



# Memorandum

Date: May 19, 2017  
 To: Transportation Authority Citizens Advisory Committee  
 From: Jeff Hobson – Deputy Director of Planning  
 Subject: 05/24/17 CAC Meeting: Update on Emerging Mobility Services & Technologies, Including Transportation Network Companies

<p><b>RECOMMENDATION</b>    <input checked="" type="checkbox"/> Information    <input type="checkbox"/> Action</p> <p>None. This is an information item.</p> <p><b>SUMMARY</b></p> <p>This memo provides an update on the range of activities we are conducting relevant to Emerging Mobility Services and Technologies. We seek input on draft Guiding Principles that will shape upcoming evaluation activities as well as policy and program responses. The draft Principles were collaboratively developed by the Transportation Authority and the San Francisco Municipal Transportation Authority (SFMTA) and are based on existing local policies. The memo also provides updates on a definition of this sector, existing conditions, legislative developments at the local and state levels, and recent research by others on Transportation Network Companies.</p>	<p><input type="checkbox"/> Fund Allocation</p> <p><input type="checkbox"/> Fund Programming</p> <p><input checked="" type="checkbox"/> Policy/Legislation</p> <p><input checked="" type="checkbox"/> Plan/Study</p> <p><input type="checkbox"/> Capital Project Oversight/Delivery</p> <p><input type="checkbox"/> Budget/Finance</p> <p><input type="checkbox"/> Contracts</p> <p><input type="checkbox"/> Procurement</p> <p><input type="checkbox"/> Other:</p> <hr/>
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**DISCUSSION**

**Background.**

The San Francisco Charter mandates Transit First – charging the City and County of San Francisco with providing for the safe and efficient movement of people and goods in San Francisco. In the last decade, San Francisco has seen dramatic growth of many emerging mobility services and technologies that present opportunities while also challenging that core policy. These services and technologies include everything from mobile applications that connect passengers with demand-responsive transportation vehicles to self-driving and connected vehicles. While they each provide new conveniences, access, and mobility options, their impacts remain unclear with respect to our established policies and goals.

**Definition and Inventory of Emerging Mobility Services.**

We have developed the following proposed definition for this field: An “emerging mobility service or technology” is any private or nonprofit transportation services that automates at least three of the following characteristics: driving, routing, reservations/orders, vehicle tracking, billing, customer feedback, matching/sharing, crowd-sourced routing, and/or (un)locking. This definition includes a wide range of services.

## Agenda Item 11

For each of the different types of service, we have developed a draft description of the existing services, including a description of the sub-types of services, the services' background and approach, and examples of usage in San Francisco (see Attachment 1). This description is based entirely on existing data. As such, the data are spotty, often only including gross numbers for the services/company as a whole. The existing conditions largely point to the need for additional research in order to evaluate these services and technologies.

### **Draft Guiding Principles - Request for CAC Feedback.**

New mobility services and technology are developing at a rapid pace. Transportation Authority and SFMTA staff have established a set of draft Guiding Principles for Emerging Mobility Services and Technologies (see Attachment 2). These draft principles are based on the city's adopted goals of providing for safe, reliable, sustainable and equitable transportation choices now and in the future. These goals reflect the major policy themes and priorities contained in myriad city and countywide plans and policies including our Transit First Policy, San Francisco Transportation Plan, San Francisco Congestion Management Program, SFMTA Strategic Plan, Climate Action Strategy, and Vision Zero Strategy among many others.

The joint agency study team will use these principles as a framework to evaluate these services and technologies; identify areas for improvement or policy intervention; identify outstanding questions to shape future areas of research and study; and proactively develop pilots and programs to address research questions.

### **Recent Legislative and Regulatory Activities.**

As these services have grown, there have been an increasing number of legislative and regulatory activities at the local and state levels.

- SFTMA/Transportation Authority Joint Letter on Department of Motor Vehicles (DMV) Autonomous Vehicle Regulations: On April 20, Transportation Authority Executive Director Tilly Chang and SFMTA Director Ed Reskin sent a joint letter to the California Department of Motor Vehicles, commenting on DMV's Proposed Autonomous Vehicle (AV) Driverless Testing and Deployment Regulations (see Attachment 3). This letter provides detailed comments on how to ensure AVs complement our city's efforts to provide streets that are safe for all.
- Senate Bill (SB) 182 on Transportation Network Company (TNC) Business Licenses: Following passage of a position of Oppose earlier in the month at the Board of Supervisors, last week Chair Peskin sent a letter opposing SB 182, which would allow TNC drivers to obtain only a single business license to operate in all local jurisdictions statewide, irrespective of where they operate their business (see Attachment 4). SFMTA Director Reskin also sent a letter in opposition to SB 182. The Transportation Authority Board meeting on May 23 will consider SB 182 among other state legislative positions.
- Board of Supervisors Resolution on TNC Data-sharing: On April 4, 2017, the Board of Supervisors unanimously adopted a resolution urging the state legislature to amend relevant codes to allow local jurisdictions to access trip data for TNCs and to permit and conduct enforcement of TNCs as warranted to ensure safety and disability access, and to manage congestion (see Attachment 5).

## Research on TNCs.

- We have also been tracking several threads of research on TNCs. Of particular interest are the following two studies: Schaller Consulting's release of [Unsustainable? The Growth of App-Based Ride Services and Traffic, Travel and the Future of New York City](http://schallerconsult.com/rideservices/unsustainable.htm). New York is unique in the nation in requiring public reporting of TNC data on trips provided in New York City. Schaller's report finds that TNC ridership initially grew by attracting passengers away from taxis. As TNC ridership continued to grow, however, TNCs have attracted more riders from transit, walking, and biking. The report estimates that between 2013 and 2016, TNCs increased vehicle miles traveled by 7% in the most congested parts of the city. The report concludes with several recommendations, including improving public transit and implement road pricing. The detailed report, and a briefer overview, is available at <http://schallerconsult.com/rideservices/unsustainable.htm>.
- For several reasons, these data may not be directly representative of San Francisco's experience. The transit system is the largest in the U.S. and the TNC industry is governed in a very different way in New York than in any other part of the country. Further, some in the TNC industry have questioned some of the methodology and data in the report. Nonetheless, we look forward to learning more from the New York experience.
- Natural Resources Defense Council (NRDC)/UC Berkeley study: In fall 2015, UC Berkeley and the NRDC embarked on a study to assess the climate impacts of TNCs and convened a technical advisory committee on which our Executive Director participates. The study will use passenger and driver surveys to try to understand how people are using TNCs: what portion of TNC riders were previously driving, using transit, walking, or biking? Crucially, the study will also use data from Uber and Lyft in several major metropolitan areas, including San Francisco, to validate survey data against actual ridership data. When complete, we expect the analysis will provide a significant advance in our understanding of the TNC phenomenon.

## FINANCIAL IMPACT

None. This is an information item.

## CAC POSITION

None. This is an information item.

## SUPPLEMENTAL MATERIALS

Attachment 1 – Draft Technical Memorandum: Definition of Emerging Mobility Services

Attachment 2 – Proposed Guiding Principles for Emerging Mobility Services & Technology

Attachment 3 – SFMTA/Transportation Authority Joint Letter to California Department of Motor Vehicles, on DMV's Proposed Autonomous Vehicle (AV) Driverless Testing and Deployment Regulations

Attachment 4 – Letter from Transportation Authority Chair Peskin stating opposition to SB 182

Attachment 5 – San Francisco Board of Supervisors Resolution 114-17

Attachment 1



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**To:** Warren Logan, San Francisco County Transportation Authority  
**From:** Rachel Zack, WSP | Parsons Brinckerhoff  
**Date:** 4/20/17  
**Re:** **Emerging Mobility Services, their respective approach and background, ridership and usage statistics**

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## Introduction

Innovations in transportation technology are leading new transportation service types. The nomenclature around these services varies from the broad “on-demand transportation services” to more precise “shared-use mobility.” This memo focuses on Emerging Mobility Services. As defined in this report, an “Emerging Mobility Service” is a private or nonprofit transportation service that automates at least three of the following characteristics:

- Driving
- Routing
- Reservations/orders
- Vehicle tracking
- Billing
- Customer feedback
- Matching/sharing
- Crowd-sourced routing
- (Un)locking

These services are typically linked to the “Mobility as a Service” movement, as well as advances in autonomous technologies, such as autonomous vehicles and/or drones.

The purpose of this memo is to categorize service types, their background, approach, current service offerings and usage in San Francisco. This memo will serve as the foundation for additional areas of study in this arena including 1) a legislative landscape study that investigates the legal questions related to these identified services and technology; and 2) a scenario modeling exercise that examines potential short-term and long-term futures of the various services and technologies identified. The table below defines the nomenclature of Emerging Mobility Services types discussed in this memo.

