SUPPLY CHAIN TRANSPORTATION & LOGISTICS
UNIVERSITY of WASHINGTON
College of Engineering

Growth of E-Commerce and Ride-Hailing Services is Reshaping Cities

Innovative Goods Delivery Solutions for Cities of the Future

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Eno Center for Transportation
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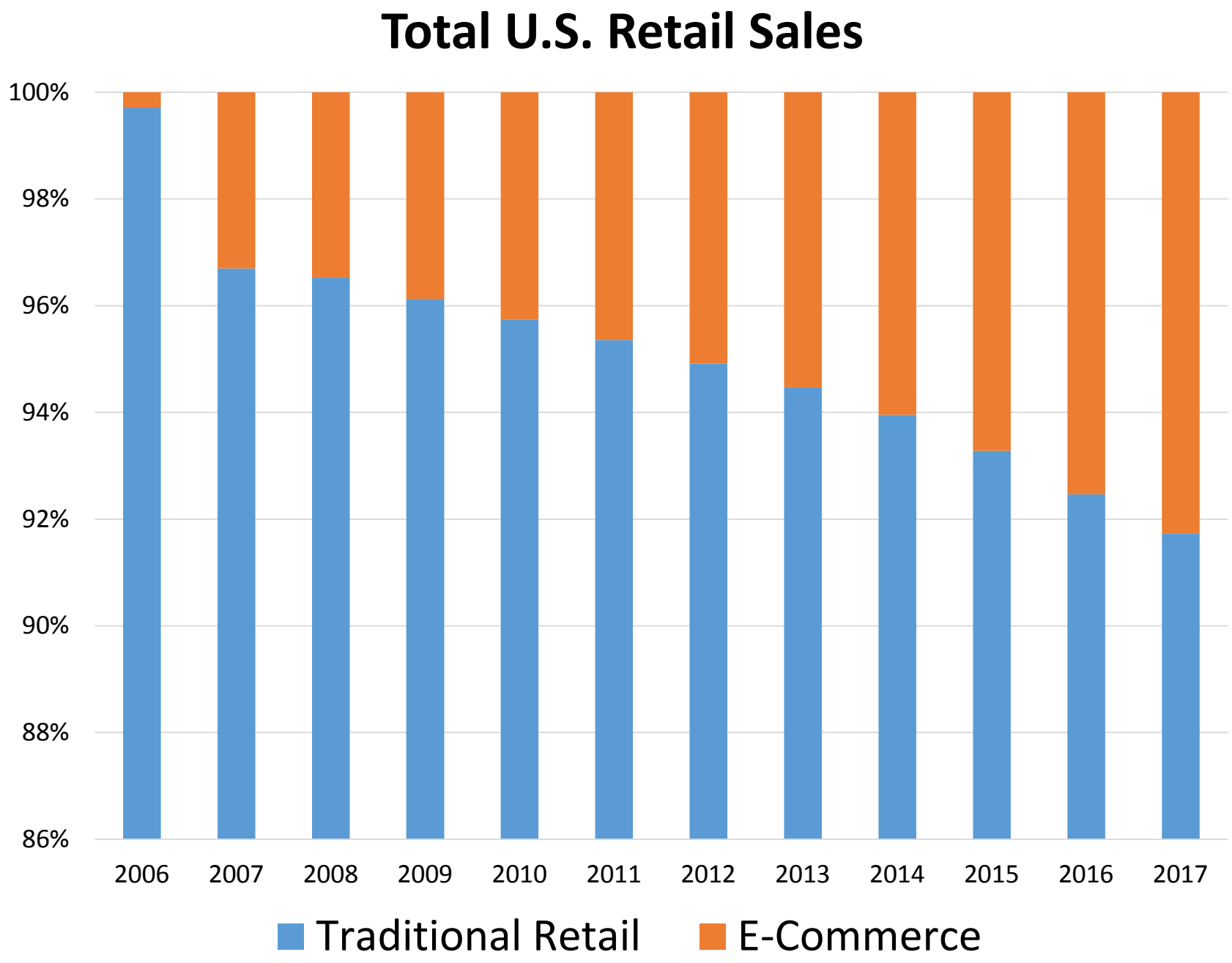
E-Commerce sales were $453.5 billion in 2017, up 16% from 2016.



Are cities ready for an explosion of e-commerce and ride-hailing growth?

A 20% e-commerce compound annual growth rate (CAGR) would more than double goods deliveries in 5 years.

If nothing changes, this could double delivery trips in cities; thereby doubling the demand for load/unload spaces.

Growth in on-demand passenger services

Ride-hailing services such as Uber and Lyft are also creating new demand for load/unload spaces at city curbs.

In 2017 more than 23 million people took a Lyft, up from 12 million in 2016; while Uber completed 4 billion rides.

These services create a negative feedback loop affecting curb demand, as parking problems are the top reason people use the service instead of driving.

