



Office of Inspector General | United States Postal Service

RARC Report

Coordination and Optimization Technologies and Postal Applications

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- On Street Menu
- 1 Scan Barcode
 - 2 Review Entries
 - 3 Settings
 - 4 Firm Sheet
 - 5 Manual Input
 - 6 Change Route
 - 7 Dynamic Delivery
 - 8 Collection Box Info
 - B Text Message
 - H Prepaid Acceptance
 - R Rural Route Study
 - D Database Info
- ESC ENTER
- 03/19 2:31 PM

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Executive Summary

The parcel delivery landscape is rapidly changing. Customers' orders are being delivered faster and at more convenient times and locations. Retail chains and logistics companies are contracting independent drivers to deliver goods locally within a few hours. Cities are partnering with postal and logistics operators to test new, sustainable delivery models. Shippers are buying a la carte from different transportation, fulfillment, and delivery partners to create customized supply chains.

These developments are all enabled by what this paper defines as Coordination and Optimization Technologies (COTs) — a mix of optimization algorithms, machine learning, data analytics, Internet of Things technologies, and coordination platforms. This paper shows how the combination of these technologies could contribute to the increased efficiency, flexibility, and customer-centricity of the Postal Service's parcel delivery operations.

The Postal Service already employs COTs to optimize its operations, network, and resources for the efficient sorting and next-day delivery of letters and parcels along regular and parcel routes. However, to respond to growing competition and increased customer expectations for faster, customized delivery options, USPS may need to expand the capabilities of its delivery value chain.

The OIG, in collaboration with an academic institution with an urban logistics research center, has identified a variety of postal applications that illustrate how COTs could make current delivery operations more dynamic, support the development of collaborative delivery models, and extract additional value from existing postal infrastructure:

- **A more flexible last mile.** The Postal Service could leverage real-time delivery route optimization software to pilot the real-time pickup and delivery of parcels. Additionally, the Postal Service might consider the feasibility of letting customers select time windows on parcel routes.
- **Collaboration in urban last mile delivery.** In collaboration with local governments, the Postal Service could trial a new, flexible delivery model that

Highlights

Coordination and Optimization Technologies (COTs) are a combination of algorithms, data analytics, Internet of Things, machine learning, and platform technologies.

COTs can make parcel delivery more efficient, flexible, and customer-centric.

As competitive pressures and customer expectations for faster deliveries grow, COTs can help USPS expand the capabilities of its delivery network while paving the way for new parcel services and models.

Possible applications of COTs include:

- Same-day pickup and delivery on select regular urban and rural routes;
- Customized delivery time-windows on parcel routes;
- Collaborative same-day urban deliveries that might combine postal and on-demand carriers;
- Leasing parts of the postal infrastructure — such as vacant fulfillment space or parcel lockers — with shippers or other delivery companies.

USPS already employs some COTs to optimize its parcels delivery operations. It could consider expanding its use of COTs to better position itself in the last mile of the future.

would enable faster delivery in high density urban areas. The model would add new parcel distribution points to the existing delivery infrastructure and potentially use on-demand delivery partners to complement USPS carriers. A COTs-powered postal platform would determine the optimal mode of pickup and delivery for each parcel, provide instructions to carriers, and communicate with shippers and recipients.

- **Extracting new value from the last mile infrastructure.** The Postal Service could create a COTs-based platform that would dynamically monitor the available capacity of underutilized USPS facilities. Through the platform, USPS would lease excess space on-demand to mid-size merchants interested in moving their fulfillment processes closer to large metropolitan areas. Similarly, USPS could lease the use of its parcel lockers to third parties, including smaller, local, and crowdsourced delivery companies and retailers.

COTs are playing a critical role in the modernization of the increasingly competitive parcel market. It is essential that the Postal Service continue to leverage COTs to protect and grow its parcels business. As the technology engine behind new collaborative models, COTs could also help USPS progressively become a nimbler “anytime, anywhere” delivery platform.

Observations

Introduction

All supply chains inherently involve coordination among segments of the processing “pipeline” and optimal use of resources — such as staff, transportation, and machines. A new generation of software platforms, advanced data analytics, and algorithms enable a level of coordination, disruption, and innovation not possible before in parcel delivery. These Coordination and Optimization Technologies (COTs) and their potential use by the U.S. Postal Service are the subject of this paper.

Uber, which matches real-time requests for rides with the nearest available independent drivers, is perhaps the best illustration of the disruptive power of COTs. Uber’s success has led to the rise of new parcel and grocery delivery businesses that are developing similar “asset-light,” scalable, and flexible delivery models, which cater to customers’ rising needs for faster, more customized deliveries.

Several factors contribute to the development of COTs:

- The Internet of Things (IoT) enables the wide availability of location-based, real-time data from “objects” such as packages, vehicles, carriers, and recipients’ smart phones;
- The emergence of mobile apps, ecommerce, and shipping platforms that coordinate operations and communications between the parties involved in delivery, from e-commerce sellers to transportation intermediaries to delivery companies to recipients;
- Higher customer expectations about speed and reliability of delivery, ease of returns, and a fast-growing parcel market.

Long before Uber popularized the concept of a COTs platform, the Postal Service was already coordinating its operations with mailers, mail service providers,

recipients, transportation providers, and other posts to meet service performance goals and minimize costs. In today’s dynamic, highly competitive, customer-centric delivery market, COTs can help USPS protect and grow its parcel business by offering new tools to enhance products and operations as well as experiment with new services and business models.

This white paper first provides an overview of COTs and how they are disrupting and innovating the parcel delivery chain. It then identifies a variety of possible use cases for the Postal Service to consider and highlights some potential implementation issues. To develop the use cases, the OIG collaborated with an academic research institution with strong expertise in urban logistics.

Coordination and Optimization Technologies Building Blocks and Capabilities

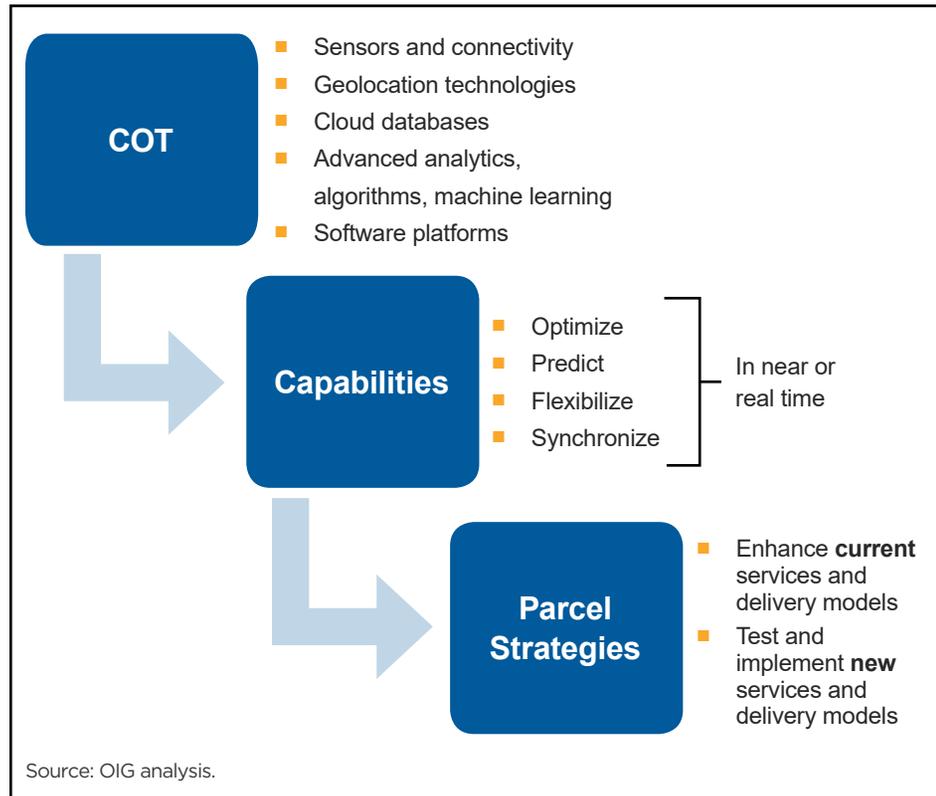
The OIG defines COTs as the mix of technologies that can make the last mile more efficient, dynamic, and flexible, including (Figure 1):

- Sensors and connectivity (IoT) enabling data collection and transmission;¹
- Geolocation technologies providing the geographic locations of objects and devices connected to the Internet;
- Cloud databases for storing, managing, and sharing big data;
- Advanced data analytics, algorithms, and machine learning that support or automate operational and business decisions;
- Software platforms to run and support different types of applications.

COTs impact supply chains through their ability to optimize, predict, “flexibilize,” and synchronize data, information, or processes. This section describes each of these capabilities in turn.

¹ OIG, *The Internet of Postal Things*, Report No. RARC-WP-15-013, August 3, 2015, https://www.uspsaig.gov/sites/default/files/document-library-files/2015/rarc-wp-15-013_0.pdf.

Figure 1: Coordination and Optimization Technologies Main Capabilities



Optimize: Optimization Algorithms

Optimization algorithms are the engine behind georouting software.² Since the 1980s, postal operators and other delivery companies have used these mathematical models to calculate and plan the shortest or lowest-cost delivery routes under operational constraints such as volumes, time windows, vehicle availability, capacity, or maximum driving time.³ For example, the Postal Service

² See Appendix A for a deeper discussion of the history and use of georouting software.

³ The mathematical problem routing algorithms help solve is called the “Traveling Salesman Problem” (TSP). Markus Wohlsen, “The Astronomical Math Behind UPS’ New Tool to Delivery Packages Faster,” *Wired*, June 13, 2013, <https://www.wired.com/2013/06/ups-astronomical-math/>.

⁴ UPS, “Optimized Network,” <https://sustainability.ups.com/committed-to-more/optimized-network/>.

is using a georouting software to optimize its parcel routes, such as its Sunday delivery routes (Box 1). UPS achieved approximately \$400 million savings a year by implementing its ORION route optimization system.⁴

Box 1: USPS Delivery Routes

At the end of FY2017, the Postal Service had about 229,000 delivery routes. Almost all of them deliver both letters and parcels on weekdays. These regular routes are fixed because, unlike private competitors, the Postal Service serves each of its 157 million delivery points six days a week. Regular routes are only reviewed and some of them updated once a year.

However, USPS uses parcel routes:

- In some very dense urban areas, where carriers on foot deliver letters while parcels are delivered separately by trucks.
- To deliver excess parcels, for example, during the peak holiday season.
- To deliver parcels on Sundays.

For a long time, optimized routes were “static,” meaning the software generated turn-by-turn instructions given to drivers before the start of the route. Now, dynamic real-time optimization algorithms allow “on-the-fly” rerouting as new events occur, such as unexpected pick-up requests or traffic jams. This additional flexibility can be key to providing faster deliveries and responses to customers’ requests, as well as additional cost savings. The software uses real-time GPS and local traffic data to prioritize and recalculate an optimal sequence of deliveries as new events are added.

Delivery companies like DHL started testing real-time dynamic optimization systems in Germany in 2009 and UPS plans to deploy them nationwide in the United States in 2019.⁵ On-demand delivery platforms — such as Postmates, Instacart, or Target-owned Shipt — use a different type of real-time optimization: as order requests come in, a dispatch algorithm assigns them to the appropriate independent driver, ensuring that orders are delivered on-time and in the most efficient way.⁶ This allows for the delivery of groceries (and in some cases, parcels) in a couple of hours.

Predict: Machine Learning Systems

Machine learning refers to statistical models that digest data — such as historical data — to draw inferences from them and to identify hard-to-see patterns in demand and customer behavior. Machine learning algorithms are constantly refined as new data (called “training data”) are fed into the system. A popular example is Netflix: the more data on a customer’s viewing and browsing behavior the system gets, the better its ability to accurately predict whether consumers “might also like this.” A postal example is USPS’ Expected Delivery (ExD) service, which aims to provide customers with two-hour time windows for upcoming parcel deliveries.⁷ ExD estimates are enabled by a combination of predictive analytics based on historical delivery data and the actual time the carrier starts their route.