Type of Service	Examples of service	Role of Technology
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## Attachment 1

	providers	
Car sharing	Zipcar, Car2go, Getaround	Reservations, vehicle tracking, (un)locking, billing, customer feedback
Bike sharing	Bay Area Bike Share, Motivate, Bluegogo, Zagster	Reservations, vehicle tracking, (un)locking, billing, customer feedback
Ridesourcing & Ride-splitting	TNCs: Lyft/LyftLine, Uber/UberPool, Flywheel	Reservations, routing, vehicle tracking, billing, customer feedback
Ridesharing	Waze Carpool, Scoop, Blablacar, Tripda	Reservations, routing, vehicle tracking, billing, customer feedback
Microtransit	Chariot, Leap, Night School, LyftShuttle	Tracking, crowd sourcing routes, billing, customer feedback
E-Bike/Scooter Sharing	Scoot, Renault's Twizy, Toyota's iRoad	Reservations, routing, vehicle tracking, billing
Courier Network Services	Amazon's PrimeNow, Good Eggs, Caviar, Instacart, Grub Hub, Postmates, Omni	Reservations/ordering, vehicle tracking, billing, customer feedback
Autonomous Vehicles	Uber, Lyft/GM, Ford, EasyMile, Renault/Nissan, Mercedes, Tesla	Driving, reservations, vehicle tracking, driving, routing
Drones	Amazon Prime Air	Reservations/ordering, vehicle tracking, billing, customer feedback

Table 1: Catalogue of Emerging Mobility Services, adapted from "*Between Public and Private Mobility*", National Academies of Sciences, page 9.

## Car sharing

Car sharing is the shared use of a privately-owned vehicle. These vehicles are typically priced for short-term use in order to encourage their return to the fleet of available vehicles, and are managed by a third party.

### Types

There are several types of car sharing models, though membership is typically a one-time fee and hour/half-hour fee structure:

## Attachment 1

*Point-to-point/One-way* - Users can pick-up and drop off cars anywhere within a defined geographic region. The cars are stored on the street. This is the fastest growing model of car sharing. Point-to-point car sharing is typically managed by a third party who owns the fleet. Unlike other models of car sharing, point-to-point fares can be charged by the minute. At present, there are no point-to-point car sharing models in San Francisco.

*Round-trip* – Users reserve a vehicle from the same pick-up spot they return the vehicle to. Vehicles are stored in parking lots and garages, though some cities have explored designated on-street parking spaces, where car sharing vehicles are not subject to typical street parking violations, such as street cleaning. Round-trip car sharing is typically managed by a third party who owns the fleet and the fares are usually by the half-hour.

*Peer-to-peer* - This type of car sharing model enables existing vehicle owners who want to share their car through a third party platform that handles the reservations, payment and (un)locking of the vehicle. The trips are typically round-trip, though parking doesn't have to be in the exact same location and is subject to street parking violations.

*Niche car sharing services* - This type of car sharing service is developed for niche markets, such as round-trip car share for a group of residents, a campus, or tourists.

### Background and Approach

Car sharing started to gain momentum in the United States in the late 1990s. Early car-sharing companies began as nonprofits or cooperatives with significant grassroots support. In their current iterations, companies frequently partner with government agencies who are interested in the environmental and social benefits of car sharing, as well as the potential increased transit ridership and revenue. Studies confirm that car share services lead to car-shedding and increased use of shared modes.<sup>1</sup> However, when car sharing first started in San Francisco, vehicle miles increased, presumably because the early clientele were mostly non-car owners. This induced demand was reduced in the second year of membership as novelty wore off.<sup>2</sup> As of 2015, there were 45 car share operators and 1.5 million members in the United States.<sup>3</sup>

Car share in San Francisco began in 2001 through a partnering effort between San Francisco Planning and the Urban Research Association, which provided the start-up capital for what became the nonprofit, City Car Share. Zipcar joined the San Francisco market in 2005. Nationally, car share membership saw a growth rate of 65% between 2012 and 2014<sup>4</sup>. Zipcar

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<sup>1</sup> A. Millard-Ball et al., (2005). "Car-Sharing: Where and How It Succeeds", *TCRP Report 108*. <https://books.google.com/books?id=DDxB61imYzkC&lpg=PP1&dq=carsharing%20%20Millard-Bal1&pg=PP1#v=onepage&q=carsharing%20%20Millard-Bal1&f=false> [2017, April].

<sup>2</sup> R. Cervero and Y. Tsai, (2003). "San Francisco City CarShare: Second-Year Travel Demand and Car Ownership Impacts". <https://goo.gl/2Ae0IE> [2017, April].

<sup>3</sup> National Academies of Sciences, Engineering, Medicine, (2016). "Between Public and Private Mobility: Examining the Rise of Technology-Enabled Transportation Services", *Special Report 319*. <https://www.nap.edu/read/21875/chapter/1> [2017, April].

<sup>4</sup> W. Goodall et al, (2017). "The rise of mobility as a service: reshaping how urbanites get around". *Deloitte University Press*. <https://dupress.deloitte.com/dup-us-en/deloitte-review/issue-20/smart->

## Attachment 1

grew to be an international company and was bought by Avis in 2013. Avis was not the only rental company interested in the car share model as Hertz developed Hertz On-Demand and Enterprise similarly launched Enterprise Car Share. Nonprofit car sharing is also seeing rapid changes. City Car Share was bought by the nonprofit Carma, and later merged with the peer-to-peer San Francisco car sharing platform Getaround in 2016.

Round-trip car sharing continues to have a strong working relationship with San Francisco government. In July of 2013, San Francisco Municipal Transportation Agency's Car Sharing Policy and Pilot Project set up a framework for the implementation and evaluation of on-street parking spots for round-trip car share vehicles. The Pilot's evaluation showed successful results and recommendations are being prepared for SFMTA's Board of Directors. The City of San Francisco is hesitant to work with point-to-point providers until more studies show their impact.<sup>5</sup>

The future of car sharing may be connected to autonomous vehicle development, where personal autonomous vehicles are shared through a network when not in use by the primary owner, as described in Tesla's Master Plan Part Deux or as one option of many on an integrated platform, as demonstrated by Mobility as a Service (MaaS) offerings like General Motor's Maven app, Ford's "Ford Pass" app, and MaaS aggregators, such as the Whim app in Helsinki.<sup>6</sup>

### Usage in San Francisco

For publicly available usage statistics on San Francisco car share services providers, see Appendix A.

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[transportation-technology-mobility-as-a-service.html](#) [2017, April].

<sup>5</sup> San Francisco Municipal Transportation Agency (SFMTA), (2013). "Car Sharing Policy and Pilot Project". [https://www.sfmta.com/sites/default/files/projects/SFMTA Car Sharing Policy\\_MTAB\\_20130716.pdf](https://www.sfmta.com/sites/default/files/projects/SFMTA%20Car%20Sharing%20Policy_MTAB_20130716.pdf) [2017, April].

<sup>6</sup> E, Musk, (2016). "Master Plan, Part Deux", *Tesla*. <https://www.tesla.com/blog/master-plan-part-deux> [2017, April].

## Bike Sharing

Bike sharing is a system of bicycles that is available to users to access as needed for point-to-point or round-trip trips, traditionally to station kiosks. They are generally unattended and established in dense urban areas. Advances in bike share locking technology have allowed for free-floating bikes within a geographic region. The majority of bike sharing operators cover the costs of bicycle maintenance, storage and parts. Membership varies on an annually, monthly, daily or per-trip basis and different companies offer different incentives.<sup>7</sup>

### Types

Bike sharing can be privately owned, public, or, most commonly, offered through a public-private partnership. Public-private partnerships are common due to aligned sustainability goals: bike sharing has proven ability to increase mobility while avoiding fossil fuel usage.<sup>8</sup>

*Dock and dockless* - Ownership models vary, as do bicycle technologies. Some systems require docking the bike in designated docking stations which allow locking/unlocking through a local ticketing station, while others can be locked on any bike rack, and are reserved through a smartphone. San Francisco is home to both kinds technology, however, the free standing bike operator does not hold a permit.

*Peer-to-peer* - Lastly, peer-to-peer bike sharing technology is available, though still in the early stages of adoption. Bitlock is a keyless bike lock app and hardware system that uses phones to lock and unlock bicycles, allowing peers to share their bikes with one another. Bitlock takes care of payment processing; allows the client to adjust their “access policy”; and provides real-time alerts, geolocation (enabling geofences and penalized out-of-hub returns), and data on daily/total income, number of rides, miles traveled, calories burned, and CO2 saved versus driving. There are currently 5,000 downloads of the Bitlock app, and most riders use it for personal use, though the company is positioned to work with agencies and companies as well.<sup>9</sup>

### Background & Approach

The public-private partnership model was the first model to gain traction in San Francisco. The Metropolitan Transportation Commission and the Bay Area Air Quality Management District partnered with Motivate to create the Bay Area Bike Share program in 2013. These agencies,

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<sup>7</sup> S. Shaheen, A. Cohen, and I. Zohdy, (2016). “Shared Mobility: Current Practices and Guiding Principles”, *FHWA-HOP-16-022*. <https://ops.fhwa.dot.gov/publications/fhwahop16022/> [2017, April].

<sup>8</sup> T. Gaegauf and C. Gardner, (2014). “The Impact of Bikesharing: White Paper on the Social, Environmental, and Economic Effects of Bikesharing”. [http://www.academia.edu/7934411/Bikeshare\\_Funding\\_White\\_Paper\\_A\\_Guide\\_to\\_the\\_Different\\_Bikeshare\\_Business\\_Models\\_and\\_Funding\\_Process](http://www.academia.edu/7934411/Bikeshare_Funding_White_Paper_A_Guide_to_the_Different_Bikeshare_Business_Models_and_Funding_Process) [2017, April].