Photo by AP, Feb. 25, 2018

There is not enough curb capacity, now

A recent curb parking utilization study in the City of Seattle indicated 90% or higher occupancy rates in Commercial Vehicle Load Zones (CVLZs) for some areas for much of the workday.

Photo by Chris Eaves, Seattle Department of Transportation (SDOT)

The Urban Freight Lab

- The Urban Freight Lab at the University of Washington (UW), in partnership with the City of Seattle Department of Transportation (SDOT), is using a systems engineering approach to solve delivery problems that overlap cities' and businesses' spheres of control.

- The Urban Freight Lab is a living laboratory where potential solutions are generated, evaluated, and pilot-tested inside urban towers and on city streets.

- Members of the Urban Freight Lab - Charlie's Produce, Ford Motor Company, Kroger, Nordstrom, UPS and USPS - fund the Lab and dedicate senior executives' time to solving problems in it.

Final Fifty Feet Research

The final 50’ of the urban delivery system:

- Starts when a truck driver parks in a load/unload space;
- Includes delivery persons’ activities as they maneuver goods over curbs, along sidewalks and through intersections;
- Ends inside urban towers when they complete their deliveries.

Photo by Urban Freight Lab, UW

Final 50’ Research Goal #1

Reduce dwell time, the time a truck is parked in a load/unload space.

Public and private benefits include:

- Lower costs for delivery firms, and therefore potentially lower costs for their customers;
- More efficient use of truck load/unload spaces creates more capacity without building additional spaces; and
- Room for other vehicles to move through alleys.

Photo by Urban Freight Lab, UW, 2017.

Final 50’ Goal #2

Reduce failed first deliveries to:

- Improve urban online shoppers’ experiences and protect retailers’ brands;
- Lower traffic congestion in cities, as delivery trucks could make up to 15% fewer trips while still completing the same number of deliveries;
- Cut costs for the retail sector and logistics firms;
- Cut crime and provide a safer environment.

Photo by Urban Freight Lab, UW, 2017.

How should cities innovate to meet demand?

Step 1: Map and measure the complete truck load/unload space network

In 2016 Seattle's geospatial databases included one part of the truck load/unload network: CVLZs at the curb.

In 2017 – 2018 the UFL GIS-mapped and measured two additional elements of the urban goods delivery network in Seattle's Center City:

1. Privately-owned loading docks and bays, and
2. Truck spaces in alleys.

The Urban Freight Lab defined the three elements of the commercial vehicle load/unload space network