Machine learning systems can provide a better prediction of incoming volumes. This leads to a better delivery resource allocation plan. For example, machine learning systems can estimate the number of online grocery orders expected from customers on Tuesday morning in a particular neighborhood; this helps an on-demand delivery firm determine how many drivers it will need to pick up and deliver orders in that area. New generations of machine learning systems will also allow postal operators to automate many operational decisions by incorporating more real-time data from customers, operations, and external sources (e.g., weather or traffic).

Adding Flexibility: Shared Delivery Supply Chains

This emerging trend is driven by shippers’ and recipients’ appetite for more flexibility in the processing and delivery of parcels. In response to this need, new types of on-demand companies provide a wider choice of delivery options and providers. This enables the transformation of the traditional parcel value chain into an “a la carte” system — a virtual supply chain broken down between different providers.

For shippers, these platforms can provide value chain flexibility at different levels:

- **Selection among different shipping partners.** Shipping platforms such as Shippo let parcel shippers choose from different last-mile providers (including the Postal Service) depending on weight, price, volume, delivery time, reliability, and other mailers’ preferences. Likewise, freight brokerage platforms like Cargo Chief or Transfix help shippers find real-time available capacity in freight carriers’ line-haul transportation vehicles.
- **Acquiring new capabilities.** Shippers looking to expand deliveries in new areas can purchase on-demand warehousing or fulfillment capabilities from platforms such as DarkStore and Flexe. These companies offer vacant space made available by a variety of retailers, shopping malls, or warehousing companies.⁸

For recipients, these platforms can provide additional and customized delivery options. For example, the Finnish company Smartmile offers alternative parcel pick up locations, such as parcel lockers or retailer stores, to recipients. When purchasing from ecommerce sites, the Smartmile platform allows recipients to enter a Smartmile delivery address. Carriers, instead of delivering directly to customers, drop off orders to Smartmile’s warehouses. Here, all the packages from the different carriers are consolidated and delivered to the pickup location selected by the customer.⁹

5 UPS, “Optimized Network” and Quintiq, “DHL SmartTrucks powered by Quintiq technology,” November 16, 2010, <http://www.quintiq.com/news-2010/dhl-smarttrucks-powered-by-quintiq-technology.html>.

6 The ecommerce platform Shopify defines on-demand delivery as “the immediate or scheduled delivery of your product to your customer; initiated immediately after they make their order.” Shopify, “The Timely Guide to On-demand Delivery,” 2016, <https://www.shopify.com/guides/on-demand-delivery>.

7 After pilots held in 2017, the service should be rolled out nationwide by the end of 2018.

8 For example, merchants can rent vacant storage capacity from 900 warehouses referenced on the Flexe website. Flexe, “The delivery speed you need,” <https://www.flexe.com/next-day-delivery/>.

9 SmartMile, “How it works,” <https://fi.smartmile.rocks/#/home>.

Synchronize: Coordination Systems

Postal operators' IT efforts have long dealt with the development of systems to provide visibility of the mail and facilitate coordination of mail and parcel operations both internally and with customers. There are many USPS examples of coordination systems relative to both the first and last mile, including:

- **The Electronic Verification System (eVS):** launched in 2005, eVS enables shippers to electronically transmit to the Postal Service the number, type, and weight of parcels — which facilitates postage payment and coordination between the shipper and USPS' origin or destination facility.¹⁰
- **The Volume Arrival Profile (VAP):** launched in fiscal year (FY) 2014 for internal synchronization purposes, VAP provides post office supervisors with near real-time visibility of incoming volumes, intra-facility movement of mail and parcels, carrier and vehicle arrival and departure times, and transportation and labor utilization. This helps managers resolve issues related to mail movement and coordinate local sorting, delivery, and transportation.¹¹

An innovative example of a synchronization system is the one developed by Ocado, the leading online grocery retailer in the United Kingdom. The company has based its entire business model on its ability to use COTs to fully integrate and synchronize the “order-to-fulfillment-to-delivery” process in real time. They created a Software as a Service (SaaS) platform that allows an order to be fulfilled in a few minutes from highly-automated warehouses. Groceries are then delivered in the delivery slot chosen by customers by vehicles using optimized loading and routing software.¹² In the United States, Ocado has partnered with Kroger to help this retail chain implement Ocado's integrated approach to online grocery shopping.

¹⁰ PostalPro, “Electronic Verification System (eVS®),” <https://postalpro.usps.com/shipping/evs>.

¹¹ VAP allows for better management of mail pick up based upon customer volumes. VAP allows management to identify opportunities to get carriers back to the delivery unit earlier in the day, which gets mail inducted into processing earlier, ultimately increasing efficiencies throughout the network.

¹² Paul Clarke, “How an Online Grocery Platform Could Reshape Retail as We Know It,” *Harvard Business Review*, May 9, 2017, <https://hbr.org/sponsored/2017/05/how-an-online-grocery-platform-could-reshape-retail-as-we-know-it>.

¹³ The model developed by Unmanned Life involves putting a “system integration box” on top of the delivery vehicle. Through its sensors the box monitors the location and position of the car; it connects to the post's central delivery systems through cellular networks; through a control device, it provides instructions to the drone.

¹⁴ Kumardev Chatterjee, Unmanned Life CEO, in conversation with the authors, April 9, 2018.

Effective synchronization is also critical when different modes of delivery are combined or when different delivery partners collaborate. An example is autonomous drones that use the tops of trucks for take-off and landing. How do the truck and the drone synchronize? Unmanned Life proposes a solution where an integration system is installed on the vehicle.¹³ The system provides “flying instructions” to the drone, calculated with the help of GPS positioning, cellular network connectivity, and interfaces with their postal partner's delivery operations information systems (Video 1).¹⁴

Video 1: Autonomous Drone Parcel Delivery System Integrated with Delivery Vehicles: Unmanned Life



Source: <https://vimeo.com/241856897>.

The four capabilities described above envision a last mile that is potentially more effective, innovative, collaborative, and attuned to customers' needs. The next section discusses in more detail how these capabilities are disrupting established delivery models.

COTs-based Disruption and Innovation in Delivery

COTs create both challenges and opportunities for USPS. The challenges derive from the fact that they are:

- **Driving competition in the last mile.** The flexibility of crowdsourced delivery platforms heightens new direct competition in the last mile.¹⁵ Emerging competition is also coming from large retailers (such as Target or Walmart) who put in place same-day/next-day delivery networks in urban areas using crowdsourced delivery platforms. The recent demise of on-demand parcels delivery platforms Shyp and UberRush illustrates the same-day delivery model's current struggles with financial sustainability. However, these models, if they manage to build density and become profitable, may over time take volumes from the Postal Service, especially in dense urban areas.¹⁶
- **Elevating recipients' expectations about delivery.** On-demand delivery platforms are setting the customer experience bar higher and higher. Recipients are getting used to easy-to-use interfaces that provide complete control over the delivery experience, including a choice of delivery windows that few "traditional" operators currently provide.¹⁷ Additionally, U.S. customers, especially millennials, increasingly expect companies to deliver faster.
- **Elevating shippers' expectations about delivery.** As the logistics industry moves to new models that embody what Deloitte calls the "always on" supply chain — anywhere, anytime delivery to customers at the time the customer orders and specifies — merchants will expect their shipping partners to have the capabilities to better integrate with their IT and operation management systems.¹⁸

At the same time, COTs can provide new tools to the Postal Service to respond to these challenges and protect a parcel business that in FY 2017 amounted to

5.7 billion packages, represented 28 percent of its total revenue, and brought in a contribution (profit) of about \$6 billion.

USPS already uses a variety of COTs to enhance parcels delivery, ranging from optimization routing software to predictive analytics, to customer-facing platforms such as usps.com and Informed Delivery. Figure 2 provides examples of COTs used by USPS.

However, the transformative power of COTs can do more than enabling incremental operational improvements. The following section provides three examples of how they are changing the way last-mile deliveries are done.

On-demand Delivery

In the past few years, COTs have fueled the development of a local, on-demand, same-day delivery market. By combining COTs and crowdsourced delivery, new entrants like Instacart have expanded the scope and increased the affordability (typically \$6 to \$10) of same-day delivery of groceries in large cities.

Box 2: Instacart's COTs Strengths

“We have two logistics teams at Instacart. One focuses on balancing supply and demand, the other assigns orders to our shoppers in real time to optimize for speed and quality. We use machine learning heavily in both.”

Source: : Jeremy Stanley, "Instacart AMA," Kaggle, June 12, 2017, <https://www.kaggle.com/c/instacart-market-basket-analysis/discussion/34200#192013>.

15 For example, Amazon rolled out its Amazon Flex same-day service in 50 U.S. markets in two years. They on-boarded 100,000 independent drivers without bearing high employment costs. Itamar Zur and John Brown, "NextGen Supply Chain: How Crowdsourcing is Transforming the Face of Final Mile Delivery," *Supply Chain Management Review*, January 15, 2018, http://www.scmr.com/article/the_next_game_changer_how_crowdsourcing_is_transforming_the_face_of_final_m.

16 The OIG is planning to conduct in 2018 a follow-up research on the US same-day/next-day delivery market.

17 In April 2018 Deutsche Post DHL Parcel announced it would soon let its German customers choose three-hour delivery windows for a small fee (\$3.60). The company said it was the first operator to offer this service in Germany. Deutsche Post DHL Group, "DHL further expands options for preferred parcel delivery time," April 30, 2018, <https://www.dpdhl.com/en/media-relations/press-releases/2018/dhl-further-expands-options-preferred-parcel-delivery-time.html>.

18 Deloitte, *The 2017 MHI Annual Industry Report Next-Generation Supply Chains: Digital, On-Demand and Always-On*, 2017, <https://static1.squarespace.com/static/562164dae4b0099ac9c04b5c/t/595126ece4fcb533d1d7fe2d/1498490608835/Nextgen+-+MHI+2017+Industry+Report.pdf>.

Figure 2: Examples of COTs Applications by USPS

Function	Service	Description
Optimization	Carrier Optimization Routing (COR)	Optimization software first introduced in 2005. [REDACTED]
	Dynamic Routing (DRT)	Software that optimizes parcels-only delivery routes, particularly for Sunday deliveries. [REDACTED]
	Vehicle Loading	[REDACTED]
	Parcel Delivery Territory Assignment Tool (PDTAT)	[REDACTED]
Prediction	Expected Delivery (ExD)	Electronically notifies customers of two-hour anticipated delivery time window based on historical delivery time data and actual departure information captured from carriers' handheld terminal (MDD). (2017 pilot.)
Flexibilization	USPS.com	(Among other features) notifies recipients of incoming packages; allows them to provide delivery instructions, manage notifications, and schedule redelivery.
Synchronization	Volume Arrival Profile	Dashboard providing post office managers with consolidated information from different USPS information systems on arrival and departure times of the mail and incoming volumes. Helps post office managers better organize the day's delivery work.
	MyPO (My Post Office)	Internal portal providing local post office supervisors a list of ad hoc delivery tasks for each carrier route, such as pickup requests from residential customers and businesses.
	USPS Web Tools APIs	Allows businesses to access USPS ecommerce functionality, such as delivery requests (for example, hold for pickup mail) and information on delivery status by interconnecting their IT system with USPS's.

Source: OIG analysis.

