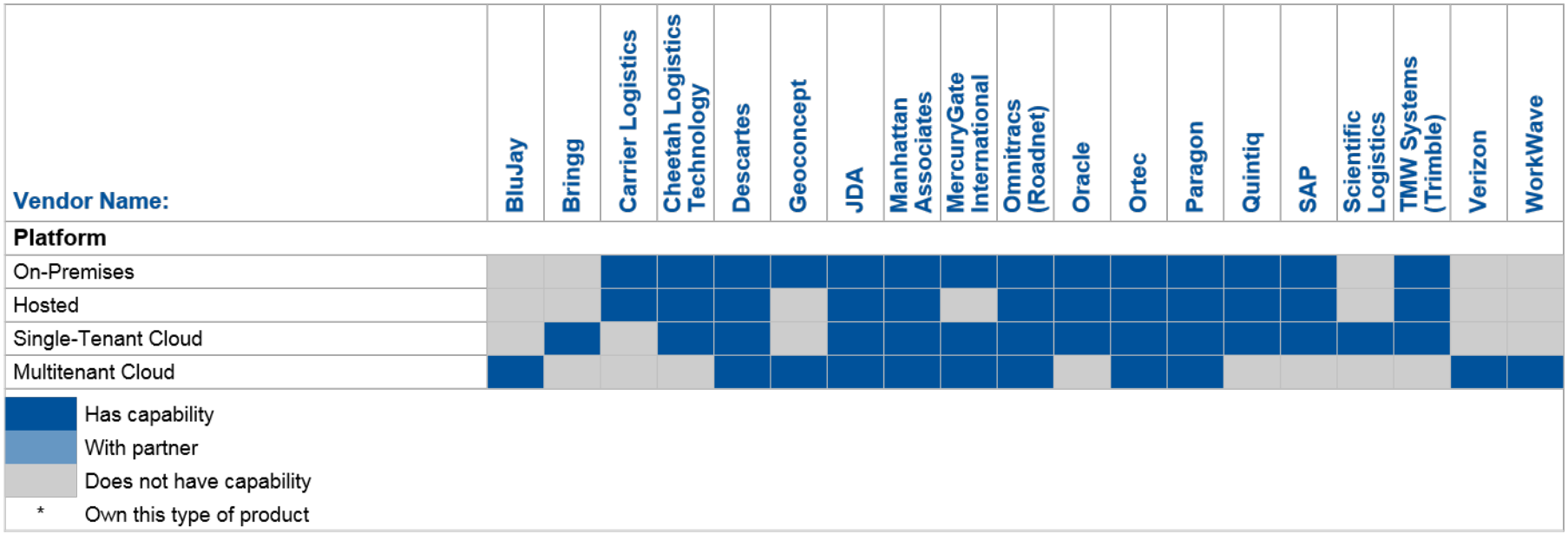
■ Has capability
■ With partner
■ Does not have capability
* Own this type of product

Source: Gartner (November 2017)

The vendor solutions are evolving to be more SaaS and cloud-hosted. Some vendors don't offer on-premises solutions, although most large-scale implementations of large fleets are currently still on-premises. Newer players in the market will typically focus on multitenant cloud solutions. This is also true for smaller fleets that are adopting these solutions (see Figure 8).

Vendors are broadening their offerings by adding additional functionality to VRS. The vendors are able to do this by acquiring other vendors, creating partnerships with companies providing these solutions or stepping up the internal development of the solutions (see Figures 9 and 10).