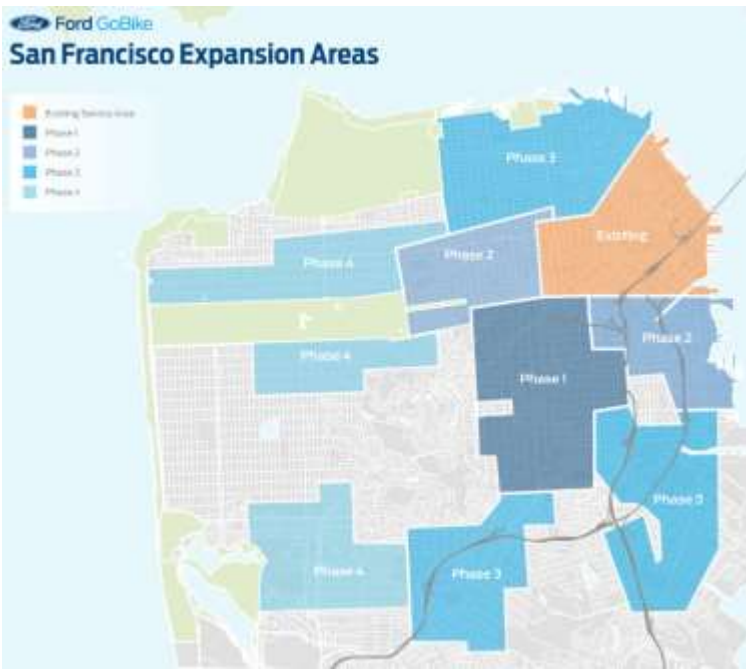
<sup>9</sup> BitLock, *GooglePlay Store*. <https://play.google.com/store/apps/details?id=co.bitlock&hl=en> [2017, April].



## Attachment 1

along with other municipalities across the Bay Area, helped fund the program which is operated by Motivate (formerly Alta Bicycle Share), a bike share operator with systems in the United States, Canada and Australia.

The business of bike share is challenging. Communities and cities want to build and expand bike share programs, but aren't able to promise continued public funding. Private bike share companies take on larger and larger projects without knowing where the future funding will come from.<sup>10</sup> Bringing bike share to more people and lower-income riders involves government investment, but the metrics used for public transit investment do not apply well to the scale of bike share nor evaluate the benefits of bike share.<sup>11</sup> To close the funding gap, bike share companies like Motivate have limited opportunities: choose between raising fees, finding more sponsors, or seeking out private philanthropy.



*Image 1: Ford is sponsoring an additional seventy-two new bike share stations that will expand the geographic area of San Francisco's bikeshare program to the areas in blue. Source: Bay Area Bike Share*

In San Francisco, sponsorship was the chosen route to expansion. In 2016, Ford Motor Company partnered with Motivate and agreed to sponsor a \$50 million expansion to the Bay Area Bike Share system in early 2017, increasing the regional program's 700 bikes to 7,000, making it the second largest system in the United States. Seventy-two of the stations will be in

<sup>10</sup> M. Gunther, (2014). "Bike sharing is pricey: can startup Zagster make it profitable?" *The Guardian*. <https://www.theguardian.com/sustainable-business/2014/aug/28/bike-sharing-is-pricey-can-startup-zagster-make-it-profitable> [2017, April].

<sup>11</sup> Z. Stone, (2014). "The Business of Bike-Share", *Next City*. <https://nextcity.org/features/view/bike-share-make-money-start-up-citi-bike-business-sharing-economy> [2017, April].

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San Francisco.<sup>12</sup> The system will be renamed “Ford GoBike” and the new bicycles will be produced by Social Bicycles (SoBi). The SoBi bikes are equipped with an on-board lock and can be parked outside of the existing docking stations.<sup>13</sup> The bikes require less infrastructure than traditional dock-oriented bike sharing systems, and the tech-enabled bikes can provide data on miles traveled, calories burned, CO2 reduced and more, making them valuable to mobility providers interested in data.<sup>14</sup>

Due to the public-private partnership aspect of the Bay Area Bike Share system, there are unique programs that help integrate the system with transportation planning goals. Bay Area Bike Share’s data is available for public use, making anonymous each trip’s bike number, trip start day and time, trip end day and time, trip start station, trip end station, rider type and annual member’s home zip code. Additionally, the Metropolitan Transportation Commission, Ford and Motivate committed funds to a new outreach plan to low-income communities with a reduced annual membership of \$5, as opposed to \$88. The outreach effort will be led by TransForm, a local San Francisco transportation advocacy nonprofit.

The presence of dockless, private-market bikes in San Francisco is just emerging, threatening to disrupt order on the city streets, as well as current public-private Bay Area Bikeshare model. In early 2017, bike share company Bluegogo announced plans to bring 20,000 of its dockless, GPS, solar technology bikes to San Francisco’s streets. While the company’s plans were halted by the San Francisco Board of Supervisors who called the bikes a “public nuisance,” the bikes are currently available in small batches in on-street parking spaces rented by the company. The bikes do not require a membership to use and it is \$1 for one half hour.

Alongside public bikeshare, private bikeshare is also in San Francisco. In this model, the operator provides both the hardware and support to integrate with the company acquiring the service. In San Francisco, private companies, such as Salesforce, offer bike share through Zagster.

### Usage in San Francisco

For publicly available usage statistics on San Francisco bike share services providers, see Appendix A.

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<sup>12</sup> R. Rudick, (2016). “Milestone Reached in Bay Area Bike Share Expansion”, *StreetsBlogSF*. <http://sf.streetsblog.org/2016/03/23/milestone-reached-in-bay-area-bike-share-expansion/> [2017, April].

<sup>13</sup> I. Dawid, (2016). “Bay Area Bike Share Renamed for New Sponsor: An Auto Company”, *Planetizen*. <https://www.planetizen.com/node/89277/bay-area-bike-share-renamed-new-sponsor-auto-company> [2017, April].

<sup>14</sup> I. Dawid, (2016). “Bay Area Bike Share Renamed for New Sponsor: An Auto Company”, *Planetizen*. <https://www.planetizen.com/node/89277/bay-area-bike-share-renamed-new-sponsor-auto-company> [2017, April].

## Attachment 1

### E-Bike & Scooter Sharing

E-bike and scooter sharing are the shared-use of a fleet of scooters, typically managed by a third-party. The scooters are often electric.

#### Types

Systems usually allow for both point-to-point and round trips. Members can rent the scooters by the minute, and in exchange, they have a private scooter without the cost of owning, parking or maintaining one.

#### Background & Approach

Scooter sharing is slowly gaining in popularity around the globe. The service is popular in European cities, but, as of September 2015, was only available in two United States cities.<sup>15</sup> Zapp is a company offering scooter sharing services in Columbia, South Carolina, and Scoot is offering shared electric scooter service in San Francisco, California.

Scoot launched in San Francisco in 2012. Membership is currently free, though there is some discussion that that might change. Scoot vehicles are priced to encourage short trips and off-peak travel: \$3 for half hour and dime per minute thereafter, \$5 for rush-hour service. Scoot also includes a 2-day pass for \$79, targeting tourists who then receive 48 hours of unlimited access. Scoot's vehicles include "quads" which are mini-electric cars with a top speed of 25 miles per hour, a range of 40 miles, can carry two people and do not require a

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<sup>15</sup> Shared Use Mobility Center, (2015). "Share-Use Mobility: Reference Guide". [https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&cad=rja&uact=8&ved=0ahUKEwi557irjLTTAhXI5oMKHX3LDCMQFggpMAE&url=http%3A%2F%2Fsharedusemobilitycenter.org%2Fwp-content%2Fuploads%2F2015%2F09%2FSharedUseMobility\\_ReferenceGuide\\_09.25.2015.pdf&usq=AFQjCNGoE7hRM87ez4X\\_Lj9X8pXfY8qm8Q&sig2=GmjgG0xINPqHaA78mZHi-w](https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&cad=rja&uact=8&ved=0ahUKEwi557irjLTTAhXI5oMKHX3LDCMQFggpMAE&url=http%3A%2F%2Fsharedusemobilitycenter.org%2Fwp-content%2Fuploads%2F2015%2F09%2FSharedUseMobility_ReferenceGuide_09.25.2015.pdf&usq=AFQjCNGoE7hRM87ez4X_Lj9X8pXfY8qm8Q&sig2=GmjgG0xINPqHaA78mZHi-w) [2017, April].