Curb Parking Spaces

Alleys

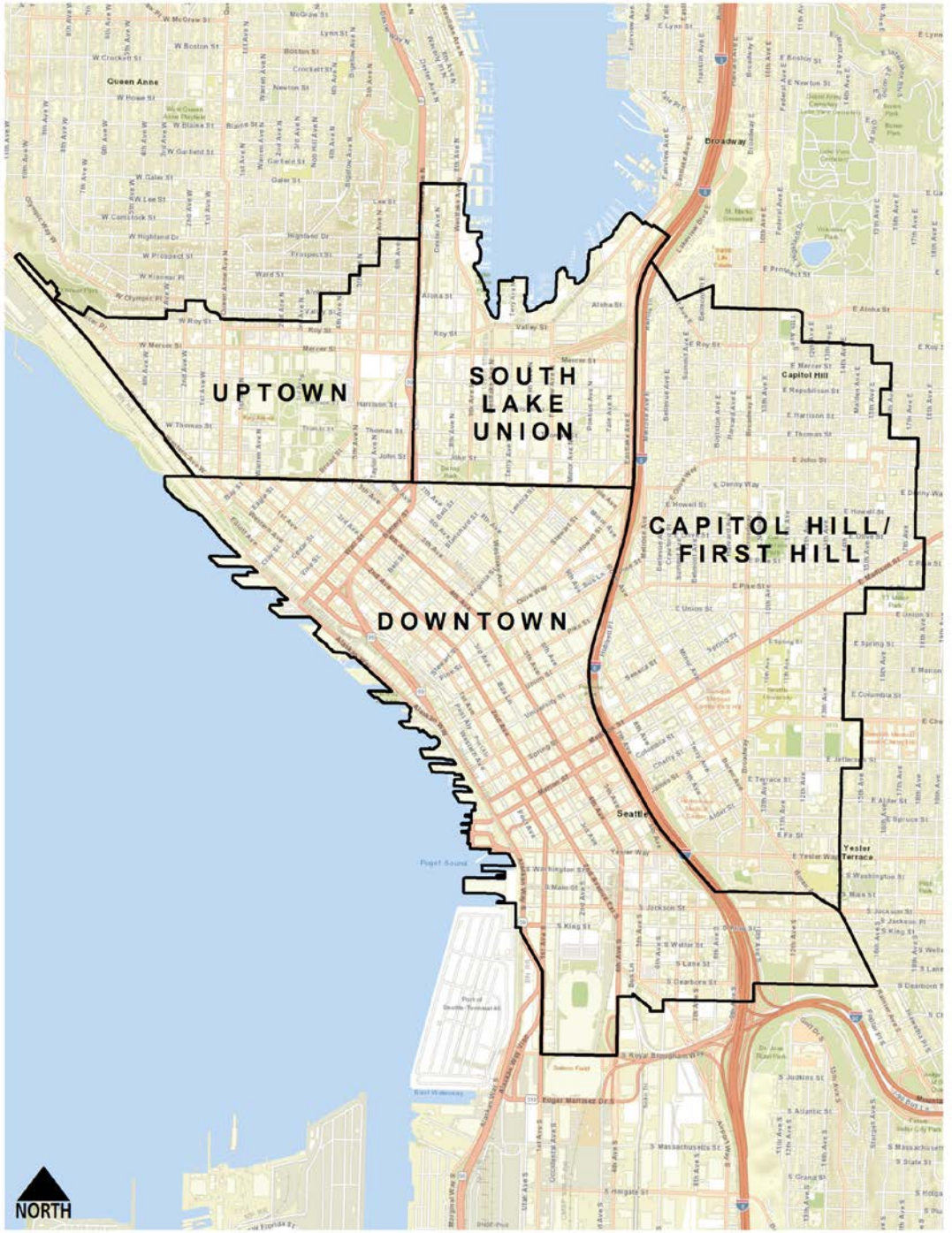
Private Loading Bays and Docks

Photos: G. Giron, Urban Freight Lab, University of Washington, Seattle, 2018

Seattle is the first city to GIS map and measure all three elements of the load/unload space network

The Seattle Department of Transportation (SDOT) engaged the Urban Freight Lab (UFL) to identify the geospatial locations and truck-related features of the two additional load/unload elements in the Center City area:

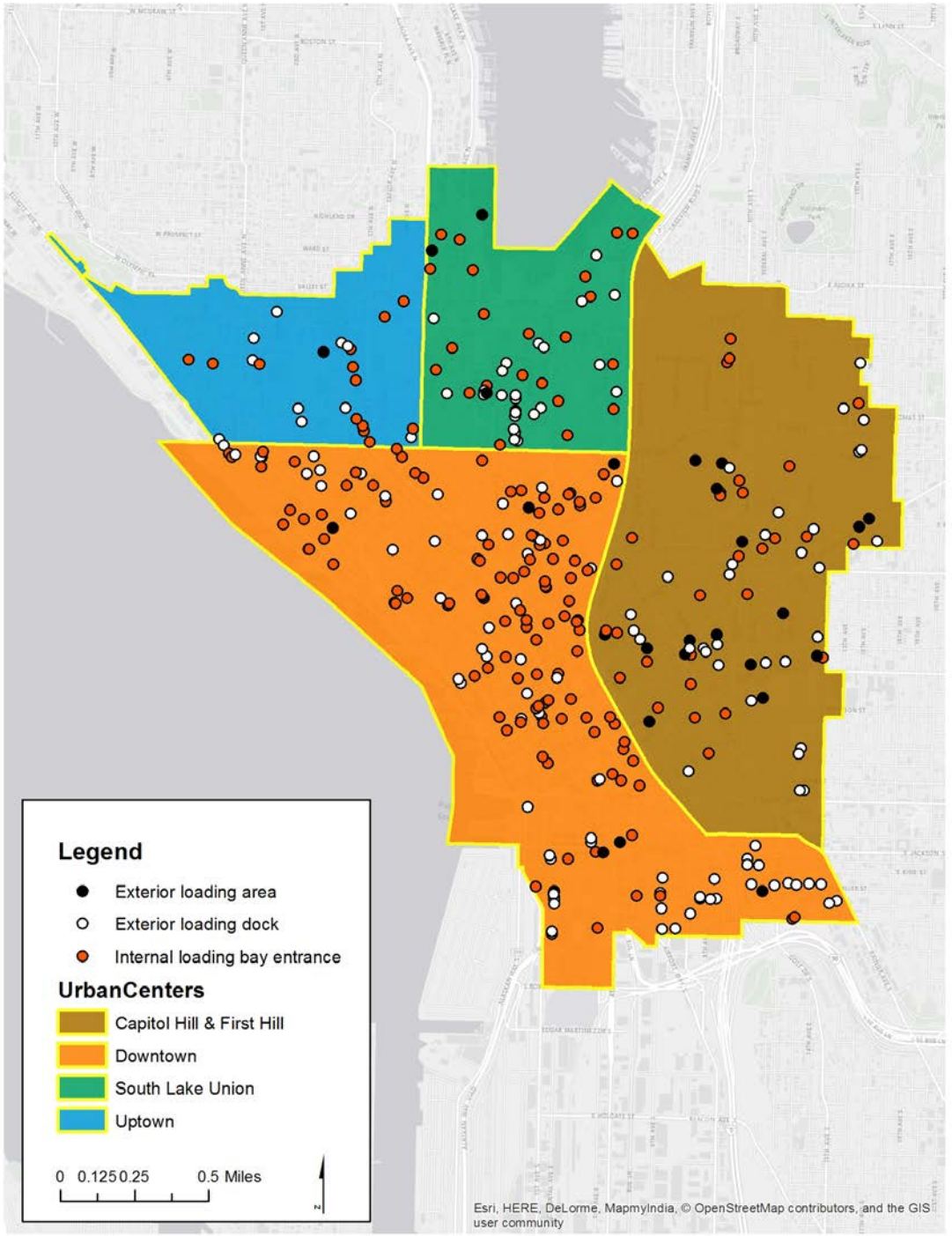
1. Privately-owned loading bays and docks under and next to buildings, and
2. Alleys.