Figure 8. Platform



Vendor Name:	BluJay	Bringg	Carrier Logistics	Cheetah Logistics Technology	Descartes	Geoconcept	JDA	Manhattan Associates	MercuryGate International	Omnitracs (Roadnet)	Oracle	Ortec	Paragon	Quintiq	SAP	Scientific Logistics	TMW Systems (Trimble)	Verizon	WorkWave
Platform																			
On-Premises			■	■	■	■	■	■	■	■	■	■	■	■	■		■		
Hosted			■	■	■		■	■		■	■	■	■	■	■		■		
Single-Tenant Cloud		■		■	■		■	■	■	■	■	■	■	■	■	■	■		
Multitenant Cloud	■				■	■	■	■	■	■		■	■					■	■

■ Has capability
■ With partner
■ Does not have capability
* Own this type of product

Source: Gartner (November 2017)

Figure 9. Additional Functionality

Vendor Name:	BluJay	Bringg	Carrier Logistics	Cheetah Logistics Technology	Descartes	Geoconcept	JDA	Manhattan Associates	MercuryGate International	Omnitracs (Roadnet)	Oracle	Ortec	Paragon	Quintiq	SAP	Scientific Logistics	TMW Systems (Trimble)	Verizon	WorkWave
Additional Features																			
Track and Trace	■	■	■	■	■	■	■	■	■	■	■	■			■	▒	■	■	■
Mobile Solutions	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	▒	■	■	■
Blockchain																	■		

■ Has capability
▒ With partner
Does not have capability
* Own this type of product

Source: Gartner (November 2017)

Figure 10. Technology Partnerships

Vendor Name:	BluJay	Bringg	Carrier Logistics	Cheetah Logistics Technology	Descartes	Geoconcept	JDA	Manhattan Associates	MercuryGate International	Omnitracs (Roadnet)	Oracle	Ortec	Paragon	Quintiq	SAP	Scientific Logistics	TMW Systems (Trimble)	Verizon	WorkWave
Technology Partnerships																			
Visibility Platforms	■		■		*	■	■	■	■	■	■	■					*		■
Mapping Vendors	■		■	■									■	■	■	■	*	*	
TMS/WMS Vendors	*	■		■	*		*	*	*		*		■	■	*	■	*		■
Telematics Vendors	■	■	■	■	*	■		■	■	*	*	■	■			■	*	*	*
Solution Integration Vendors		■			■	■	■		■		■	■		■	■	■			
API Vendors			■		■	■	■		■			■			■				
Freight Matching Platforms				■				■	■		■	■					■	■	

■ Has capability
■ With partner
■ Does not have capability
* Own this type of product

Source: Gartner (November 2017)

The vendors have expanded their offerings to provide solutions for multiple industries, although each vendor still has specific strengths and presence in a small subset of industries. Carrier fleets, fleets in the consumer goods industry and service fleets are making up the largest amount of the VRS implementations. Industry coverage is based on the vendor's current customer landscape and experience in those industries.

Market Recommendations

The current challenges fleets are facing due to new government regulations, more demanding customers, increasing operational costs, increasing driver shortage, growing last-mile delivery volumes and new channels to market require companies to improve the ways they are using their resources, both assets and drivers. Technology is one way to address these challenges and contribute to a more efficient fleet operation that can reduce operational costs, increase customer service and comply with government regulations. The "speed of doing business" has increased, and companies need to use better and more technology to keep up.

The fragmented nature of the solution market and the diversity in requirements between different industries and fleet types can make the selection of the right vendor a challenge. There are several questions which must be considered. These include "Which category of vendors best aligns with the company's present and future needs?" "Is the company ready to invest in piloting or implementing VRS capabilities?" and "What type of capabilities will offer the best return on investment?"

Gartner Recommended Reading

Some documents may not be available as part of your current Gartner subscription.

"Hype Cycle for Supply Chain Execution Technologies, 2017"

"Market Guide for Transportation Mobility Technology"

"Magic Quadrant for Transportation Management Systems"

"Apply the Five-Stage Maturity Model to Drive Logistics Excellence Within the Supply Chain"

"Supply Chain Guide to Making Smart Decisions on Warehouse and Transportation Management Systems"

Evidence

[1] American Trucking Associations: Freight Transportation Forecast 2017 to 2028.

[2] 2016 Institute for Operations Research and the Management sciences survey.

More on This Topic

This is part of an in-depth collection of research. See the collection:

- Supply Chain Guide to Foundational Transportation Technologies

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