Through an easy-to-use app, an Instacart “shopper” buys groceries on behalf of online customers then delivers them. As an “asset-free platform,” Instacart does not maintain warehouses and does not own delivery vehicles. The service is assembled out of existing supermarkets, part-time workers, and their personal vehicles. Like Uber, Instacart’s business model is mostly based on strong COTs:

- Predictive analytics to forecast orders and number of drivers needed by day and time of day.
- Dynamic pricing to align costs with demand: customers may choose to pay more if they want groceries delivered during the busiest time windows.
- Optimization algorithms to automatically assign each order to the closest driver.¹⁹

In early 2018, the service was available to 70 million households across the United States and Canada.²⁰

Collaborative Delivery

In addition to powering on-demand delivery startups, COTs also help traditional delivery companies develop and experiment with new collaborative models for speedier and “cleaner” delivery.

Collaborative Same-day Parcel Delivery

Several international posts have leveraged COTs to enter the same-day delivery market, diversifying their portfolio of parcels services.²¹ The posts of Belgium and Switzerland, for example, have acquired same-day delivery startups with COTs capabilities.²² These moves aim to identify the potential of the same-day segment, its operational feasibility, and possible synergies with their existing delivery infrastructure and workforce.

In March 2018, Deutsche Post DHL announced the Parcel Metro service, a same-day/next-day delivery service available in large U.S. metro areas. The service relies on a flexible collaborative network of local, regional, and crowdsourced providers in addition to its own fleet.²³

Effective synchronization of pickup and deliveries is key to the success of this model. Specifically, the Parcel Metro platform (1) coordinates and assigns pickup and delivery orders to drivers based on location, requested delivery times, and vehicle availability and capacity; (2) allows recipients to schedule and track deliveries and communicate with delivery drivers through the app; and (3) lets customers select their delivery preferences (two-hour, same-day, etc.) and time windows from the online merchant’s website (Figure 3).²⁴ While still in the roll-out phase, this service shows how last-mile coordination platforms can be used by a traditional delivery player to combine the capabilities of different last-mile partners to achieve faster deliveries at the least possible cost.

Collaborative Sustainable Delivery

Several large European cities — as well as the U.S. cities of New York, Seattle, and Chicago — are exploring policies to reduce congestion and CO₂ emissions in downtown areas. In Europe, as part of these initiatives, posts and other delivery companies are working with big cities to determine how new logistics models for faster delivery can also be more environmentally sustainable.

In Berlin, Amsterdam, and Paris, the national posts are involved in the test of a COTs-powered “microhub” model. This model involves trucking parcels to small depots — microhubs — from which hyper-local urban delivery (within a radius of about one mile) is done faster and cleaner by carriers on foot or by small electric vehicles such as cargo bikes. While logistics operators currently use their own delivery workforces in these early experiments, they could use a mix of their own and crowdsourced deliverers in the future.

¹⁹ Ji Chen, “Instacart Anytime: A Data Science Paradigm,” <https://tech.instacart.com/instacart-anytime-a-data-science-paradigm-33eb25a5c32d>.

²⁰ Instacart, “Tipping Point,” February 11, 2018, <https://news.instacart.com/tipping-point-1a9b6335f905>.

²¹ For example, Groupe La Poste, in partnership with large grocery chains, is experimenting with a continuum of expedited urban grocery delivery services, such as one-hour, same-day in the afternoon, delivery on Sundays, or next day within a 30-minute time window. To do this, the company combines its own pre-existing express delivery network (Chronopost) with that of its newly-acquired subsidiary, Stuart. Marek Rozycki, “La Poste bets on Casino to strengthen its stronghold in France,” *Post and Parcel Technology International*, March 14, 2018, <https://www.linkedin.com/pulse/la-poste-bets-casino-strengthen-its-stronghold-france-marek-rozycki/>.

²² Groupe La Poste acquired Stuart, an instant grocery delivery company active in the UK, France and Spain, in 2017 (<https://stuart.com/>); Swiss Post took in March 2018 a majority share in Notime, a parcels same-day cargo bike delivery platform (<http://www.notime.ch/>). Bpost launched in 2016 a peer-to-peer crowdshipping platform now called Parcify (<https://parcify.com/>).

²³ Deutsche Post DHL Group, “DHL introduces new technologies and delivery solutions in US to meet evolving demands of the urban consumer,” news release, March 16, 2018, http://www.dhl.com/en/press/releases/releases_2017/all/dhl_introduces_new_technologies_and_delivery_solutions_in_us_to_meet_evolutionary_demands_of_the_urban_consumer.html.

²⁴ This is done through APIs (Application Programming Interfaces) that directly connect the Parcel Metro information system to merchants’ online ordering platforms.

Figure 3: The DHL Parcel Metro Platform

DHL Parcel Metro ushers in a new form of worksharing in parcel delivery where the first and last miles are outsourced.

Parcel Metro revolves around a DHL coordination platform that manages third-party independent drivers and delivery firms, who pick up and deliver parcels in major U.S. cities. The platform optimizes the assignment of pickup and deliveries to truck/drivers, depending on location, available capacity, and the delivery timeframe specified by recipient (same day, next day, and at a later stage two-hour windows). Consolidation of orders is done by DHL at its warehouses.

- | | | | |
|--------------------------------------------------------------|--------------------------------------------------------------------|------------------------------------------------------------------|------------------------------------------------------|
| 1 Consumer makes purchase online | 3 Driver pickup & delivers package to DHL for consolidation | 5 Consumer notified of scheduled delivery | 7 Driver delivers, collects proof of delivery |
| 2 Retailer prints label & prepares package for pickup | 4 Route assigned & pickup confirmation sent to retailer | 6 Consumer tracks delivery and gives special instructions | 8 Consumer can rate delivery experience |



Source: Deutsche Post DHL website.

In Berlin, the city itself provides the warehouse space from which Deutsche Post DHL and UPS, among others, deliver using their own emission-free vehicles.²⁵ In Amsterdam, PostNL operates seven microhubs from which carriers on cargo bikes and small electric vehicles deliver packages (Figure 4).²⁶ COTs play a key role in optimizing carrier routes in real time, coordinating delivery to and from the microhubs, and selecting the best delivery option (foot or smaller vehicles).

Figure 4: PostNL’s Urban Electric Delivery Vehicle Carries Loads up to 900 Pounds



Source: https://commons.wikimedia.org/wiki/File:PostNL_Stint.jpg.

Omnichannel Fulfillment

Ecommerce companies are increasingly blending retail and online sales fulfillment into one single distribution channel.²⁷ A key aspect of this transition is storing merchandise closer to where in-store and online shoppers live to make shipping faster and cheaper. Proactive retail chains like Target are building omnichannel fulfillment capacity now — either internally or through partnering — to enable next-day or same-day delivery.²⁸

25 Ian Taylor, “Collaborative and clean city logistics,” *Postandparcel*, April 18, 2018, <https://postandparcel.info/95697/news/infrastructure/collaborative-and-clean-city-logistics/>.

26 Nanette Wielenga (PostNL), “PostNL Bike Logistics,” Presentation to the CityLab Conference, March 8, 2018, http://www.citylab-project.eu/presentations/180308_Amsterdam/Wielenga.pdf and CityLab, Amsterdam — Implementation status and next steps, <http://www.citylab-project.eu/Amsterdam.php>. The project is now being extended to other Dutch cities, such as Haarlem. DHL has piloted a similar concept in another Dutch city, Utrecht.

27 Jon Kuerschner, “Transforming Your Supply Chain for Omnichannel Fulfillment,” *Multichannel Merchant*, June 6, 2017, <http://multichannelmerchant.com/operations/transforming-supply-chain-omnichannel-fulfillment/>.

28 This strategy enables a choice between free two-day, next-day, and (in select areas) same-day deliveries. Target currently ships online orders from 1,400 of its 1,800 stores. The company is also piloting a new process which uses the same inventory to replenish stores and fulfill online orders — sending from warehouses to stores more frequent but smaller shipments. Stuart Lauchlan, “Hitting the omni-channel retail Target – the CEO perspective,” *Diginomica*, March 6, 2017, <https://diginomica.com/2017/03/06/hitting-omni-channel-retail-target-ceo-perspective>.

29 Raj Kumar, Tim Lange, and Patrik Silén, *Building Omnichannel Excellence*, McKinsey, April 2017, <https://www.mckinsey.com/industries/consumer-packaged-goods/our-insights/building-omnichannel-excellence>.

This model relies on the real-time monitoring of inventory available for shipping in all stores and warehouses and coordination of shipping to online buyers from these locations.²⁹ Powerful COTs — some of which did not yet exist a few years ago — have been put in place to help automate these tasks. They include:

- **Real-time inventory visibility software:** Where is this product available, and how fast can I get it to customers?
- **Distributed order management systems:** Given customer location, from which shop or warehouse should this order be fulfilled (Video 2)?
- **Predictive inventory analytics:** What will be the demand for each product in a particular area? How much stock should I have in each store or warehouse to respond to the expected demand?
- **Carrier management:** Given the customer’s delivery preferences and product availability, what is the best delivery channel for this parcel? At what time will it be available for collection by the delivery company?

Video 2. IBM Omni-Channel Order Management System



Source: <https://www.youtube.com/watch?v=ojfNgPOeyLc>.

As retailers and logistics companies implement new models, the Postal Service will need to adjust its operations to leverage the new opportunities they can create.

Postal Service Use Cases

The OIG identified use cases that illustrate the potential value of coordination and optimization technologies to the Postal Service.³⁰ The OIG classified these concepts in three categories:

- **A More Flexible Last Mile:** Various COTs are applied to the Postal Service's current parcels delivery network and infrastructure to make them more dynamic.
- **Collaboration in Urban Last-Mile Delivery:** COTs enable the testing of new delivery models as a source of future efficiencies and revenue.
- **Shared Last-Mile Infrastructure:** COTs that allow USPS to share portions of its physical infrastructure to generate cost savings and revenue with third parties.

A More Flexible Last Mile

Dynamic Route Optimization for Same-day Pickups and Deliveries Along Existing Routes

Concept. USPS could leverage real-time optimization software and advanced algorithms to start making some of the existing delivery routes more “flexible” by introducing real-time pickup and possibly local same-day delivery. USPS already offers pickup services for both individuals and businesses. For example, USPS has a Ship From Store (SFS) pickup service targeting retailers doing business-to-consumer (B2C) shipments from individual locations.³¹ Pickup requests are

submitted via usps.com (for individuals) or MyPO (for businesses) the day before and printed out in the post office to be handed over to carriers in the morning before starting the route. Deliveries are made the day after.

In this concept, the use of real-time route optimization would allow USPS to start offering same-day pickup and delivery along select regular routes whenever the pickup and delivery points are within a reasonable distance from the route. For example, an order placed with a local retailer in the evening (or early morning before a given cut-off time) could be picked up along the regular route and delivered same-day. The optimization algorithm would determine whether same-day pickups along the scheduled route and same-day delivery can be done cost-effectively. Routes would be re-optimized in real time and updated instructions would be communicated to the driver, as shown in [Figure 5](#).

Main COTs supporting the use case are:

- A platform interfacing with usps.com, MyPO, and other systems (e.g., the shipping management system of large retailers) collecting pickup and delivery requests, alerting USPS when a package is ready for pickup, and indicating its delivery address for same-day delivery if it is feasible.
- Advanced algorithms to determine the feasibility of a request, including the closeness of pickup and delivery points to the route, the time and cost that the request would add to route, and the distance of the driver from the pickup point. If any deviation from the route is determined to be inefficient (i.e., too costly or far away from the driver's current location), the platform could delay pickup (or delivery) until the next day.³²
- Real-time optimization software, to recalculate the carrier route based on new pickup and delivery requests received through the platform.

³⁰ Use cases are partly based on those developed by an academic institution with an urban logistics research center for the OIG. See [Appendix B](#).

³¹ Twenty-one thousand retail locations use the Ship From Store parcels pickup service. ██████████ million SFS parcels were picked up in FY2017 – a tiny share ██████████ of the Postal Service's total parcels volumes. As part of SFS, USPS started in 2018 picking up prescriptions from CVS stores nationwide for next-day delivery. The postal truck stops at CVS in the afternoon after the end of the regular delivery routes, on the way back to the post office.