Key findings of Center City loading bay and dock survey

- **87% of Seattle's Center City buildings rely solely on deliveries from curb and alley load/unload spaces,** documenting the importance of public spaces.

- There are 338 private loading bays and docks in the urban core.



Collaborating with the private sector greatly reduced uncertainty

- Data collectors in the field identified **548 potential loading bays**.
- However, in **206 cases the doors were closed**.
- UPS had their local drivers review the closed door locations, based on their extensive knowledge of the area. The Urban Freight Lab provided photos and location information.
- That review allowed the Lab to rule out 90% of the locations behind closed doors, **reducing uncertainty from 38% to <1%.**

Alley infrastructure and operations

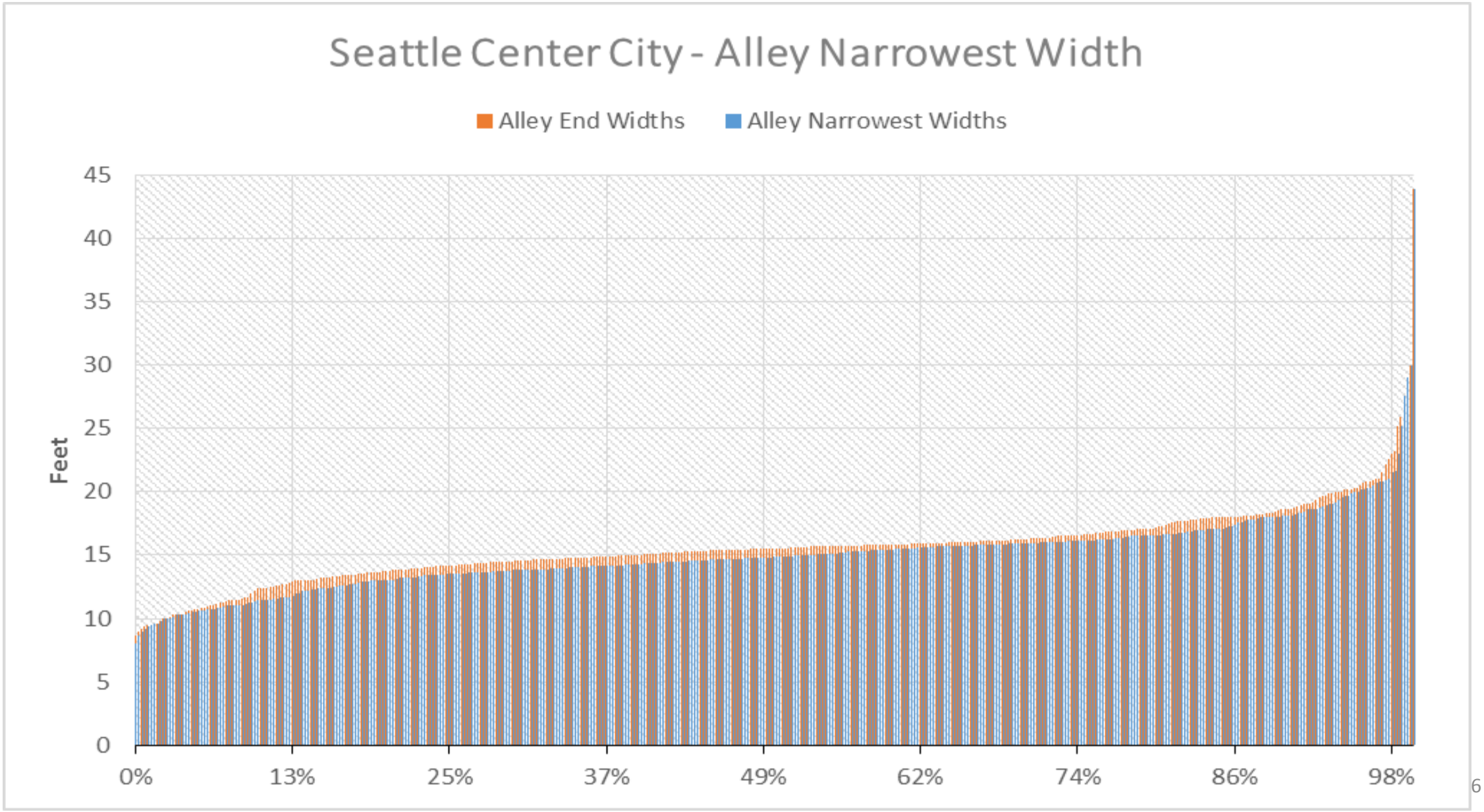
Alley grids were originally built to provide access to the backs of buildings for:

- Goods deliveries,
- Electrical, plumbing and other service calls,
- Trash pick up, and
- Fire/emergency services.

Many major U.S. cities have alley grids including:

- Seattle
- Chicago (1,900+ miles)
- Detroit
- Minneapolis

Key finding: vast majority of Center City alleys are 1-lane wide



Over 90% of the 417 alley blocks in Center City are constricted to one lane for trucks, cargo and service vans

This limits parking per alley to one-to-two commercial vehicles at a time.

As box trucks are 9 feet wide (excluding mirrors) and delivery vans are typically 8.8 feet wide, alleys up to 19-feet-wide provide only one-lane for commercial vehicle use.

This fact is critically important to measuring the load/unload capacity of the city's alleys. When a truck, car or van parks in a one-lane alley, it blocks all other trucks from loading/unloading there unless they back into the alley to park, or back out of the alley to exit.

Backing into street traffic and backing up into alleys are both prohibited by the Seattle Municipal code for safety reasons.

Center City Alley Occupancy Study

SDOT commissioned this research to understand current commercial vehicle operations in urban alleys.

The UFL research team observed all types of delivery vehicles loading/unloading in alleys.

Researchers quantified the time alleys were occupied by:

- Various types of trucks and vans,
- Passenger vehicles used to deliver goods, and
- Cargo bikes and trikes.

Key Findings from Seattle Center City Alley Occupancy Study

1. **68% of all vehicles in the 7 alleys studied were there 15 minutes or less.**

Vehicles vs Dwell Time

Vehicles Type	15 min or less	15 min < x <= 30 min	More than 30 minutes	Grand Total
Trucks and Cargo Vans	30.8%	12.9%	10.1%	53.8%
Van	6.1%	0.9%	0.2%	7.3%
Service Vehicles	5.9%	2.6%	1.4%	9.9%
Passenger	17.4%	1.9%	0.9%	20.2%
Passenger making a delivery	2.8%	0.2%	0.5%	3.5%
Garbage vehicle	3.5%	0.5%		4.0%
Uber/Lyft	0.2%			0.2%
Others	0.7%		0.2%	0.9%
Unknown	0.2%			0.2%
Grand Total	67.6%	19.0%	13.4%	100.0%

Vehicle Count

2. Moving vehicles through alleys quickly is the only path to increase productivity.

More than 90% of Center City area alleys are only one-lane wide. This creates an upper limit on alley parking capacity, as each alley can functionally hold only one or two vehicles at a time.

Since 68% of vehicles in the alleys parked there for 15 minutes or less—it becomes clear that as one parked vehicle operationally blocks the entire alley, the goal of new alley policies and strategies should be to reduce the amount of time alleys are blocked to additional users.