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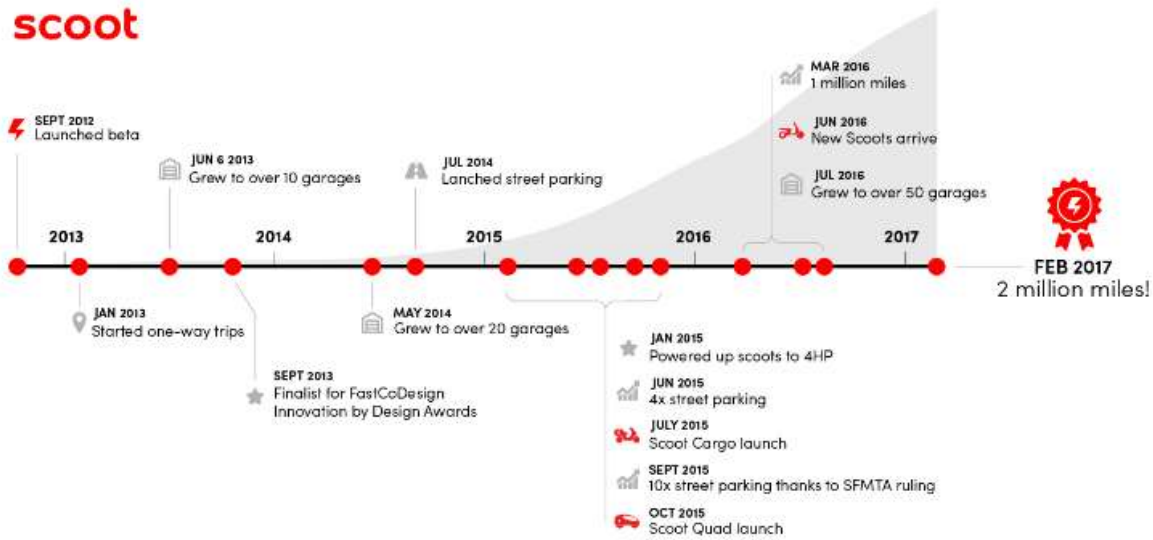


Image 2: Scoot's ridership started growing exponentially when they partnered with SFMTA for street parking.  
Source: Scoot's Blog

license. The cars are similar to Renault's "Twizy" vehicles offered in their "Twizy Way" pilot in Saint-Quentin-en-Yvelines, France.

### Usage in San Francisco

For publicly available usage statistics on San Francisco's scooter sharing services provider, see Appendix A.

## Ridesourcing & Splitting

Ridesourcing services match riders with drivers, on-demand. Ridesourcing is often referred to as “ridesharing”; however, we have chosen the term “Ridesourcing” to distinguish the fact that these drivers do not share a destination with their fares. Ridesourcing companies are distinguished from taxi services by the ability to street hail (ridesourcing companies can only pick up pre-arranged rides). The companies are known in California as Transportation Network Companies (TNCs) and are regulated by the California Public Utilities Commission.

### Types

There are three types of ridesourcing services: on-demand professional driver services, peer-to-peer and ridesplitting. On-demand professional driver services are essentially hailing a fleet operator’s taxi over the phone. Peer-to-peer includes both riding with people driving their own vehicles as well as driving for a fleet owner, such as a taxi or limousine company.<sup>16</sup> Finally, ridesplitting was introduced through service providers<sup>17</sup>. Ridesplitting is the assigning of fares traveling along similar routes to one car, and enabling the splitting of the fare. Split rides are offered on peer-to-peer TNC services only, and their rides are typically 60% less than regular service rides.<sup>18</sup>

### Background and Approach

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<sup>16</sup> Ibid.

<sup>17</sup> Ibid.

<sup>18</sup> Lyft, <https://www.lyft.com/> [2017, April].

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Ridesourcing has quickly become a popular form of transportation in San Francisco and across the nation.<sup>19</sup> In New York City, since 2014, “after accounting for declines in yellow cab, black car and car service ridership, TNCs have generated net increases of 31 million trips and 52 million passengers” because their users are former transit riders, pedestrians and cyclists.<sup>20</sup> The largest ridesourcing company, Uber, founded in San Francisco in 2009, reported \$500 million in revenue in 2015 (three times that of the taxi market) and ridership was on track to triple annually.<sup>21</sup>

“These organizations need to start talking, rather than dictating how it's going to be. It's part of the wide-spread discontent, which is the arrogance of some of these billion-dollar tech company owners.” - Aaron Peskin, San Francisco Supervisor, District 3

Ridesourcing companies have not integrated easily with transportation, regulatory and enforcement agencies in California. Despite being close in taxonomy to a taxi, ridesourcing was established as another permit class, regulated by the California Public Utilities Commission, with looser TNC's regulations than the taxi industry. The change in permit class caused San Francisco Municipal Transportation Authority's to lose authority over the number of for-hire vehicles on the City's roadways, and no local data collection mechanism was established to allow for the monitoring of the new services' impacts. Enforcement of cease and desist letters has been difficult, and company-issued obstructions of justice have come to light. Investigations are currently underway in the San Francisco District Attorney's Office to explore the potential use of Uber's “Greyball” tool, an evasion tool used to identify and block accounts that were tagged to have police activity.<sup>22</sup>

Ridesourcing companies typically use surge pricing as part of their fare payment calculation. Surge pricing increases the fare when demand is high in order to entice more drivers to join the network, thereby bringing prices back down for users. It is unclear if the drivers see the dividends from this, however, after reports surfaced that Uber shows customers one higher price and the driver a lower fare.<sup>23</sup>

Ridesourcing's future is linked to autonomous vehicles. Uber and Lyft, the biggest ridesourcing companies on the market, are explicit about this shared-autonomous future, where vehicles are

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<sup>19</sup> H. Blodget, (2015). “Uber CEO Reveals Mind-Boggling New Statistic That Skeptics Will Hate”, *Business Insider*. <http://www.businessinsider.com/uber-revenue-san-francisco-2015-1> [2017, April].

<sup>20</sup> B. Schaller, (2017). “Unsustainable? The Growth of App-Based Ride Services and Traffic, Travel and the Future of New York City”, *Schaller Consulting*. <http://www.businessinsider.com/uber-revenue-san-francisco-2015-1> [2017, April].

<sup>21</sup> H. Blodget, (2015). “Uber CEO Reveals Mind-Boggling New Statistic That Skeptics Will Hate”, *Business Insider*. <http://www.businessinsider.com/uber-revenue-san-francisco-2015-1> [2017, April].

<sup>22</sup> J. Fitzgerald, (2017). “SF district attorney investigating Uber for evading authorities with secret app”, *SF Examiner*. <http://www.sfexaminer.com/sf-district-attorney-investigating-uber-evading-authorities-secret-app/> [2017, April].

<sup>23</sup> K. Kokalitcheva, (2016). “Here's Why Uber Sometimes Pockets Extra Money From Rides”, *Fortune*. <http://fortune.com/2016/10/05/uber-upfront-pricing-higher/> [2017, April].

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linked in a network that customers access on-demand with their cell phones<sup>24</sup>. Lyft is working with minority stakeholder General Motors to begin testing autonomous vehicles in 2018 and, in a controversial move, Uber rolled out its autonomous vehicles on the streets of San Francisco without a permit in December of 2016.<sup>25</sup> <sup>26</sup> The move was determined “illegal” by the California DMV and Uber removed the vehicles from city streets. Before removing the vehicles, however, one of Uber’s fleet ran a red light near City Hall, raising questions about public safety. At this time, Uber has paid for the \$100 permit and is operating autonomous vehicles on San Francisco’s streets.

### Usage in San Francisco

For publicly available usage statistics on San Francisco’s ridesourcing services, see Appendix A.

## Ridesharing

Ridesharing is the third-party service of matching of riders and drivers with similar shared destinations, enabling them to split the cost of the ride. Unlike ridesourcing and ridesplitting, the driver is not fare-motivated.

### Types

There are two types of emerging mobility ridesharing services: dynamic matching, which is the matching of riders to drivers on-demand, and the batching of matches, where travelers enter their desired pickup and drop-off schedule and all of the inputs are matched at a certain hour every day, alerting the users of their upcoming schedule. Ridesharing is generally peer-to-peer, though there are some new services emerging that blend ridesharing and car sharing. The services can be nonprofit or for-profit entities, and often work closely with government agencies who value ridesharing for its congestion and emergency management benefits.

### Background and Approach

The Metropolitan Transportation Commission (MTC) has taken a leadership role in supporting ridesharing services in the Bay Area. MTC’s Climate Initiatives Grant Program provided \$1.76 million of initial funding to Avego Inc. to develop the carpooling app “Carma” in 2009. Carma

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<sup>24</sup> J. Zimmer, (2016). “The Road Ahead”, *Medium*. <https://medium.com/@johnzimmer/the-third-transportation-revolution-27860f05fa91> [2017, April].

<sup>25</sup> Reuters, (2017). “GM and Lyft Plan to Deploy Thousands of Self-Driving Chevy Bolts”, *Fortune*. <http://fortune.com/2017/02/17/gm-lyft-chevy-bolt-fleet/> [2017, April].

<sup>26</sup> A. Davies, (2016). “As Uber Launches Self-Driving in SF, Regulators Shut it Down”, *Wired*. <https://www.wired.com/2016/12/ubers-self-driving-car-ran-red-light-san-francisco/> [2017, April].



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was a nonprofit dynamic ridesharing app that connected users to commuters with similar origin and destinations. The users were able to contact one another, schedule trips and pay for their rides within the app. Carma Carpool was unable to keep up with development demand of the app, as well as overcome the most critical component for ridesharing: critical mass.<sup>27</sup> Despite recruiting 50k-100k users, Avego Inc. shut down the Carma Carpooling app in October of 2016.<sup>28</sup>

Fare structure for ridesharing is standardized. Drivers are reimbursed at or below the federal mileage rate of \$.54 per mile to ensure the driver is not fare-motivated, and the activity fits the statutory definition of carpooling and not the definition of a TNC.<sup>29</sup> However, carpoolers can be incentivized by third parties, such as government agencies or employers, who wish to motivate people to share rides. The third-party service provider either takes a cut of the exchange, or charges an additional fee for matching.

Several ridesharing apps have come and gone from 2015 through 2017. LyftCarpool briefly entered the carpool market in March of 2016, recruiting people who were commuters to utilize their platform to find riders. They shut down the project within six months. MTC's 511 Carpool Team, who worked closely with LyftCarpool, reported this was mainly due to challenges getting non-professional drivers to understand they weren't applying to drive for Lyft's other professional services. MüV, a small provider out of Santa Cruz shut down their carpool in March of 2017.