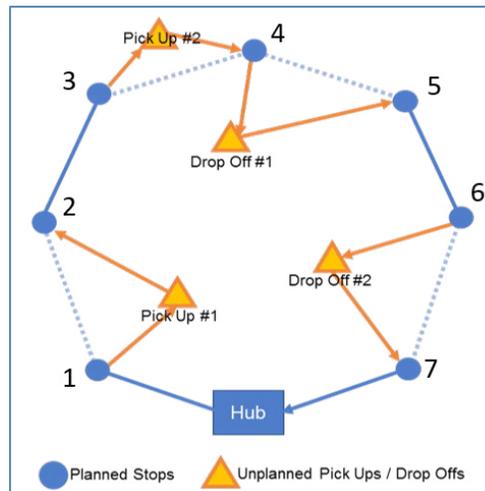
³² Over time, local post office supervisors would reconfigure delivery routes to ensure that routes do not exceed eight hours, including regular deliveries and the average predicted time same-day pickup and deliveries take.

Figure 5: Introducing Dynamic Pickups and Drop-offs

THE PLATFORM MANAGES UNSCHEDULED SAME-DAY PICKUP AND DELIVERY REQUESTS ALONG EXISTING ROUTES

The regular fixed delivery route (in blue) goes directly from delivery points 1 to 2. Customer 1 nearby asks an unscheduled pickup for same-day delivery to a location also close to the route.

In this example the platform automatically determines that the carrier can do this effectively and tells them to drive from delivery point 1 to pick up location #1 before resuming regular deliveries at 2. Carrier will later depart again from fixed route to deliver the parcel at drop off point #1.



Source: John Mabe, Onfleet and a Last Mile Delivery Platform, *TechGistics*, June 17, 2017, <http://www.techgistics.net/blog/onfleet-and-a-last-mile-delivery-platform-logistics-on-demand-delivery>.

Benefits. In rural areas, the service might enable USPS to start providing same-day delivery from stores. While rural residents increasingly buy online — 41 percent live in a household that subscribes to Amazon Prime — faster delivery options are usually not available to them or are expensive.³³ In urban areas, many large retailers are already partnering with on-demand companies to offer same-day pickup from store and delivery. This solution might allow USPS to gradually

upgrade and modernize its own local delivery service starting with limited pilots along regular routes.

Implementation. The main objective of a [redacted] would be to determine the [redacted] that lend themselves to [redacted] — those where a significant number of parcels could be picked up and (profitably) delivered same-day without disrupting service performance. In urban areas, USPS might [redacted] this service for [redacted] retailers. [redacted] routes would first need to be negotiated and agreed upon with postal unions to maintain manageable workdays and routes. This would be a critical issue in rural areas, where increasing parcels volumes often force Rural Carriers and Rural Carrier Assistants to work long days.³⁴

Customized Delivery Time Windows

Concept. The USPS might develop a delivery time windows management system to improve the accuracy of estimates and provide shorter or customized delivery time windows on parcel routes.³⁵ USPS customers already have a certain degree of control over the parcels they receive — they can track them end-to-end and reschedule missed deliveries through usps.com. Starting this year, they will also be provided an estimated two-hour delivery window.

The delivery route optimization software would enable recipients to choose a preferred delivery time window and change it up to the day of delivery. Continuous communication between the carrier and recipient via text updates on the day of delivery would keep recipients updated about the expected delivery time and carriers informed of last-minute changes.³⁶

Furthermore, in this concept, predictive analytics can enable dynamic pricing. When customers place an order on a merchant's site, USPS could propose a choice of delivery days and time windows at different price points. Delivery

33 Matt Lindner, "Nearly half of all US residents live in an Amazon Prime household," *Digitalcommerce360.com*, August 8, 2017, <https://www.digitalcommerce360.com/2017/08/08/nearly-half-u-s-residents-live-household-amazon-prime-membership/> and <https://www.amazon.com/gp/help/customer/display.html?nodeId=201118050>. The "free" two-day delivery associated with Prime applies to all addresses within the contiguous United States.

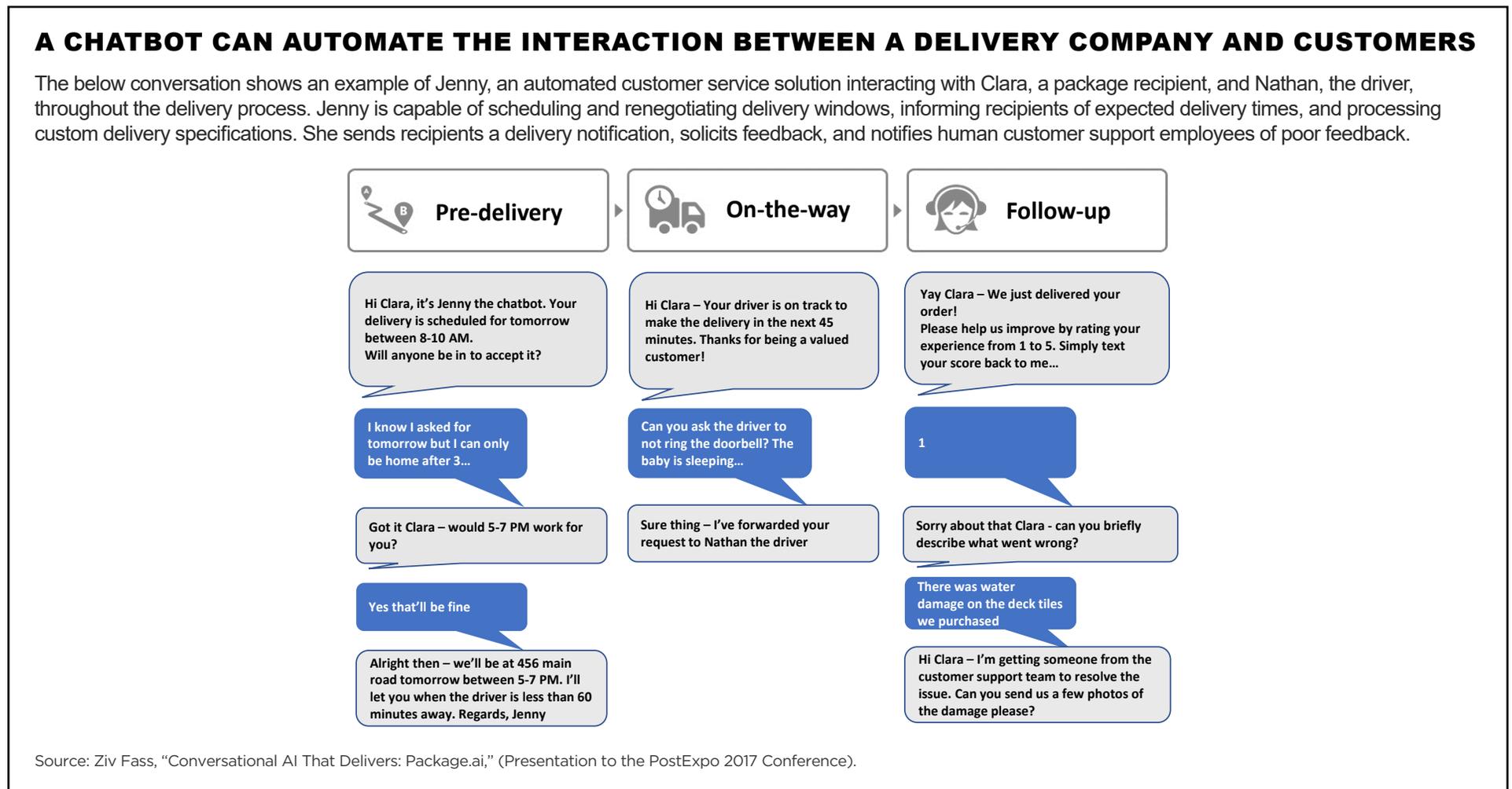
34 Jake Bittle, "In Rural America, the Postal Service Is Already Collapsing," *The Nation*, May 2, 2018, <https://www.thenation.com/article/in-rural-america-the-postal-service-is-already-collapsing/>.

35 For fixed routes, by definition, delivery times depend on where on the route recipient's delivery point stands.

36 On the importance of time delivery windows, see William Salter, "Is Your Fulfillment Operation Ready for the Holidays?," *Material Handling and Logistics*, October 13, 2017, <http://www.mhlnews.com/transportation-distribution/your-fulfillment-operation-ready-holidays>.

options and prices would be set according to forecasted demand, additional delivery costs, and operational constraints (such as driver availability and vehicle capacity), not unlike the pricing system of Instacart or Uber. In a more interactive version of the use case, USPS would agree on the delivery day and time with customers through an artificial intelligence system such as a chatbot.³⁷ Chatbot-based solutions are already on the market, such as the one used by the last-mile logistics automation company Package.ai (Figure 6).

Figure 6: The Package.ai Solution



³⁷ Chatbots are computer programs that simulate human conversation, both verbally or via text.

Benefits. This use case would provide consumers more choice, control, visibility, and responsiveness while ensuring operational efficiency. A more customer-centric delivery experience where recipients are directly involved in the selection of delivery options would improve customer satisfaction. The customer-carrier interaction system would help increase first attempt delivery success — one of the Postal Service’s current areas of strategic focus. For USPS, this would be particularly helpful when a package requires a signature, cannot be left outside the home, or when a customer has requested a parcel pickup from home. This solution would align USPS with the rest of the market where major operators are already moving in that direction. In the U.S., UPS MyChoice customers can pick (for a fee) a two-hour confirmed delivery window from within an original four-hour estimate.

Implementation. From a marketing perspective, USPS would have to determine the operational feasibility of a [REDACTED] for parcel routes and whether to position it as an optional [REDACTED], similar to UPS MyChoice. USPS would also have to determine to what extent the introduction of a [REDACTED] is compatible with the existing regulatory framework and would be approved by the Postal Regulatory Commission (PRC). If so, the Postal Service would then need to [REDACTED] to pay for the convenience of [REDACTED]. The chatbot capability could be a useful addition to the [REDACTED], which already allows users to track deliveries and request redeliveries.

Collaboration in Urban Last-Mile Delivery

Concept. USPS could pilot a new, flexible delivery model to provide sustainable same-day delivery in high density urban areas. This model would imply the

redesign of the parcel delivery network in the tested area to create additional parcel distribution points closer to recipients (microhubs) from which deliveries would depart, the potential use of on-demand delivery partners in addition to USPS carriers, and using clean and nimble delivery vehicles.

This use case assumes that over the next couple of years parcel volumes will continue to grow in large cities, especially the demand for same-day delivery of parcels and groceries.³⁸ Solutions based on making fixed delivery routes more flexible through dynamic routing as discussed above would not be sufficient. For all carriers, including the Postal Service, increased traffic and lack of parking would increase the time and cost of delivery rounds in dense urban areas. Furthermore, large cities may impose restrictions on deliveries or encourage delivery companies to reduce their environmental footprint by collaborating and using low-emissions vehicles.³⁹

In this model, USPS’ microhubs would have large containers to hold parcels for same-day delivery.⁴⁰ Several times a day, postal trucks would bring packages to USPS microhubs throughout the city (each truck would serve several microhubs), from which deliveries would be made on that same day to recipients located within a small radius, for example, one mile or less (see Figure 7).⁴¹ This means that a package picked up in the morning would be delivered same-day. Delivery from the hub would be made by either a dedicated postal workforce, on-demand drivers/carriers, or both. In a “non-simultaneous” variant of the model, trucks would bring parcels to microhubs in the evening to take advantage of better traffic conditions. Delivery from microhubs would take place in the morning.