Commercial Vehicle Curb Occupancy Study

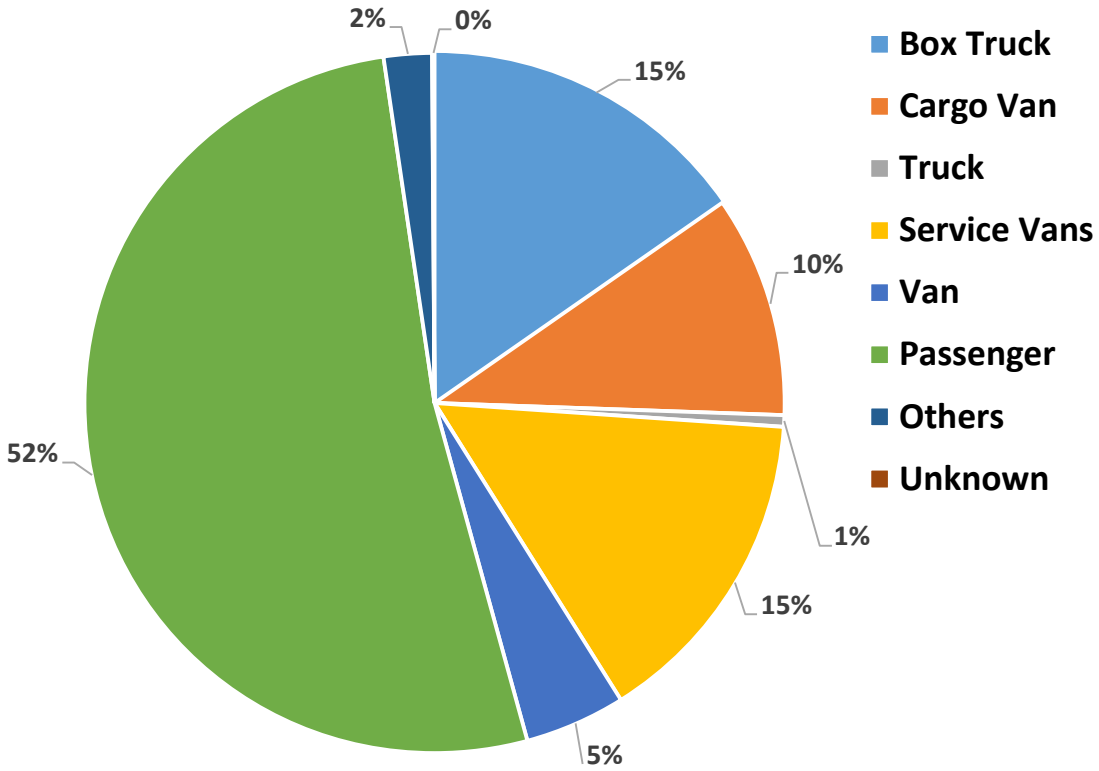
The Seattle Department of Transportation (SDOT) commissioned this study to understand the current commercial vehicle use of curb load/unload zones in Seattle's Center City area.

Urban Freight Lab data collectors observed vehicles loading and/or unloading at the curb around five buildings. They documented the 'minutes vacant' and 'minutes occupied' for:

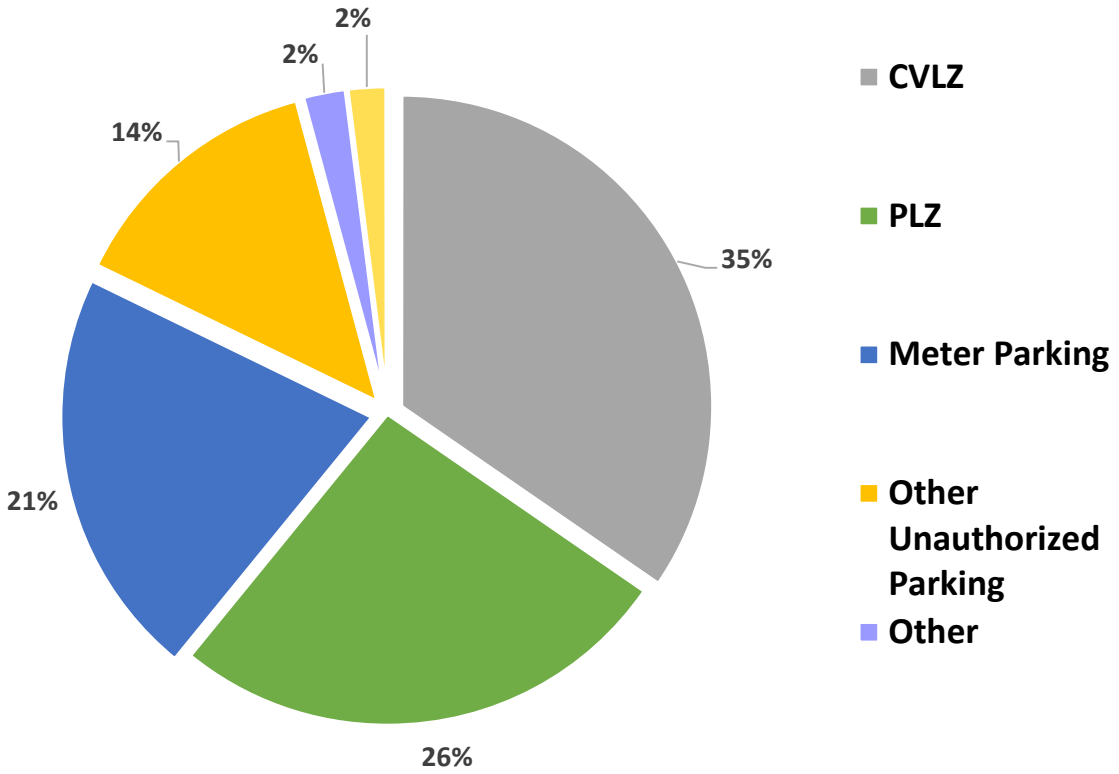
1. Commercial vehicles in all curb load/unload spaces, and
2. Passenger and other vehicles in Commercial Vehicle Load Zones (CVLZs).