Lyft is not the only ridesourcing/splitting company interested in carpooling. Uber also attempted a carpool service in Seattle and is currently offering "digital slug lines" in Washington D.C.<sup>30</sup> Uber sees high market potential in the area because people are already carpooling (a.k.a. slugging) along another busy route in the area with HOV-3 restrictions, and no pickup or drop off hubs established on the busy routes that have HOV-2 restrictions during rush hour.<sup>31</sup> Thus, if there are certain market drivers, such as high congestion, HOV lanes increasing carpool demand, ridesourcing companies are likely to (re)enter the ridesharing service world.

Some ridematching services are starting to gain traction. Scoop Technologies' carpooling app, "Scoop," founded in 2015, has over 50,000 Bay Area users, and has partnered with several Bay

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<sup>27</sup> Metropolitan Transportation Commission, (2015). "Climate Initiatives Program: Evaluation Summary Report", *OneBayArea*. [http://mtc.ca.gov/sites/default/files/CIP\\_Evaluation\\_Summary\\_Report\\_7-13-15\\_FINAL.pdf](http://mtc.ca.gov/sites/default/files/CIP_Evaluation_Summary_Report_7-13-15_FINAL.pdf) [2017, April].

<sup>28</sup> Carma Carpooling. *Crunchbase*. <https://www.crunchbase.com/product/carma-carpooling-2#/entity> [2017, April].

<sup>29</sup> Association for Commuter Transportation, (2014). "Defining 'Ridesharing:' A Guide for Reporters, Legislators, and Regulators". [http://actweb.org/wp-content/uploads/2014/11/Ridesharing-Definition-Release\\_091714v2.pdf](http://actweb.org/wp-content/uploads/2014/11/Ridesharing-Definition-Release_091714v2.pdf) [2017, April].

<sup>30</sup> F. Siddiqui, (2017). "Uber is betting D.C. commuters are willing to pay to slug", *The Washington Post*. [https://www.washingtonpost.com/local/trafficandcommuting/uber-is-betting-dc-commuters-are-willing-to-pay-to-slug/2017/03/27/112f56c2-10b7-11e7-9d5a-a83e627dc120\\_story.html?utm\\_term=.574965dd9a31](https://www.washingtonpost.com/local/trafficandcommuting/uber-is-betting-dc-commuters-are-willing-to-pay-to-slug/2017/03/27/112f56c2-10b7-11e7-9d5a-a83e627dc120_story.html?utm_term=.574965dd9a31) [2017, April].

<sup>31</sup> Ibid.



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Area businesses and government agencies.<sup>32</sup> Scoop batches the matches, and decouples the morning and afternoon commutes to optimize the customer's matching experience. Matches are run at 9pm and 3pm, letting users know their schedule 15 minutes later. Scoop makes 3-person carpools for bridge commuters only. Additionally, Scoop tackles the critical mass issue by rolling out their service route by route. The result has been match rates of over 95% on some corridors. Scoop also provides a guaranteed ride home, leveraging local government guaranteed ride home programs where possible, or covering the costs on their own.

Waze Carpool launched a pilot in the Bay Area in May of 2016. Leveraging its driver platform of 75 million users, Waze Carpool allows riders to download a "Waze Rider" app, set their origin and destination, what time they would like to be picked up, and then send that request out to drivers on the Waze platform. There are currently more than 100,000 downloads of Waze Rider noted in GooglePlay. MTC's 511 Carpool Program reports that Waze Carpool has recently partnered with Bishop Ranch, and is beginning to work more closely with government agencies.

Duet and Carzac are two other ridesharing apps available in the Bay Area, though their Google app store downloads are in the hundreds. Carzac's model varies from the other origin and destination models in that it sets popular neighborhood locations, such as a coffee shop or cafe, as origins.

Ridesharing services often tout their purpose as reducing traffic congestion, however, they are also focused on an autonomous vehicle future. These are platforms that, similar to ridesourcing services, could operate autonomous vehicles.<sup>33</sup> Waze is an acquisition of Google, who has spearheaded driverless car development with its former self-driving car project, now its own company, Waymo. Scoop is venture-funded by BMW i Ventures, focused on BMW's future business in the technology and customer service space.

### Usage in San Francisco

For publicly available usage statistics on San Francisco's ridesharing services, see Appendix A.

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<sup>32</sup> L. Kolodny, (2016). "Scoop gets Bay Area cities to pick up the tab for carpooling to alleviate traffic jams", *TechCrunch*. <https://techcrunch.com/2016/10/04/scoop-gets-bay-area-cities-to-pick-up-the-tab-for-carpooling-to-allevia>

<sup>33</sup> A.J. Hawkins, (2016). "Google's Waze jumps on the carpool bandwagon with new Bay Area pilot", *The Verge*. <http://www.theverge.com/2016/5/16/11685396/google-waze-carpool-pilot-san-francisco-uber-lyft> [2017, April].

### Microtransit

Microtransit is an unsubsidized, privately operated shuttle service, enabled by technology that usually operates along a dynamically generated route. Microtransit operates in areas where public transit is reaching capacity, not always available where demand is for an alternative option to public transit. As such, microtransit services usually focus on commuters' experience and offer bus-stop similar service to individuals willing to pay the additional price above public transit.<sup>34</sup>

#### Types

Microtransit companies can vary by fleet (buses or vans), route structure (fixed or dynamic), and, more recently, fleet ownership.

#### Background and Approach

Chariot, founded in 2013, is currently the most successful microtransit provider in San Francisco. Chariot owns and operates a fleet of vans throughout San Francisco and neighboring counties. They offer 35 routes, 27 of which are members-only, similar to charter buses, serving private partners such as GoPro in Oakland, Glasdoor in Mill Valley, and San Francisco Bay Club. The other eight routes are generally crowd-sourced Muni routes.

Essential to Chariot's success is their crowdfunding model.<sup>35</sup> Users subscribe to routes before they open. "Chariot Credit" passes start at \$10 for two or three rides, \$50 for 10-11 rides, \$95 for 20-26 rides. It costs \$119 for an unlimited monthly pass that can be used both off and on-peak. Chariot charges members less than \$3 per ride if they choose to purchase a \$119 unlimited pass, a dollar more than public transit in the City of San Francisco. Unlike public transit, Chariot is able to vary the cost of the trip by pick-up time, charging more for riding during peak times and less for riding off-peak.

San Francisco, and beyond, saw several microtransit attempts before watching Chariot swiftly rise to the 35 route provider it is today. Before Chariot, Leap (a luxury transit service line) went out of business in 2015, after the California Public Utilities Commission issued a cease and desist letter because the company had not completed its original approval notice. Nightschool, a microtransit company trying to serve late night rides between Oakland, shut down before

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<sup>34</sup> National Academies of Sciences, Engineering, Medicine, (2016). "Between Public and Private Mobility: Examining the Rise of Technology-Enabled Transportation Services", *Special Report 319*. <https://www.nap.edu/read/21875/chapter/1> [2017, April].

<sup>35</sup> L. Waxmann, (2016). "Can New Shuttle Service Curb San Francisco's Transportation Trouble?", *Mission Local*. <https://missionlocal.org/2016/02/can-new-shuttle-service-curb-san-franciscos-transportation-trouble/> [2017, April].

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opening its doors, claiming that the California Public Utilities Commission was making it too difficult for their business to be a properly licensed as a passenger carrier.<sup>36</sup> Bridj, a commuter shuttle service based out of Boston failed in Washington, DC and Kansas City, was only able to gain 1,480 riders during its operation.<sup>37</sup> Despite all of these microtransit failures, Chariot was acquired by Ford in September of 2016 and as of 2017 Chariot has begun searching for a General Manager to expand the service in New York City.

Ridesourcing companies move in and out of the microtransit space, trying out the operation of fixed-route service, without owning a fleet or limiting the vehicles on the platform to a route. In 2015, Uber launched “SmartRoutes,” a service made available to UberPool users. UberPool riders could request a ride on a “SmartRoutes” route, or a well-traveled roadway identified in the app, and catch a ride for a price less than that of transit.<sup>38</sup> Similarly, Lyft, launched “LyftShuttle” in 2017. Users receive a discounted ride for hailing a Lyft from a designated stop along a route. It is only available during weekday commute hours, from 6:30-10AM and 4-8PM and fares are fixed.<sup>39</sup>

### Usage in San Francisco

For publicly available usage statistics on San Francisco's microtransit provider, see Appendix A.

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<sup>36</sup> S. Cagle, (2015). “How a Start-Up That Wouldn't Break the Rules was Forced to Fail”, *Pacific Standard*. <https://psmag.com/how-a-start-up-that-wouldn-t-break-the-rules-was-forced-to-fail-657d60b71ef0> [2017, April].

<sup>37</sup> A. Marshall, (2017). “How a Failed Experiment Could Still be the Future of Public Transit”, *Wired*. <https://www.wired.com/2017/03/failed-experiment-still-future-public-transit/> [2017, April].

<sup>38</sup> R. McCormick, (2015). “Uber is turning San Francisco cabs into buses”, *The Verge*. <http://www.theverge.com/2015/8/25/9204349/uber-smart-routes-san-francisco-cab-bus> [2017, April].