38 Regarding the groceries segment, a Nielsen and Food Marketing Institute study forecasts that online groceries could represent 25 percent of all grocery sales in the US in 2025. They are estimated at 2.5 percent in 2018. Pam Danziger, “Online Grocery Sales To Reach \$100 Billion In 2025; Amazon Is Current And Future Leader,” *Forbes*, January 8, 2018, <https://www.forbes.com/sites/pamdanziger/2018/01/18/online-grocery-sales-to-reach-100-billion-in-2025-amazon-set-to-be-market-share-leader/> and Coresight Research, “U.S. Online Grocery Consumer Survey: Amazon Is the Most-Shopped Retailer, but Not Yet a Full-Order Grocery Destination,” 2018, <https://www.funfglobalretailtech.com/research/us-online-grocery-consumer-survey-amazon-shopped-retailer-not-yet-full-order-grocery-destination/>.

39 For example, the city of New York has trialed the concept of off-hours delivery (goods are delivered in the evening or early morning rather than during the business day). See [Appendix C](#).

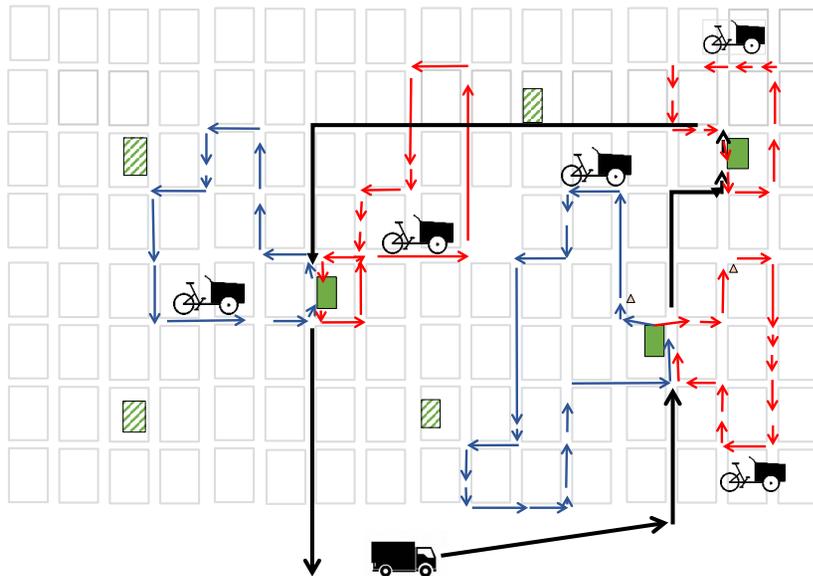
40 To determine the number and optimal location of microhubs, USPS would first develop a districting plan. This optimization model would use historical data on delivery flows and patterns, as well as data on the speed and cost of different last mile delivery alternatives (such as electric trucks, cargo bikes, and on-foot deliveries where possible). In its report to the OIG, the academic institution also suggested that every day the Postal Service, based on forecasted volumes, determine which of the USPS microhubs should be activated the next day and how many drivers/carriers should be made available to deliver from each of them.

41 Trucks would bring packages entered at the destination delivery unit (DDU) for same-day delivery or picked up packages from local businesses. The DDU is the final stop in the U.S. Postal Service network that a package makes prior to delivery. Packages arriving at a DDU are sorted to carrier routes and sent out for delivery.

Figure 7: Urban Same-day Delivery: the Microhub Model

MICROHUBS HAVE LARGE CONTAINERS FROM WHICH USPS CARRIERS OR INDEPENDENT DRIVERS WOULD DELIVER SAME-DAY PARCELS IN A NEIGHBORHOOD

Several times per day, postal trucks follow a fixed route (in black) bringing packages for daily delivery to microhubs (in green) situated in different neighborhoods. Postal or contracted carrier/drivers then deliver them along optimized routes (in blue and red). Depending on the day's estimated workload, microhubs could be turned on or off to reflect the most efficient allocation of postal trucks and deliverers (inactive microhubs in green with stripes).



For each parcel, a USPS-owned coordinating platform would determine the optimal delivery mode (for example, cargo-bike, small vehicle or walking route; postal or non-postal carriers). The choice would be based on operational feasibility, capacity constraints, cost effectiveness, and, where applicable, city restrictions on the delivery of parcels in certain times of the day or areas, or city construction and road closures.⁴² Algorithms would also automate decisions on whether a carrier should start their route or wait for the next truck to consolidate more packages into one load. Over time, the coordination of same-day deliveries might be extended to new delivery modes, such as robots or drones.⁴³

Benefits. The main benefit of this COTs-powered model is that technology complements the fixed postal network with additional and scalable infrastructure and resources, making it relatively easy and cost-efficient to manage and coordinate. The combination of microhubs and more flexible postal or independent labor would potentially allow USPS to expand its portfolio with same-day offerings and other ancillary services. In addition, if last-mile delivery is done with emission-free vehicles, the microhub model could have significant environmental benefits. In fact, the prospect of reducing traffic and pollution through microhub delivery models has pushed some European cities to lend posts and private competitors public space to pilot the solution.

Implementation. Introducing additional labor flexibility would first require USPS to work with unions to determine feasibility. Should this be feasible, in establishing collaborations with external delivery companies, USPS should make sure that [REDACTED]. This will be key to ensuring a reliable, high-quality delivery service and preserving the value of the postal brand.

As far as the location of the microhubs is concerned, they could be located wherever possible on [REDACTED] to reduce the cost of renting spaces in generally pricey city centers. Working with city governments to identify and negotiate the conditions for using urban spaces would also be required.

42 This would mirror the type of carrier selection that shipping platforms, as well as Amazon or UPS already do when deciding which company is going to do the last mile. The platform could be programmed to reflect different priorities — for example, priority for low cost (all things being equal, assigning a delivery to the cheapest delivery option), or priority for using postal employees to make the delivery.

43 For a review of the different types of Autonomous Mobile Robots (AMRs) for last-mile delivery, see OIG, *Autonomous Mobile Robots and the Postal Service*, Report No. RARC-WP-18-006, April 9, 2018, <https://www.uspsog.gov/document/autonomous-mobile-robots-and-postal-service>.

Finally, ██████████ could best be done in partnership with ██████████.⁴⁴ In fact, U.S. local governments have started looking for new technological solutions that can help make urban delivery more efficient. New York's Smart Truck Management Plan or Seattle's New Mobility Playbook are examples. One of the largest U.S. cities has even expressed interest in testing this concept.⁴⁵ In the coming years, options considered by large cities to reduce congestion and pollution may well include policy and tools that encourage delivery companies to share infrastructure and resources.⁴⁶

As the delivery company with the largest market size in volume and physical infrastructure, it is important that the Postal Service participate in the discussions on transportation policies that cities and other organizations are hosting.⁴⁷ This would help inform the debate and help preempt the passing of restrictive city regulations that could potentially hamper its ability to operate in U.S. downtowns (see [Appendix C](#)).⁴⁸

Extracting New Value from the Last-Mile Infrastructure

As ecommerce grows, elements of the Postal Service's vast physical infrastructure could be shared by online retailers or other delivery companies to create sources of additional revenue.

The Shared Postal Facilities

Concept. USPS would create a platform that would dynamically update available excess capacity in larger and underutilized USPS facilities. Through the

platform, USPS would lease vacant space to mid-size merchants willing to move fulfillment centers closer to large metropolitan areas to allow for same or next-day deliveries. In addition to warehouse space, USPS could provide fulfillment and delivery services.

As already mentioned, COTs have allowed the emergence of on-demand warehousing and fulfillment platforms such as Flexe or Darkstore, which connect retailers and online merchants looking for warehousing and fulfillment space with stores or malls willing to monetize excess space. Delivery services are increasingly offered in addition to fulfillment services and warehousing space. Flexe, for example, is now offering online retailers access to nationwide next-day delivery.⁴⁹

Two OIG reports have already suggested the Postal Service consider broadening its revenue stream to include warehousing services for small businesses.⁵⁰ This model would offer USPS the opportunity to do it in an efficient and automated way. The Postal Service could do it either through existing on-demand warehousing platforms or create its own on-demand platform.

Should USPS create its own fulfillment platform, the main COTs required would be the integration and coordination between shippers' order management systems, the USPS fulfillment platform, and its delivery information systems. In other words, shippers would manage on the same platform their warehousing, fulfillment, and shipping — all provided by USPS.

44 In Europe, for example, La Poste plans to create 80 microhubs in downtown Paris, starting in 2018, with eco-friendly last-mile delivery. The plan supports the company's objective to move all parcels deliveries to clean deliveries and also supports the city of Paris' own Blueprint for Sustainable Urban Logistics. Ian Taylor, "Le Groupe La Poste Mulling Plans for Parisian Parcel Microhubs," *PostandParcel*, December 1, 2017, <https://postandparcel.info/90835/news/parcel/le-groupe-la-poste-mulling-plans-for-parisian-parcel-microhubs/>.

45 Prof. Jose Holguin-Veras, Rensselaer Polytechnic Institute, in discussion with the authors, June 11, 2018.

46 For example, activities planned by the city of Seattle include the development of "a goods trip reduction program to reduce unnecessary urban delivery trips and inefficient delivery movements," the testing of shared parcel delivery lockers, and "work with digital logistics platforms to build delivery capacity using shared vehicles." City of Seattle DOT, "Mobility Playbook, Play 2 — Strategy 2.3," <https://newmobilityseattle.info/playbook/play/2/strategy/3>.

47 However, while a member of University of Washington's Urban Freight Lab, the Postal Service lags behind competitors in terms of its level of engagement with U.S. cities.

48 Collaboration through organizations such as the Transportation Research Board, or Intelligent Transportation Society (ITS) America, where cities, government agencies, private sector stakeholders, and academic partners share ideas on enhanced future of transportation and mobility for the last mile and beyond would also be a productive way for USPS to build partnerships and inform what could become its City Logistics strategy.

49 Jennifer Smith, "Flexe to Offer Next-Day Delivery for Online Retailers," *Wall Street Journal*, May 11, 2017, <https://www.wsj.com/articles/flexe-to-offer-next-day-delivery-for-online-retailers-1494539661>.

50 OIG, *Opportunities for the Postal Service – Micro-Warehousing and Other Logistics Support Services*, Report No. MS-WP-14-003, March 13, 2014, https://www.uspsoig.gov/sites/default/files/document-library-files/2015/ms-wp-14-003_0_0.pdf. Another OIG report highlighted the fact that retailers were seeking small warehouses located within urban centers "to allow them to compete with Amazon and others in providing ultra-fast delivery." It also argued that given its vast network and available space, the Postal Service might be well suited to help address this need. OIG, *The Evolving Logistics Landscape and the U.S. Postal Service*, Report No. RARC-WP-16-015, August 15, 2016, https://www.oversight.gov/sites/default/files/oig-reports/RARC-WP-16-015_0.pdf.

Benefits. For each package leaving the depot, on-demand warehousing companies typically charge \$2 to \$4 per parcel, depending on volume and parcel size (oversize parcels incur additional charges).⁵¹ Should USPS embrace a similar pricing model, a USPS warehousing platform could help generate new revenues from existing assets. If allowable under existing regulations, a one-stop-shop service — combining warehousing, fulfillment, and DDU (Destination Delivery Unit) dropshipping from the same site — could support its parcels business and help meet retailers’ increased need for faster deliveries. This new “Ship From USPS Facilities” service would nicely complement the existing “Ship From Store.”

Implementation. The Postal Service would mainly be challenged to identify large sites with significant vacant capacities that could be rented out to shippers. [REDACTED] to allow [REDACTED] and creating [REDACTED] to support this new business line would require additional investment. Entering the warehousing industry could also require modifications to the Postal Service’s [REDACTED].⁵² Finally, USPS may need approval from the PRC to offer this new service.