Curb Occupancy Study: Key Findings

1. Commercial and passenger vehicle drivers are using CVLZs and Passenger Load Zones (PLZs) fluidly in center city.



52% of all vehicles in CVLZs were passenger vehicles; but half of these were only there 5 minutes.



26% of all commercial vehicles (CVs) parked in PLZs.

2. Most CVs Parked for 15 Minutes or Less

Over half (54%) of all commercial vehicles (CVs) parked for 15 minutes or less, in all types of curb spaces.

Box trucks parked more frequently (17%) for 15 minutes or less, than other types.

Nearly three-quarters of all CVs (72%) parked for 30 minutes or less.

But 28% of CVs parked for more than 30 minutes; and half of those for more than an hour. The largest percent of CVs parking for more than one hour (10%) were service vans.

Dwell time of all commercial vehicles across all curb parking space types in all areas

Commercial Vehicle Type	No. Vehicles Observed	15 min or less	15-30 min	30min-1hr	More than 1hr	Total share of parked vehicles
Delivery vehicles:	693	33.6%	11.3%	6.8%	3.7%	55.3%
Box Truck	376	17.2%	6.5%	4.7%	1.6%	30.0%
Cargo Van	285	14.9%	4.0%	2.0%	1.8%	22.7%
Truck with Trailer	32	1.5%	0.7%	0.1%	0.2%	2.6%
Cargo Bike	1	0.1%				0.1%
Service Van	456	15.1%	5.4%	6.1%	9.8%	36.4%
Van	81	3.9%	1.6%	0.8%	0.2%	6.5%
Others	23	1.2%	0.2%	0.2%	0.2%	1.8%
Time parked by vehicle type	1,253	53.8%	18.4%	13.9%	13.9%	100.0%

3. Forty-one percent all CVs parked in unauthorized locations

But a much higher (55%-65%) percentage of them parked in unauthorized areas near the two retail centers, when compared to the predominately office and residential areas (27% - 30%).

Curb Study Area		CVLZ Supply	Commercial Vehicle Demand		Ratio of Supply of Time in CVLZs to the Commercial Vehicle Demand for Curb Parking (Minutes)	Percent of Commercial Vehicles that Parked in Unauthorized Locations
Building	Primary land use	Total available parking time in CVLZs, minus the time passenger vehicles parked in CVLZs (minutes)	Total number of commercial vehicles parked	Total time commercial vehicles parked (minutes)		
Four Seasons Hotel	Hotel, residential retail	2,811	256	5,325	0.53	65%
Westlake Center	Retail	1,608	215	6,017	0.27	55%
Seattle Municipal Tower	Office	486	152	4,368	0.11	30%
Insignia	Residential	4,207	272	13,323	0.32	28%
Dexter-Horton	Historic (office)	10,343	359	13,749	0.75	27%

Step 2: Offer Goods Trip Reduction Strategies to building developers and managers

Emerging strategies include:

- Install Common Carrier Locker Systems(mini-distribution nodes in buildings to gain delivery density);
- Require developers to provide loading bays in every new building;
- Use integrated technologies to actively manage and increase the productivity of all load/unload spaces in the city's network.

Seattle Municipal Tower, a 62-story office building studied in the Urban Freight Lab

Seattle Municipal Tower Common Carrier Locker Pilot Test

March - April 2018

The aim of this research pilot project was to:

1. Test whether creating delivery density via a smart locker system in a public space reduces the:
   - Number of failed first delivery (FFD) attempts,
   - Parcel delivery time in an urban tower.

2. Begin to develop a functional business model to provide Common Carrier Locker Systems in public spaces that any retailer, goods delivery firm, and user may access.

Common Carrier Locker Systems are a promising solution in dense urban areas

Common carrier lockers reduce urban congestion and dwell time in parking spaces by creating delivery density, so trucks can deliver many packages at one stop.

They can also reduce the failed first delivery attempt rate for parcels to zero.

‘Common carrier’ means that <u>any retailer</u> and any delivery firm may use them.

Seattle Municipal Tower Common Carrier Locker Pilot Test, 2018.
Left to right: Chris Eaves and Jude Wilcher, SDOT, and Barb Ivanov, UW Urban Freight Lab