<sup>39</sup> A.J. Hawkins, (2017). “Lyft Shuttle mimics mass transit with fixed routes and fares”, *The Verge*. <http://www.theverge.com/2017/3/29/15111492/lyft-shuttle-fixed-route-fare-sf-chicago> [2017, April].

## Courier Network Services

Courier Network Services (CNS) are companies that develop a platform to connect orders to delivery drivers utilizing their app network. These on-demand delivery platforms connect thousands of part-time local delivery folks with customers requesting products to be delivered immediately.<sup>40</sup>

### Types

There are several types of app-enabled ordering services, such as aggregators, catered/custom meal delivery and recipe delivery. CNS are ordering portals that also offer the logistics of delivery, or service providers who only offer a delivery network to order aggregators.

CNS' take on many forms. Some have contractual agreements with restaurants while others do not have contracts, sending the courier to make the purchase on behalf of the customer with company issued cards. Postmates, Instacart, Google Express, Amazon PrimeNow, DoorDash, and Caviar are all examples of CNS. And while courier services offer delivery of just about anything, the majority of deliveries are food products.<sup>41</sup>

### Background and Approach

On-demand courier services are very popular. In a study conducted in 2015 by the National Technology Readiness Survey, on-demand food/grocery delivery was the third largest category at 5.5 million monthly consumers and \$4.6 billion annual spending, with Ridesourcing services in second with 7.3 million monthly consumers and \$5.6 billion in annual spending.<sup>42</sup> The survey also showed that over half of the consumers of on-demand projects were millennials.

By easing the link between customers and products, CNS have made themselves very valuable. In March of 2017, Instacart's valuation reached \$3.4 billion. Google Express, Amazon PrimeNow and Instacart are have been able to raise a lot of capital in 2017's series D funding round. While that fundraising makes it clear that customers enjoy the convenience of delivery, it will also likely make it harder for smaller companies such as GoodEggs and Postmates to

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<sup>40</sup> D. Asper, (2017). "The Timely Guide to On-Demand Delivery". <https://www.shopify.com/guides/on-demand-delivery/definition> [2017, April].

<sup>41</sup> S. Buhr, (2015). "Uber Takes On Postmates with UberRUSH, an On-Demand Delivery Service", *TechCrunch*. <https://techcrunch.com/2015/10/14/uber-takes-on-postmates-with-uberrush-to-deliver-all-the-retail-things-to-you/> [2017, April].

<sup>42</sup> C. Colby and K. Bell, (2016). "The On-Demand Economy is Growing, and Not Just for the Young and Wealthy", *Harvard Business Review*. <https://hbr.org/2016/04/the-on-demand-economy-is-growing-and-not-just-for-the-young-and-wealthy> [2017, April].

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compete.<sup>43</sup>

The impact on City streets as a result of this induced demand for delivery of goods remains largely unexplored. On-demand ridesourcing has been shown to induce demand due to cheap prices and convenience.<sup>44</sup> CNS charge a premium currently, and people continue to pay for the convenience of delivery. If these services become autonomous, their costs will likely drop. Technical memo Technical memorandum on potential outcomes and effects of EMS a in the short term and long term will take a deeper dive into this future scenario.

### Usage in San Francisco

For publicly available usage statistics on San Francisco's courier network services providers, see Appendix A.

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<sup>43</sup> L. Kolodny and R. Lawler, (2017). "Instacart raises \$400 million at a \$3.4 billion valuation to deliver groceries on demand", *TechCrunch*. <https://techcrunch.com/2017/03/07/instacart-raises-400-million-at-a-3-4-billion-valuation-to-deliver-groceries-on-demand/> [2017, April].

<sup>44</sup> B. Schaller, (2017).

### Technology

Drones and autonomous vehicles are not necessarily “Emerging Mobility Services.” However, many EMS companies have announced a future that is intertwined with these advances in vehicle technology. As such, they are included in this study.

### Autonomous Vehicle Services

According to the UK Department of Transport “a fully autonomous vehicle (AV) is capable of completing journeys safely and efficiently, without a driver, in all normally encountered traffic, road and weather conditions.<sup>45</sup> In other words, AVs need to operate on par or better than human-driven vehicles in all conditions. AVs have the potential to drastically change our infrastructure, traffic and parking needs, insurance policies, and much more.

### Types

AVs are continually growing in a number of markets, including car share and ridesourcing fleets (TNCs), shuttle services and personal vehicles. This paper looks at two types: shared autonomous fleets and privately owned autonomous vehicles.

#### *Shared Autonomous Fleets*

Ridesourcing companies like Uber and Lyft see that future of mobility as a shared-autonomous one. James McBride, a technical leader at Ford supported that viewpoint by stating, “The prohibitive cost of self-driving cars is a huge part of the reason why AVs are likely to be shared”<sup>46</sup>. However, Ford believes it will have more direct control over AV technology if they are created as commercial fleets.

Shuttle services (like EasyMile and Ollie) also provide interesting market options for AV technology, especially for the “last mile” connection to and from transit services. EasyMile’s shuttles have three modes: metro - where shuttles stop at predefined stations; bus - where the shuttle stops as requested; and on demand - where the shuttle acts as a taxi. The shuttle itself is called an “electric people mover” and can transport up to 12 people with no steering wheel or dedicated front/back.

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<sup>45</sup> R. Skinner and N. Bidwell, (2016). “Making Better Places: Autonomous vehicles and future opportunities”. <http://www.wsp-pb.com/Globaln/UK/WSPPB-Farrells-AV-whitepaper.pdf> [2017, April].

<sup>46</sup> L. Bliss, (2017). “The Future of Autonomous Vehicles is Shared”, *City Lab*. <http://www.citylab.com/tech/2017/01/the-future-of-autonomous-vehicles-is-shared/512417/> [2017, April].

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### *Privately-Owned Autonomous Vehicles*

Personal use of AVs has continued to gain traction, with most new cars having some portion of autonomous technology. As the technology becomes more advanced and less cost-prohibitive, additional AV technologies will be integrated.

As of October 2016, all Tesla models “have the hardware needed for full self-driving capability at a safety level substantially greater than a human driver.”<sup>47</sup> In early 2017, Tesla began testing its autonomous vehicles on public roads in California, with all legal permits in place. However, Tesla’s Model S was involved in the first self-driving fatality in 2016 - a setback for the company but determined not to be the fault of their AV technology, “Autopilot”<sup>48</sup>.

### Background & Approach

As of spring 2017, leaders in the AV world include Ford, General Motors, the Renault-Nissan Alliance, and Daimler.<sup>49</sup> “Contenders” in the AV space include Tesla, VW Group, Toyota, BMW and more. Lastly, “Challengers” include Honda, Uber and a few others. The AV market has pushed automakers and technology companies to become partners, leading companies like Daimler and Uber, General Motors and Lyft, and Waymo and Google, and others to partner up to combine the technology with automobiles. For example, Ford Motor says it plans to invest about \$1 billion over five years in Argo AI to develop AV technology of its own and will begin production of a fully automated car by 2021. Audi, BMW, and other car companies have made similar claims.<sup>50</sup>

All companies are still in the testing phase of their autonomous vehicles. As of April 2017, 30 companies have received permits to test their AV on California roads:

- Volkswagen Group of America
- Mercedes Benz
- Google
- Delphi Automotive
- Tesla Motors
- Bosch
- Nissan
- GM Cruise LLC
- BMW
- Honda
- Ford
- Zoox, Inc.
- Drive.ai, Inc.
- Faraday & Future Inc.
- Baidu USA LLC
- Wheego Electric Cars Inc.
- Valeo North America, Inc.
- NextEV USA, Inc.
- Telenav, Inc.
- NVIDIA Corporation
- AutoX Technologies Inc.
- Subaru

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<sup>47</sup> The Tesla Team, (2016). “All Tesla Cars Being Produced Now Have Full Self-Driving Hardware”, *Tesla*. <https://www.tesla.com/blog/all-tesla-cars-being-produced-now-have-full-self-driving-hardware> [2017, April].

<sup>48</sup> A. Singhvi and K. Russell, (2016). “Inside the Self-Driving Tesla Fatal Accident”, *The New York Times*. <https://www.nytimes.com/interactive/2016/07/01/business/inside-tesla-accident.html> [2017, April].

<sup>49</sup> Navigant, (2017). “Assessment of Strategy and Execution for 18 Companies Developing Automated Driving Systems”, *Navigant Research*. <https://www.navigantresearch.com/research/navigant-research-leaderboard-report-automated-driving> [2017, April].

<sup>50</sup> N.E. Boudette, (2017). “G.M. Expands Self-Driving Car Operations in Silicon Valley”, *The New York Times*. [https://www.nytimes.com/2017/04/13/business/gm-expands-self-driving-car-operations-to-silicon-valley.html?\\_r=0](https://www.nytimes.com/2017/04/13/business/gm-expands-self-driving-car-operations-to-silicon-valley.html?_r=0) [2017, April].



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As one of the most publicized technologies coming to market, rollouts of AV have been highly monitored and have had mixed success in the public eye. In February of 2017, 11 automakers and tech companies released a series of reports documenting their advancement of the technology. Waymo was the most advanced, logging almost 650,000 miles on public roads in 2016, up 49% from previous years and reducing its “disengagements” (when the driver has to take control of the car) by 64% (341 in 2015 to 124 in 2016). General Motors acquired Cruise Automation in 2016, who, at the time of writing this, has 20 licensed vehicles filed with the California DMV.