Shared Parcel Lockers

Concept. To increase usage of its existing GoPost lockers and build usage density for potential new ones, the USPS could open the use of its lockers to third parties, such as smaller, local, and crowdsourced delivery companies and retailers, for a fee. Since 2011, USPS has piloted GoPost, its own parcel locker network with the objective to redirect failed deliveries and provide customers with alternative delivery and return locations.⁵³ This solution could help USPS increase the lockers’ current and future usage. For example, bpost (the Belgian Post) launched Cubee, a nationwide network of shared lockers. Some cities in Europe

and Seattle in the U.S. are encouraging shared lockers as part of their urban sustainability policies to alleviate congestion.

A COT-enabled USPS platform would determine the lockers’ available capacity based on the number and size of packages and how long a parcel usually stays in a locker before retrieval. It would also provide an interface for third parties to see availability and submit requests, handle booking requests, assign spaces, and calculate payments.⁵⁴ Third-party delivery companies using the locker would pay USPS a fee per package. When making purchases, ecommerce buyers could select the locker as their preferred delivery location where applicable. Recipients would be notified (via mobile or Informed Delivery) that a parcel will soon be available for pickup and receive the code to retrieve the package.

Benefits. Sharing lockers would allow USPS to generate new revenues from an asset that is currently conceived as a cost-saving tool and a free-of-charge convenience option for recipients. By extending this convenience to other delivery companies for a fee, it could extract value from a delivery experience that would otherwise take place outside the postal network. The locker could also include a temperature-controlled department, optimized for groceries or medications.⁵⁵ Finally, the shared parcel locker could complement the microhub model outlined above: same-day deliveries could be done from microhubs to parcel lockers (and parcels collected from lockers transported to microhubs for delivery).

Implementation. Large shippers and carriers like UPS and Amazon have their own parcel locker networks. Although using GoPost could help them extend their market coverage, they may not be interested in doing this through partnerships. Conversely, smaller shipping companies and retailers partnering with crowdshipping companies might be more interested in using GoPost to further reduce costs and provide an alternative to home delivery. USPS could conduct [REDACTED]

51 For Darkstore, the minimum charged per package is \$2 and the maximum \$20. Megan Rose Dickey, “Darkstore wants to be the ‘invisible retailer,’” *Tech Crunch*, September 11, 2017, <https://techcrunch.com/2017/09/11/darkstore-wants-to-be-the-invisible-retailer/>.

52 OIG, *Opportunities for the Postal Service – Micro-Warehousing and Other Logistics Support Services*, Report No. MS-WP-14-003, March 13, 2014, https://www.uspsaig.gov/sites/default/files/document-library-files/2015/ms-wp-14-003_0_0.pdf.

53 So far, GoPost has produced mixed results. According to the Postal Service, GoPost lockers registered a total of [REDACTED] transactions in [REDACTED] sites in FY2017. Registered Gopost customers need to register and get a PIN they use to retrieve packages. Usps.com users can redirect failed deliveries to a nearby GoPost where available. GoPost package pickup, USPS website, <https://gopost.usps.com/go/EPLGPSearchActionInput>.

54 For example, one of the products sold on the U.S. market has a module which measures “each package’s exact dimensions” and dynamically “selects the most efficient location to store each package.” Bell and Howell, “PackRobot by Cleveron,” <https://bellhowell.net/products-solutions/click-and-collect/packrobot-pickup-tower/>.

55 SAP, “SAP Leonardo Connected Goods — Connecting Smart Parcel Lockers,” Presentation to the OIG, April 6, 2018.

[REDACTED] for such an opportunity. Investments in IT to enable the sharing of lockers would only be justified if USPS planned to [REDACTED] and found sufficient number of [REDACTED].⁵⁶

Conclusion

This latest generation of COTs, including optimization software, predictive analytics, and coordination platforms, represent new and more advanced tools that could allow the Postal Service to bring further cost efficiencies and customer value to its parcel delivery business model. COTs, therefore, can play an essential role in the Postal Service's response to new threats and opportunities emerging in the parcel delivery market.

In this context, COTs could support USPS response strategies by:

- Making the current last-mile parcel delivery model more flexible and dynamic;
- Supporting the development of new scalable and collaborative delivery models; and
- Extracting additional value from its delivery infrastructure.

The combination of these strategies could help USPS protect and grow its parcel business, positioning USPS as a potential “anytime, anywhere” delivery provider.

⁵⁶ USPS is currently promoting the Automated Parcel Drop, a self-service machine in postal retail lobbies that makes it easier for customers to drop off packages for shipment and could be seen as [REDACTED].

Appendices

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Appendix A: Last-Mile Routing Optimization

Last-mile delivery companies like the Postal Service strive to minimize the time, and therefore the cost of parcel deliveries. This appendix provides basic definitions of two classic logistics optimization problems — the “traveling salesman problem” and “the vehicle routing problem.” This section discusses how postal operators use georouting software to solve these problems.

The Traveling Salesman Problem

For at least 60 years, operations research experts have created and fine-tuned algorithms that solve the Traveling Salesman Problem (TSP) — developing models that calculate the shortest possible delivery route that visits every delivery point once and only once before returning to depot.⁵⁷

Over the years, TSP models have been refined to account for additional operational constraints, such as pre-set delivery or pick-up time windows and vehicles’ maximum capacity or driving time. Given these complexities, models often identify a “good enough” solution — one that does not require much computation but is still close enough to the optimum.⁵⁸ One of the most useful variants of the TSP is the Vehicle Routing Problem (VRP). While the TSP optimizes one single route, the VRP simultaneously determines the optimal routes for a fleet of vehicles that all leave and return to the same depot. (Figure 8).

Static and Dynamic Optimization

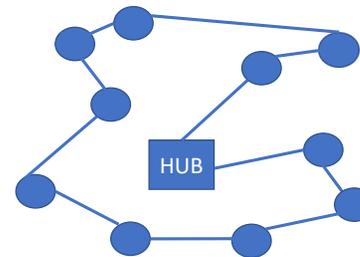
For many years, VRP optimization models were “*static*.” Delivery routes were pre-determined each day before the start of the route. Information on the delivery address of each parcel was entered into the georouting software which, using digital maps and an optimization algorithm, calculated the optimal route and generated turn-by-turn instructions.⁵⁹

Figure 8: Two Basic Optimization Problems

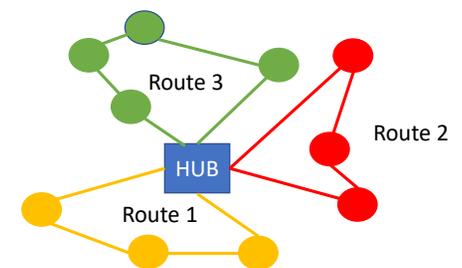
ROUTING SOFTWARE CAN SOLVE A NUMBER OF OPTIMIZATION PROBLEMS THAT TAKE INTO ACCOUNT DELIVERY COMPANIES’ OPERATIONAL CONSTRAINTS

The basic traveling salesman problem consists in identifying the shortest route connecting all delivery points. The vehicle routing problem determines the optimal routes serving the same delivery points with a fleet of vehicles (in this example, three vehicles).

Traveling Salesman Problem



Vehicle Routing Problem



Source: Wan-Yu Liu, Chun-Chen Lin, Ching-Ren Chiu, and Qunwei Wang, Minimizing the Carbon Footprint for the Time-Dependent Heterogeneous-Fleet Vehicle Routing Problem with Alternative Paths, *Sustainability* 6(4), July 2017, https://www.researchgate.net/figure/Illustration-of-the-traveling-salesman-problem-TSP-and-vehicle-route-problem-VRP_fig1_277673931.

⁵⁷ For a history of the TSP, and description of methods to solve it, see University of Waterloo, “The Traveling Salesman Problem,” <http://www.math.uwaterloo.ca/tsp/problem/index.html>.

⁵⁸ This is what mathematicians call “heuristics” — a problem-solving method that is not perfect but sufficient for achieving immediate goal.

⁵⁹ For a survey of the early development of routing technologies in the 1970s and 1980s see Lawrence D. Bodin, “Twenty Years of Routing and Scheduling,” *Operations Research*, 38(4), 1990, <https://pubsonline.informs.org/doi/pdf/10.1287/opre.38.4.571>, pp.571-579.

As geolocation data enabling the tracking of trucks in real time became ubiquitous, georouting software providers have begun considering real-time *dynamic* routing. With dynamic routing, routes can be recalculated and re-optimized in real-time as new events unfold that disrupt the pre-planned route. Dynamic routing software can reoptimize routes that face, for example, new unscheduled pickups, or traffic and weather issues. In such cases, the main challenge consists of feeding real-time data of the driver's location as well as disruptive external events into the georouting software, which can then "re-optimize" the route accordingly.

The OIG found there is no consensus regarding the definition of "dynamic" georouting. According to academics, optimization is dynamic "if the inputs of the problem are received and updated concurrently with the determination of the route." If all problem inputs are received before route determination and do not change thereafter, the route is considered static.⁶⁰ On the other hand, logistics and IT industries use an operational definition where dynamic georouting refers to routes that are not fixed and are recalculated based on next day's expected volumes — but are not necessarily re-optimized in real time.⁶¹

USPS Applications of Optimization Software in the Last Mile

The Postal Service has been using georouting software since 2013 to optimize its parcel routes. Most parcels-only routes are designated for Sunday delivery of packages, each of which usually covers several zip codes. The shipper sends data on parcels to be delivered that day to the Postal Service's information system. The Postal Service's routing software then creates up to 5-hour street delivery routes based on the number of parcels to be delivered and distance to be traveled.⁶² After generating optimal routes, the georouting software produces turn-by-turn instructions for drivers.

USPS is also using routing optimization in other cases. First, USPS uses georouting software in rare cases where it has separate rounds for letters (delivered on foot) and parcels. This is the case, for example, in parts of New York

City such as the Bronx.⁶³ Postal Service also uses georouting during peak season, when parcels volumes exceed the delivery capacities of regular routes. To deliver excess parcels USPS creates optimized overflow parcel routes (PDTAT system).

Finally, USPS uses a separate Carrier Optimization Routing (COR) system to recalibrate every year its fixed (letters and parcels) city delivery routes. COR takes actual information about the routes in a zone (times of delivery at each delivery point and volumes) to adjust the routes as needed. The Postal Service uses COR to consolidate routes, create new ones, and propose more efficient travel patterns. COR was first implemented in 2005 and is regularly updated. However, the system does not automatically change the route — it proposes solutions that management reviews and validates.

Implementation Considerations

To ensure efficient implementation of georouting software for last-mile delivery, postal operators must address two issues. First, the digital maps used for optimization must be [REDACTED]. Starting with off-the-shelf digital maps, Swiss Post had to add critical street-level information that was missing. For example, the post added small roads or paths open to postal vehicles but closed to other vehicles, and therefore initially not shown in digital maps. This allowed to recalibrate the model and increase the value of the optimization process.

Another important consideration is carriers' acceptance of the turn-by-turn instructions provided from georouting software. Carriers — who often know an area inside out — sometimes believe that their knowledge of routes should take precedence over adherence to the results of an automated, and sometimes imperfect, optimization process. A potential solution includes conducting [REDACTED] but also — as done by the Swiss Post — engaging carriers in reviewing optimized routes. Carriers can suggest that implicit traffic rules or patterns they are aware of be considered in the optimization process, making it more realistic and, therefore, more efficient.⁶⁴

60 See for example, Harilaos N. Psaraftis, Min Wen, and Christos A. Kontovas, *Dynamic vehicle routing problems: Three decades and counting*, Networks, Vol 67, Issue 1, Wiley Online Publishing, January 2016, <https://onlinelibrary.wiley.com/doi/full/10.1002/net.21628>.

61 See for example, Ortec, "Dynamic Routing," <https://ortec.com/dictionary/dynamic-routing/>.

62 For a description of the Postal Service's Sunday delivery process, see OIG, *Sunday Parcel Delivery Service*, Report No. DR-AR-15-002, <https://www.uspsaig.gov/sites/default/files/document-library-files/2015/dr-ar-15-002.pdf>.