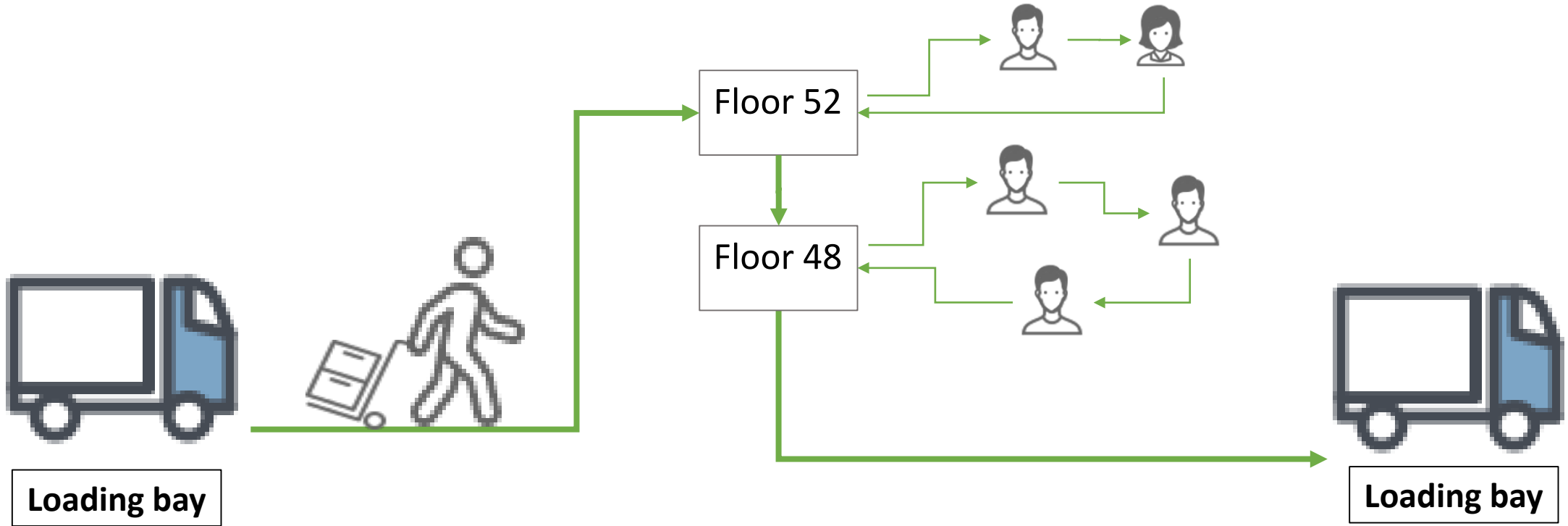
Seattle Municipal Tower pilot test results: average delivery time to multiple floors before the test

UPS visited 7 different floors on average (n = 8)

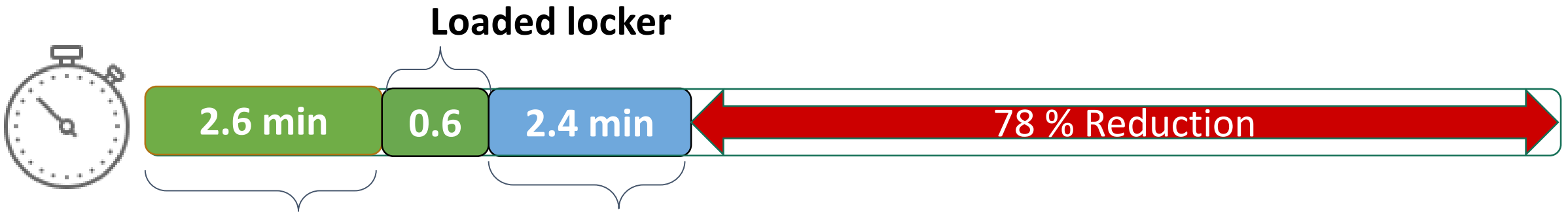
SD: 6 min

Range: 15 – 34 min

Mean: 27 min



Pilot test results: the Common Carrier Locker System reduced total delivery time by 78%



Greater Seattle transit agencies may add Common Carrier Locker Systems

King County Metro Transit, the Seattle Department of Transportation and Sound Transit are exploring providing public right of way for Common Carrier Lockers at commuter stations or in the Transit Oriented Development areas near them.

In addition to reducing congestion, parcel lockers also support the three agencies' mobility hub efforts, which call for rider amenities that create lively public spaces.

UFL developed site location & logistics evaluation criteria for the transit agencies and SDOT

1. Reliable source of electricity near site
2. Live Ethernet and/or strong cellular signal
3. ADA compliant
4. Well-lit at all times
5. Access for delivery vehicles
6. Parking for delivery vehicles
7. Few-to-no obstructions to see the locker
8. Does not impede vehicle traffic flow
9. Does not impede pedestrian traffic flow

The nine criteria were prioritized by UFL members and representatives from SDOT, Sound Transit and King County Metro Transit in January 2018.

UFL applied the criteria and located five feasible sites at or near Sound Transit stations in Seattle

For example one entrance to the Westlake Train Station (in the heart of Seattle's shopping district) completely meets all nine criteria.

This site is a rare and valuable asset in downtown Seattle as it has ample space for the locker system. There is an alley for truck load/unload activity across from the site.

The location is secure behind a locked door when the station closes.

Questions?

Please contact:

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http://depts.washington.edu/sctlctr/

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