Not all companies with permits tested vehicles, and not all vehicle testers held permits. Uber has been pushing rollout of their AVs without the attainment of permits, leading to legal issues and regulatory backlash. In late 2016, Uber launched their AV fleet in San Francisco. Not long after, the DMV’s Chief Council called the rollout “illegal” and issued a cease-and-desist order, but not before one of the vehicles was involved in a minor traffic violation (running a red light)<sup>51</sup>. However, as of late March 2017, Uber has begun operating again in San Francisco - this time with the proper permits.

Several other companies are eager to roll out on Bay Area streets. It is expected that Waymo will begin testing their cars in the Bay Area sometime in 2017 and GM and Cruise Automation have been testing their electric, AV cars in San Francisco for about a year.<sup>52</sup> GM has plans with Lyft to deploy thousands of self-driving cars in 2018.<sup>53</sup> In mid April 2017, it was also announced that Apple would now be able to test its AVs on public streets in California. Many companies are choosing to conduct testing at GoMetnum Station, an AV testing ground in Contra Costa County, where there are fewer regulations.

## Drones, Unmanned Aerial Vehicles, and Unmanned Aircraft Systems

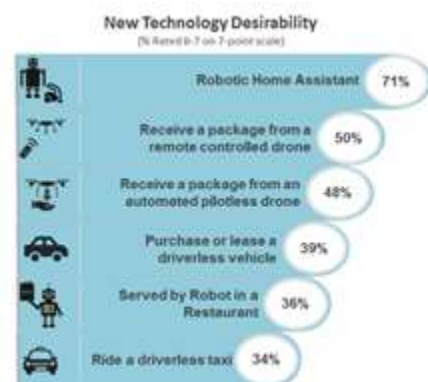
Drones are flying robots. Users control the drone’s flight path remotely via GPS and onboard sensors. Drones can also fly autonomously along software directed flight paths are embedded in their system, working with GPS and sensors.

### Types

<sup>51</sup> M. della Cava, (2016). “Calif. DMV tells Uber to stop self-driving.” <https://www.usatoday.com/story/tech/news/2016/12/14/uber-riders/95395838/> [2017, April].

<sup>52</sup> A.J. Hawkins, (2017). “Google’s new self-driving minivan.” *The Verge*. <http://www.theverge.com/2017/1/8/1420-pacifica-minivan-detroit-2017> [2017, April].

<sup>53</sup> Reuters, (2017). “GM and Lyft Plan to Deploy Thousands of Self-Driving Cars.” <http://fortune.com/2017/02/17/gm-lyft-chevy-bolt-fleet/> [2017, April].



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Image 3: Survey participants were more excited about drone delivery than riding in autonomous taxis. Source: National Technology Readiness Survey



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Use cases for drones vary widely and include insurance claim validation, wind turbine inspection, construction site management, agriculture, live gas flare inspection, first aid, security, flash flood, organ transplant delivery, and more. Transportation and logistics companies also see a prime use case: get people out of traffic and get goods to them more easily. Consumers are interested as well. In a study conducted in 2015 by the National Technology Readiness Survey, 50% of the almost 1000 survey participants desired receiving packages from remote-controlled drones and 48% said pilotless autonomous drones (Image 2). Both were almost 10% more desirable than owning or ridesourcing an autonomous vehicle. This section covers the use case of transporting goods and people.

### Background and Approach

A few companies are in the early stages of exploring the potential of drones. Some are working on convincing authorities that drone delivery is safe, while others are developing the operations necessary to implement drone delivery.

#### *Airbus*

Airbus is exploring three different technologies: urban travel, drone parcel delivery, and flying taxis. These models encompass self-piloted flying vehicles for individual passenger and cargo transport, the testing of parcel delivery to prove to the public and authorities that drone parcel delivery is safe, and to bring a flying taxi service to consumers within 10 years.

#### *Amazon*

Amazon has developed a concept for drone delivery called “Amazon Prime Air,” which allows delivery by drone within 30 minutes or less. Users can watch the drone travel on their phone screen, where they placed their order. They are waiting on regulatory support to continue exploring this possibility.

#### *Ford*

Shanghai-based Ford designers Euishik Bang, James Kuo and Chelsia Lau developed the concept of “Autolivery” for the company's Last Mile Mobility Challenge. Automating the final stretch of the goods delivery process, from curb to door, is difficult, and many companies are working to solve the problem. Ford believes the pressure to develop mobility solutions in urban areas will grow in the near future due to the rise in local deliveries from online sales, and that ideas like Autolivery can potentially reduce gridlock and air pollution, and allow people to move about more easily.

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### Conclusion

The nature of Emerging Mobility Services is largely technological with limited infrastructure, which allows for rapid evolution of service models. Many share a future with autonomous vehicles, building the intellectual property and user base to become the platform to operate a lucrative, no-labor-cost, fleet. As a result, many of the most highly valued models on the roads today are fueled by venture capital and are not currently profitable.<sup>54</sup> Those that are not, like bike share, struggle to find the funding necessary to remain open.

Emerging Mobility Services vary in their approaches, however, they are more similar than not. Ultimately, the services are optimized for the user to make mobility convenient and cheap. The service providers generally work to be perceived as enabling platforms only, though exceptions exist in some forms of bike share and car share services. In all cases, they are a transportation service that automates at least three of the following characteristics:

- Routing
- Reservations/orders
- Vehicle tracking
- Billing
- Customer feedback
- Matching/sharing
- Crowd-sourced routing
- (Un)locking

This understanding of EMS will serve as the foundation for additional areas of inquiry, such as a legislative landscape study that investigates the legal questions related to these identified services and technology; and a scenario modeling exercise that examines potential short-term and long-term futures the services described in this memo.

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<sup>54</sup> E. Newcomer, (2016). "Uber Isn't Profitable in the U.S. and is on Track to Lose \$3 Billion in 2016", *Skift*. <https://skift.com/2016/12/21/uber-isnt-profitable-in-the-u-s-and-is-on-track-to-lose-3-billion-in-2016/> [2017, April].

Attachment 1

Appendix A

Provider	Type	Usage Statistics
<b>Tesla</b>	Autonomous Vehicles	<ul style="list-style-type: none"> <li>● 500 AV testing miles in 2016</li> </ul>
<b>Waymo</b>	Autonomous Vehicles	<ul style="list-style-type: none"> <li>● 424,331 AV testing miles in 2015</li> <li>● 635,868 AV testing miles in 2016</li> <li>● 341 disengagements in 2015</li> <li>● 124 disengagements in 2016</li> </ul>
<b>Bluegogo</b>	Bike Sharing	<ul style="list-style-type: none"> <li>● Interested in delivering 20,000 bikes to San Francisco</li> </ul>
<b>Zagster</b>	Bike Sharing	<ul style="list-style-type: none"> <li>● Unavailable</li> </ul>
<b>Bay Area Bike Share</b>	Bike Sharing	<ul style="list-style-type: none"> <li>● Across entire system:</li> <li>● 700 bikes and 70 stations</li> <li>● 800,000 trips since 2013</li> <li>● 12,000+ annual memberships as of 6/2016</li> <li>● 70,000+ casual memberships as of 6/2016</li> <li>● 300,000+ trips taken in San Francisco in 2015</li> </ul>
<b>Getaround</b>	Car Sharing	<ul style="list-style-type: none"> <li>● Unavailable</li> </ul>
<b>Zipcar</b>	Car Sharing	<ul style="list-style-type: none"> <li>● 950,000 members and 12,000 vehicles across the system</li> <li>● 30 metro markets, 500 college campuses, 50 airports</li> </ul>
<b>Uber Rush</b>	Courier Network Service	<ul style="list-style-type: none"> <li>● Unavailable</li> </ul>
<b>UberEats</b>	Courier Network Service	<ul style="list-style-type: none"> <li>● 25,000 restaurants on board in 50 cities</li> </ul>
<b>Amazon PrimeNow/Flex<sup>55</sup></b>	Courier Network Service	<ul style="list-style-type: none"> <li>● Unavailable</li> </ul>
<b>Good Eggs</b>	Courier Network Service	<ul style="list-style-type: none"> <li>● Unavailable</li> </ul>
<b>Caviar</b>	Courier Network Service	<ul style="list-style-type: none"> <li>● Unavailable</li> </ul>
<b>Instacart</b>	Courier Network Service	<ul style="list-style-type: none"> <li>● 15 cities, over 4,000 personal shoppers in 2015<sup>56</sup></li> </ul>
<b>Omni</b>	Courier Network Service	<ul style="list-style-type: none"> <li>● Average user stores 50 or more possessions</li> </ul>

<sup>55</sup> Amazon's delivery employment platform is referred to as Amazon Flex

<sup>56</sup><http://www.forbes.com/sites/briansolomon/2015/01/21/americas-most-promising-company-instacart-the-2-billion-grocery-delivery-app/&refURL=&referrer=#52441f1642dc>