63 OIG, *Delivery and Customer Service Operations – Bronx, NY*, Report No. DR-AR-17-004, April 20, 2017, <https://www.uspsaig.gov/sites/default/files/document-library-files/2017/DR-AR-17-004.pdf>, pp.6-7.

64 Markus Steinmann, Swiss Post, in discussion with the authors, February 2, 2018.

Appendix B: Use Cases Proposed by an Academic Institution with an Urban Logistics Research Center

The OIG asked an academic institution with an urban logistics research center to identify COTs applications that would benefit the Postal Service. The eight use cases proposed by the academic institution are summarized below. For the first five cases, the academic institution also provided a high-level evaluation of expected benefits and implementation considerations. The use cases presented in the third section of this report are partly based on the academic institution's analysis.

Use Case #1. Dynamic Distribution Points (DDP)

To implement same-day delivery USPS would put in place an alternative delivery network based on microhubs. Trucks transport parcels to small microhubs/DDPs, from which deliveries can be made predominately by cargo bikes or electric vehicles. (DDPs are small informal microhubs where parcels can be quickly transferred from a small truck or small container to last-leg delivery modes.) In asynchronous operations, the parcels can be deposited, at night for instance, at a delivery locker or a small container at the DDP. Every day the operational DDP plan will be selected from an optimal districting plan previously established. The operational (daily) DDP plan would determine which DDPs will be used and how many last-mile carriers/vehicles and what types of vehicles would be needed.

Use Case #2. Agile Multi-Carrier Pickup and Delivery Platform

USPS would transfer parcel deliveries to external partners whenever partners can deliver at a lower cost while meeting service performance targets. A USPS platform based on optimization algorithms would identify the most cost-effective delivery options and assign parcels to either a USPS vehicle or partner vehicle.

Use Case #3. Dynamic Optimizer for Same-day Deliveries

USPS would make its regular and parcel routes and parcel routes more "flexible" by introducing dynamic (real-time) pickup to allow regional same-day or next-day delivery. Routing algorithms would determine whether same-day pickup along

the scheduled route and same-day delivery can be done cost-effectively. Routes would be re-optimized in real time. Parcels would be handed over to third-parties for last-mile delivery as needed and dictated by cost effectiveness.

Use Case #4. Municipal Collaboration Program

USPS would benefit from engaging with US municipalities to discuss effective ways to help alleviate growing congestion in downtown areas. By being proactive USPS would limit the risk of a city restricting deliveries. To initiate a dialogue with cities USPS could propose the development of a model estimating the number of B2B and B2C deliveries. The model would require USPS and other delivery companies' data. Model results could serve as a basis for discussions between cities, USPS and delivery companies on initiatives aimed at making deliveries more cost-effective with lower impacts on local communities. For example, better curbside management procedures may allow faster and less expensive pickups and deliveries.

Use Case #5. Shared Facilities

USPS would create an on-demand fulfillment platform which would dynamically update the available capacity of underutilized USPS facilities, allowing retailers/etailers to purchase extra capacity from the Postal Service. USPS would provide the fulfillment services and the last-mile delivery.

Use Case #6. Shared Lockers

The increase in online shopping requires a customized and agile network to ship and receive deliveries. Using a network of open lockers would enable shippers, receivers and carriers to exchange deliveries in a fast, integrated and convenient way. USPS could turn GoPost lockers into an open network that any retailer or carrier could use. Customers would place their orders online and select a locker at their most convenient location to receive deliveries. The partner shippers and carriers would reserve the space, use it, and notify the customer the delivery is

ready for pick up. Customers could also return or ship using the same system. The platform would be used for B2B, B2C and C2C delivery flows.

Use Case #7. Delivery Time Windows Management

Customers' needs have been quickly evolving in recent years. Today, customers expect an increasingly quick, convenient, and personal delivery experience. Improvements in technology are allowing companies to meet these demands. Being able to estimate the arrival time of deliveries as accurately as possible would help the Postal Service offer added value to its customers. The Postal Service could develop a delivery window management program to integrate tracking technologies and data analytics to provide short timeframe estimations of arrival time for deliveries. For parcel routes benefiting from dynamic routing optimization, the Postal Service could provide customers with an estimated delivery window calculated in real time. As time progresses,

increasingly precise estimations could be given to the customer up until the moment the delivery takes place.

Use Case #8. Real-Time Computation of Pickup and Delivery Routes

Parcel delivery markets are rapidly changing. Deliveries are more frequent, destinations are less predictable, and customers have expectations of shorter delivery time windows. These factors require postal operators to use dynamic routes — updated in real time — to make their deliveries. The Postal Service can build off its current Dynamic Routing Tool (DRT) to allow its real-time data feed to recalculate routes and transmit new instructions to delivery vehicles. The system requires high quality real-time traffic, road network, and demand data to update pickup/delivery routes. The system is connected to the carrier's handheld device used to monitor truck's location, transmit new instructions and track the delivery status of the packages.

Appendix C: Logistics Planning in New York City

We briefly describe below initiatives taken by the city of New York to address issues raised by the growth of ecommerce deliveries, with a focus on collaboration with logistics players.

Congestion Is Growing and Hampering the Local Economy

Following Los Angeles, New York City is the second most congested city in the world.⁶⁵ If nothing is done to discourage congestion, worsening traffic is estimated to cost the New York City economy \$20 billion a year.⁶⁶ This multi-billion-dollar cost is due in part to delivery trucks crowding already busy downtown streets. Of the over 400 million tons of cargo that passes through the city every year, more than 90 percent is transported by truck.⁶⁷ In Manhattan, the upsurge of ride-hailing apps like Uber and Lyft has compounded the congestion problem.⁶⁸

Parcel delivery-induced congestion is only growing. Ecommerce deliveries to residential areas in New York City have increased by 30 percent in the last five years. In 2017 city officials conducted a “Citywide Mobility Survey” which indicated that 40 percent of New Yorkers received a delivery of some kind at their home “at least a few times a week.”⁶⁹ The academic institution OIG partnered

with estimates that on average there are currently about 4.6 million pickups or deliveries per day in the New York metropolitan area evenly split between B2B and B2C deliveries. While very high, the density of deliveries is still lower than in some other large cities. For example, in Seoul, South Korea, the number of pickups and deliveries per capita is 66 percent higher than in New York.⁷⁰

Ecommerce Deliveries Are Increasingly Difficult

Besides increased delivery trips, the rise of B2C ecommerce in New York City has created tremendous operational challenges. Most apartment buildings were not designed to accommodate large ecommerce deliveries and do not have enough loading docks to park trucks, storage space for parcels, or freight elevators for deliveries.⁷¹ This increases dwell time in a context where the parking available for delivery trucks, mostly on-street, is not sufficient — trucks frequently double park because curbside loading zones are filled. The net effect is a significant increase in the degree of difficulty to make deliveries, which creates additional costs for deliverers and societal externalities in the form of congestion. Because they comprise almost three-fourths of parcels delivered in New York City residential buildings the main three delivery companies — USPS, UPS and FedEx — are a main part of the “problem” (Figure 9).⁷²

65 New York City ties with Moscow for the second highest number of peak hours spent in congestion in the world. *Los Angeles Tops INRIX Global Congestion Ranking*, INRIX Research, February 5, 2018, <http://inrix.com/press-releases/scorecard-2017/>.

66 The estimated \$20 billion annual cost of congestion in New York City and the surrounding metro area is based on a combination of \$9.17 billion in travel time costs, \$5.85 billion in industry revenue loss, \$2.54 billion additional fuel and vehicle operating costs, and \$2.42 billion in increased industry operating costs. Partnership for New York City, *\$100 Billion Cost of Traffic Congestion in Metro New York*, January 2018, <http://pnyc.org/wp-content/uploads/2018/01/2018-01-Congestion-Pricing.pdf>.

67 When measured by weight, 91 percent of freight moves by truck. When measured by value, 98 percent moves by truck. New York Metropolitan Transportation Council, *NYMTC Regional Freight Plan Update 2015-2040 Interim Plan*, January 30, 2014, pp. 1-5, https://www.nymtc.org/portals/0/pdf/Fright%20planning/TM2-2-1_NYMTC_Commodity%20Flow%20Analysis_FINAL.pdf.

68 Bruce Schaller, *Empty Seats, Full Streets: Fixing Manhattan's Traffic Problem*, Schaller Consulting, December 21, 2017, <http://schallerconsult.com/rideservices/emptyseatsfullstreets.pdf>.

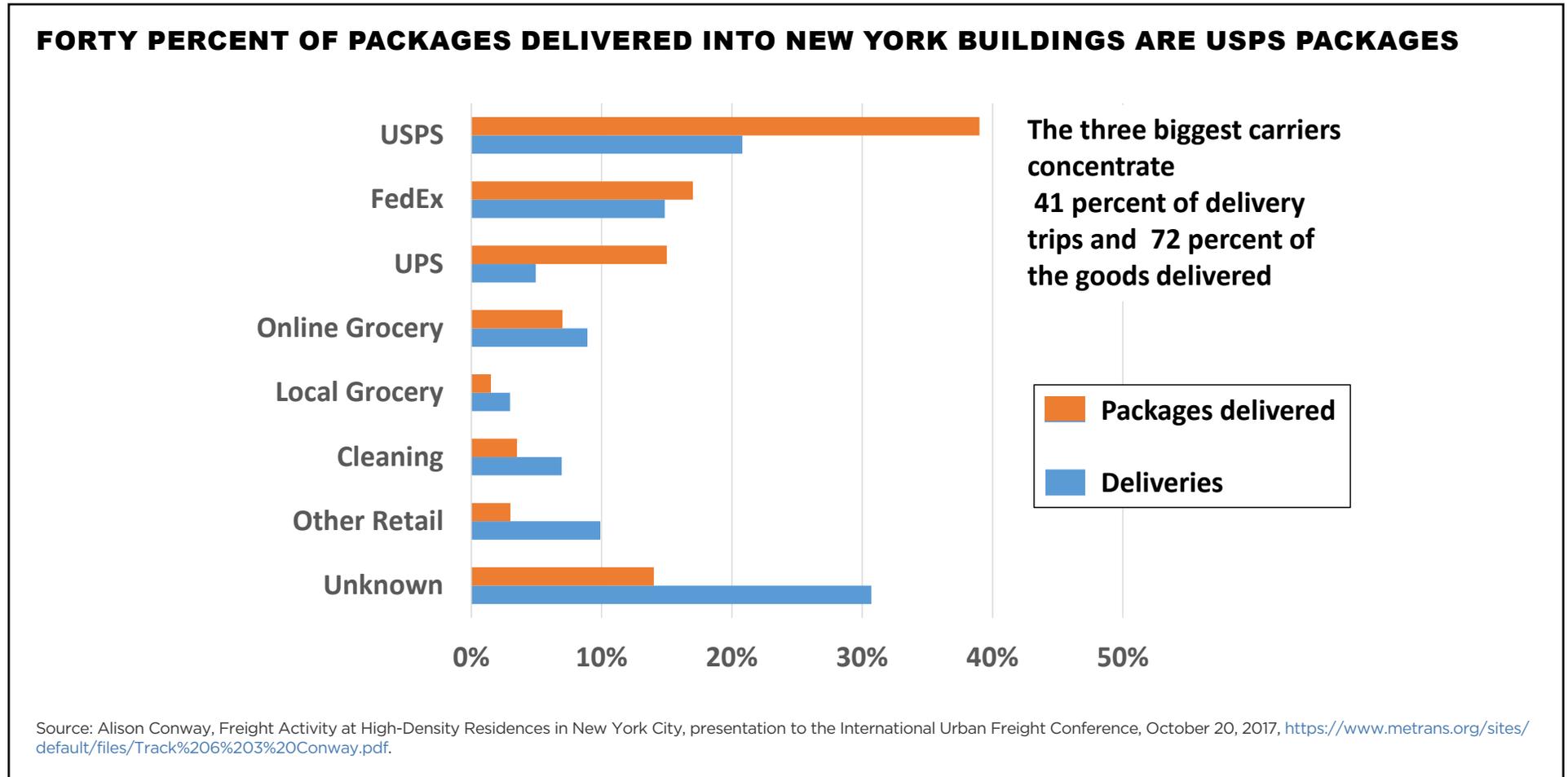
69 New York City DOT, *Citywide Mobility Survey*, August 2017, <http://www.nyc.gov/html/dot/downloads/pdf/nycdot-citywide-mobility-survey-report-2017.pdf>, slide 44.

70 Academic institution with an urban logistics research center, *Final Research Note to the OIG*, June 6, 2018.

71 Andrew Zaleski, “Cities Seek Deliverance From the E-Commerce Boom”, *Citylab.com*, April 20, 2017, <https://www.citylab.com/transportation/2017/04/cities-seek-deliverance-from-the-e-commerce-boom/523671/>.

72 Alison Conway, *Freight Activity at High-Density Residences in New York City*, The City College of New York, Presentation to the International Urban Freight Conference, October 20, 2017.

Figure 9: Structure of Deliveries to New York City's Residential Buildings



Voluntary and Coercive Measures to Reduce Congestion May Increase Delivery Costs

Current and proposed strategies envisaged by local governments may have a significant impact on last-mile delivery structure, time, and cost.

Voluntary Measure: Off-Hour Deliveries Program

Each day, nearly 97,000 trucks cross into New York City — including 25,000 into Manhattan; 80 percent travel between 6 am and 7 pm. The Off-Hour Deliveries (OHD) program was an early initiative taken in 2009 to encourage retailers to shift truck deliveries from peak hours to evening or early morning hours when there is less traffic.⁷³ In principle, off-hour delivery benefits carriers, recipients, and truck drivers:

- **Carriers** – Carriers spend less on fuel due to reduced traffic, receive fewer tickets for double parking, and experience much more efficient delivery.
- **Recipients** – Recipients experience shorter delivery windows and less disruption from delivery intake during the workday.
- **Truck drivers** – Truck drivers report faster travel times, less congestion, less stress, better parking availability, and shorter delivery times.⁷⁴

Retailers and delivery companies who participated in the 2009-2010 pilot experienced quicker delivery and cost savings.⁷⁵ Today, 400 businesses still participate in this program, which the New York City Department of Transportation (NYC DOT) would like to further expand.⁷⁶

Coercive Measures to Curb Congestion Are in Preparation

New York City Mayor Bill de Blasio released the city's first set of initiatives aimed at easing congestion in October 2017. Rollout and enforcement began

in early 2018. The plan includes coercive measures that impose restrictions on deliveries, such as:

- **Clear Lanes** – Restricts delivery to one side of the street to improve traffic flow, increases the number of traffic enforcement agents, adds new traffic cameras, and simplifies parking regulations for easier enforcement.
- **Clear Curbs** – Pilots curb restrictions on major thoroughfares during morning and evening peak commuting hours in Manhattan, Queens, and Brooklyn. During these hours, delivery truck parking, double-parking, and curbside loading are not allowed.

Another new initiative, the new “clear zone” policy includes a variety of anti-congestion efforts (e.g., street redesigns and truck-only lanes) that could speed up deliveries in five commercial districts outside of Manhattan.⁷⁷

To curb congestion, the New York State's Fix NYC advisory panel proposed in January 2018 a \$25 congestion fee for trucks traveling through Central Business District during peak hours.⁷⁸ While the measure could generate hundreds of millions in revenue and reduce congestion by 8 to 14 percent — depending on what time restrictions are implemented — it would also increase the cost of parcel deliveries.⁷⁹

Strengthening New York City's Freight Distribution Industry: The Freight NYC Plan

In July 2018, the New York City government announced an initiative to support the movement of goods to, within, and out of New York.⁸⁰ The Freight NYC plan states that:

73 Off-peak hours are any time between 7 pm and 6 am. New York City Department of Transportation, *Off-Hour Deliveries Overview*, April 24, 2009, <http://www.nyc.gov/html/dot/downloads/pdf/off-hours-delivery-overview.pdf>.

74 New York City Department of Transportation, *Off-Hour Deliveries Program*, 2011, <http://www.nyc.gov/html/dot/html/motorist/offhoursdelivery.shtml>.

75 New York City Department of Transportation, *NYC DOT Pilot Program Finds Economic Savings, Efficiencies for Truck Deliveries Made During Off-hours*, News Release, July 1, 2010, http://www.nyc.gov/html/dot/html/pr2010/pr10_028.shtml.

76 New York City Department of Transportation, *Urban Freight Initiatives*, September 14, 2015, <http://www.nyc.gov/html/dot/downloads/pdf/2015-09-14-urban-freight-initiatives.pdf>.

77 City of New York, “Mayor de Blasio Announces Initiatives to Help Ease Congestion,” October 22, 2017, <http://www1.nyc.gov/office-of-the-mayor/news/673-17/mayor-de-blasio-initiatives-help-ease-congestion#0>.

78 Congestion pricing is a method of controlling traffic volume by charging a fee or toll. The toll incentivizes drivers to take alternate routes or public transit, decreasing the number of vehicles on the roadway. Decreased traffic volume makes travel more efficient, especially during rush hours. U.S. Department of Transportation Federal Highway Administration, *What is Congestion Pricing?*, December 2006, <https://ops.fhwa.dot.gov/publications/congestionpricing/sec2.htm>.

79 Fix NYC Advisory Panel, *Fix NYC Advisory Panel Report – January 2018*, January 19, 2018, <http://www.hntb.com/HNTB/media/HNTBMediaLibrary/Home/Fix-NYC-Panel-Report.pdf>.

80 New York City Economic Development Corporation, FreightNYC, Goods for the Good of the City, July 2018, https://www.nycedc.com/sites/default/files/filemanager/Services/PortNYC/5054-PT_FreightNYC_book_PRESS_digital_3.pdf.

- Traffic congestion costs are hurting local businesses and impeding commerce; local freight volumes are expected to grow an estimated 68 percent by 2045, further compounding the problem;
- Ecommerce is a growing component of the freight industry and requires greater local warehouse space in urban centers; in New York distribution space for ecommerce could grow from 2.2 million to 6.0 million square feet from 2016 to 2019;
- Local retailers rely on more frequent and speedier warehouse-to-store deliveries to replenish stock and keep inventory costs low. They also increasingly dedicate floor space for ship-from-store deliveries to customers.

To respond to these needs, the plan will support investments in freight hubs across New York to make the city “more resilient against supply chain disruption.” The City of New York also envisages additional investments in multimodal (rail, maritime and highway) infrastructure connected to the freight hubs to support the urban distribution of goods. Another part of the plan aims at encouraging the deployment of emission-free trucks on city streets for last-mile delivery to help reduce gas emissions.

The NYC DOT’s New Freight Management Plan Is Developed in Collaboration with Logistics Players

The NYC DOT is the primary stakeholder in city logistics planning for the five boroughs. The NYC DOT “is committed to making trucking greener and more efficient through smarter technology, better enforcement, and partnerships with freight haulers, receivers, and other industry stakeholders.”⁸¹ It established the Office of Freight Mobility to specifically address the impacts of truck delivery on communities and infrastructure. The Office is responsible for designing new

programs that mitigate congestion while balancing the movement of goods with all other city street uses.⁸² To complement the new Freight NYC Plan, the NYC DOT will release a “Smart Truck Management Plan” later this year.

As part of the preparation for the plan, the NYC DOT Office of Freight Management has convened a freight advisory group involving major and smaller delivery carriers, trucking industry representatives, advocacy groups, and community and government stakeholders.⁸³ It has conducted surveys, studies and community meetings to better understand truck route usage and compliance, movement of goods, needs of shoppers and receivers, and community concerns.

Like most other cities New York did not have reliable data on the number of delivery trucks and goods movement. NYC DOT is looking to consolidate data on delivery (volumes, density, routes) from different delivery companies to inform the development of its freight management strategies.⁸⁴

Relevance for the Postal Service

The Smart Truck Management Plan is under development, and it is not yet known to what extent it will further restrict deliveries and encourage collaboration and coordination among carriers.

As cities such as New York develop and enforce new measures, the Postal Service, as the largest delivery company, will have a unique opportunity to help design them by:

- Collaborating with city government agencies;
- Developing models that show optimal urban delivery structure and scheduling;
- Brainstorming COTs-based delivery initiatives that provide mutual social, environmental, and financial benefit to cities and operators.

81 NYC DOT Strategic Plan — Part 5. Freight Movement, NYC DOT website, <http://www.nycdotplan.nyc/freight-movement>.

82 New York City Department of Transportation, *Urban Freight Initiatives*, September 14, 2015, <http://www.nyc.gov/html/dot/downloads/pdf/2015-09-14-urban-freight-initiatives.pdf>.

83 New York City Department of Transportation, *Strategic Plan 2017 Progress Report*, February 11, 2018, <http://www.nycdotplan.nyc/sites/default/files/2018-02/Strategic%20Plan%202017%20Progress%20Report%202.11.18%20WEB.pdf>. The NYC DOT has asked the Postal Service to participate in its work.

84 Diniece Peters, Director, Office of Freight Mobility at New York City Department of Transportation, in discussion with the authors, January 16, 2018.

Appendix D: List of External Interviews

Company/Organization	Name of Contact	Date of Interview
Accenture	Brody Buhler	December 5, 2017
Cargo Chief	Kyle Wilson	February 6, 2018
CTT Correios	Nuno Matos	November 17, 2017
ESRI	Rodney Conger	April 6, 2018
HERE Technologies	Cliff Allison	January 5, 2018
Kennesaw University	Donghyun Kim	January 24, 2018
New York City Department of Transportation	Diniece Peters	January 16, 2018
Onfleet	Khaled Naim	January 11, 2018
Open Pricer	Daniel Rueda	March 8, 2018
Optimoroute	Marin Saric	December 18, 2017
Package.ai	Ziv Fass	January 4, 2018
Quintiq	Robert Oliver	March 27, 2018
Rensselaer Polytechnic Institute	Jose Holguin-Veras	June 11, 2018
SAP	Derek Mumford, Dan Miller, Ken Brickner, Ruth Eberhart, Michael Dietz, Jennifer Vinh, Bert J. Dempsey, Bill King, Pierre Erasmus, Nicholas Schneider, Jeff Plachta, Dominic Benedict, Bruce Bellemore, and Richard Feco	April 6, 2018
Shippo	Richard Garcia	December 21, 2017
Smartmile	Aku Hoppo	January 3, 2018
Terbine	Damian Inglin	May 17, 2018
Swiss Post	Markus Steinmann	February 2, 2018
Unmanned Life	Kumardev Chatterjee	April 9, 2018
URBeLOG	Fabrizio Gatti	December 11, 2017

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Appendix F: Management's Comments

KRISTIN SEAVER
CHIEF INFORMATION OFFICER



08/30/2018

Amanda Martinez
Manager RARC Central
Risk Analysis Research Center

SUBJECT: Coordination and Optimization Technologies and Postal Applications (Project Number 2018RARC005)

Management has reviewed the OIG White Paper Coordination and Optimization of Technologies (COTs). The Postal Service agrees generally that utilizing Coordination and Optimization Technologies provides insight and opportunities to optimize operations, align networks, and to provide improved customer service with customized products and services. The Postal Service continues to build its competency in leveraging COTs technologies to design more customer centric products and services in a rapidly evolving market fueled by intense competition, the business imperative to fully leverage fixed assets, resources, and the needs and desires of the customer. The Postal Service must be purposeful with innovation and investments to drive both business and customer value commensurately. The Postal Service is committed to continuing leveraging its technologies and capabilities to drive efficiency and provide an enhanced customer experience.

A handwritten signature in blue ink, appearing to read "Kristin Seaver".

Kristin Seaver
Chief Information Officer and Executive Vice President

cc:

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