## Attachment 1

<b>DoorDash</b>	Courier Network Service	<ul style="list-style-type: none"> <li>• 28 major metropolitan markets across more than 250 cities in 2016</li> </ul>
<b>Postmates</b>	Courier Network Service	<ul style="list-style-type: none"> <li>• 100,000 deliveries in Q1 of 2017 across all markets</li> </ul>
<b>Zesty</b>	Courier Network Service	<ul style="list-style-type: none"> <li>• feeds tens of thousands of people around the Bay Area weekly</li> </ul>
<b>Scoot</b>	E-Bike / Scooter sharing	<ul style="list-style-type: none"> <li>• 500 bikes</li> <li>• 50 garages</li> <li>• 2 million miles from 2013-2017</li> <li>• 1 million miles from 3/2016-2/17</li> </ul>
<b>Chariot Transit</b>	Microtransit	<ul style="list-style-type: none"> <li>• 150 vans in San Francisco</li> <li>• 1000's of riders a day</li> <li>• 33 San Francisco routes</li> <li>• 90% capacity during peak commute hours</li> </ul>
<b>Waze Carpool</b>	Ridesharing	<ul style="list-style-type: none"> <li>• Unavailable</li> </ul>
<b>Scoop</b>	Ridesharing	<ul style="list-style-type: none"> <li>• 650,000 trips in first 18 months across platform<sup>57</sup></li> <li>• 50,000+ Bay Area commuters</li> </ul>
<b>Uber</b>	Ridesourcing	<ul style="list-style-type: none"> <li>• 40 million monthly riders<sup>58</sup></li> <li>• 20% of global rides are shared<sup>59</sup></li> <li>• 45,000 TNC drivers registered in San Francisco<sup>60</sup></li> </ul>
<b>Lyft</b>	Ridesourcing	<p>Across all markets:</p> <ul style="list-style-type: none"> <li>• 162.5 million rides in 2016<sup>61</sup></li> <li>• 12.7 million rides in May 2016<sup>62</sup></li> <li>• 212,000 drivers worked for Lyft in May 2016<sup>63</sup></li> <li>• Average of 1 million rides a day<sup>64</sup></li> <li>• 212,000 drivers worked for Lyft in May 2016</li> </ul>

<sup>57</sup> Scoop job posting, 2017

<sup>58</sup> Lynley, 2016 <https://techcrunch.com/2016/10/19/travis-kalanick-says-uber-has-40-million-monthly-active-riders/?ncid=rss>

<sup>59</sup> Singh, 2016 <https://newsroom.uber.com/upfront-fares-no-math-and-no-surprises/>

<sup>60</sup> Reiskin, 2016 <http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M170/K774/170774103.PDF>

<sup>61</sup> McDermid, 2016 <http://www.bizjournals.com/sanfrancisco/news/2017/01/05/lyft-profitability-ridership.html>

<sup>62</sup> Newcomer, 2016 <https://www.bloomberg.com/news/articles/2016-06-28/lyft-tells-investors-to-expect-no-growth-in-rides-for-june>

<sup>63</sup> ibid

<sup>64</sup> <https://www.forbes.com/sites/ellenhuet/2014/12/17/uber-says-its-doing-1-million-rides-per-day-140-million-in-last-year/#12bea96a52cd>

## Attachment 1

		<ul style="list-style-type: none"><li>• 45,000 TNC drivers registered in San Francisco</li></ul>
<b>Flywheel</b>	Ridesourcing	<ul style="list-style-type: none"><li>• Unavailable</li></ul>

## Attachment 2: Proposed Guiding Principles for Emerging Mobility Services & Technology

<b>Safety</b>	Safety for travelers and the general public is a top priority. Emerging Mobility Services must be consistent with the City and County of San Francisco's responsibilities for ensuring <b>public safety</b> . Among other safety-related considerations, we will consider how Emerging Mobility Services contribute toward achievement of our <b>Vision Zero commitment</b> .
<b>Transit</b>	Public transit is and must continue to be a universally accessible, available, and effective means for movement around San Francisco. Emerging Mobility Services must <b>complement rather than compete with Muni service</b> , and must support and account for the operational needs of Muni vehicles and facilities.
<b>Equity</b>	All people, regardless of age, race, color, national origin, income level or any other protected category, should benefit from Emerging Mobility Services, and <b>no group shall be disadvantaged</b> .
<b>Disabled Access</b>	Persons with disabilities, including those who require <b>accessible vehicles</b> , are entitled to receive the same or comparable level of access as persons without disabilities.
<b>Sustainability</b>	Emerging Mobility Services must be consistent with adopted policies supporting sustainability and climate change mitigation and adaptation, including helping to meet the City's <b>greenhouse gas (GHG) emissions reduction</b> goals and supporting efforts to <b>increase the resiliency of the transportation system</b> .
<b>Congestion</b>	The <b>effects on traffic congestion</b> must be carefully considered with regard to Emerging Mobility Services, especially given the resulting impacts on road safety, modal choices, emergency vehicle response time, transit reliability, and air quality.
<b>Accountability</b>	The ability to <b>evaluate the effectiveness, benefits, and impacts of Emerging Mobility Services</b> , relative to City agencies' missions and key goals and objectives. In order to gain funding or other support, Emerging Mobility Services must be accountable and take responsibility for their effects on the transportation system.
<b>Labor and Consumers</b>	Emerging Mobility Services must consider the <b>needs of their customers and their labor force</b> . Fairness in pay, labor policies and practices, and equitable access to services will be expected. Supports San Francisco's local hire principles.
<b>Financial Impact</b>	The potential for Emerging Mobility Services to have a negative financial impact on delivery of publicly-provided transportation services must be considered.

**SFMTA and SFCTA Use of Guiding Principles:** These Guiding Principles are intended to serve as a framework for SFMTA and SFCTA, both for proactive development of policies and programs, and for formulation of sound, consistent responses when warranted. Every Guiding Principle will not be relevant to every consideration associated with Emerging Mobility Services, and in some cases a potential action will not meet all of the principles consistently. SFMTA and SFCTA Directors and staff should consider whether projects are consistent on balance with the relevant Guiding Principles. If a proposal does not generally comply with these Guiding Principles, SFMTA and SFCTA will work with the service provider to better meet the principles if feasible, or may choose not to engage further with the service.



April 24, 2017

**Brian G. Soublet, Deputy Director/Chief Counsel**  
**Department of Motor Vehicles**  
**Legal Affairs Division**  
**P.O. Box 932382, MS C-244**  
**Sacramento, CA 94232-3820**

***RE: DMV Proposed Autonomous Vehicle Driverless Testing and Deployment Regulations***

**Dear Mr. Soublet:**

The San Francisco Municipal Transportation Agency (SFMTA), on behalf of the City and County of San Francisco, together with the San Francisco County Transportation Authority (SFCTA) appreciates the opportunity to comment on the Department of Motor Vehicles' (DMV) proposed regulations for the testing and deployment of driverless vehicles.

As the manager of ground transportation in San Francisco, the SFMTA is charged by the City Charter to enable a safe, effective, sustainable transportation system. The SFMTA sees the potential for autonomous vehicles in our city to advance the goals for our transportation system, but only if done right. We are currently home to many technology-enabled transportation advances that are not consistently supportive of city policy. We want to ensure that autonomous vehicles (AVs) in San Francisco complement our city's efforts, rather than working against them. That means that AVs need to be able to operate safely in complex environments like San Francisco, where pedestrians, buses, cable cars, bicyclists and trucks are central to the life of the street. It also means their operation should be governed such that it reduces congestion, and is supportive of city policy goals with respect to accessibility, affordability, air quality, and other integral aspects of our transportation system.

San Francisco recognizes the important benefits that AVs may bring to city streets, particularly in the area of safety. If deployed appropriately, AVs can help San Francisco achieve its Vision Zero goal of ending traffic fatalities, by eliminating excessive speeding and other dangerous driving behaviors, and by reducing the number of cars on our streets. A clear, standardized approach to AV regulation will enable San Francisco, other local jurisdictions, and the state of California to guard and advance the public interest while enabling the benefits that AV technology promises. Thus San Francisco supports an approach that allows the private sector to move ahead with the testing and deployment of autonomous vehicles without undue bureaucratic hurdles or procedural requirements, but ensures no adverse outcomes.

We believe that the proposed regulations, in part, rely too heavily on the AV manufacturers' self-certification of safety of technology, and in those cases we suggest strengthening validation requirements and adding safety benchmarks that the technology used must meet. Furthermore, **it is critical that trust in the private sector be paired with maximum transparency**, particularly when it comes to safety and collisions. We therefore make several

suggestions to ensure transparency.

Below are our detailed comments on the proposed regulations for the testing and deployment of fully autonomous vehicles in California. The comments include input from the San Francisco Police Department and San Francisco County Transportation Authority. The comments are organized by section for the proposed regulations, with a few general comments at the end that are not related to any specific section of the regulations.

## **ARTICLE 3.7 – TESTING OF AUTONOMOUS VEHICLES**

### **Operational Design Domain (227.02(i))**

San Francisco recommends that the DMV, working with the industry, develop standard definitions for Operational Design Domains. In addition to the Operational Design Domains identified in the proposed regulations (roadway type, speed range, environmental conditions), we want to ensure that AVs can operate safely in complex environments like San Francisco, where pedestrians, buses, rail transit, bicyclists and trucks all share the same street space and there are countless complex interactions between them on a daily basis. Moreover, the operating environment in San Francisco includes many complex and unique traffic control devices and regulations that AVs must be able to follow. Toward that end, we recommend that one of the Operational Design Domains be an “urban, multimodal environment,” and that the definition of this Operational Design Domain refer to design details included in the National Association of City Transportation Officials (NACTO) Urban Street Design Guide (<http://nacto.org/publication/urban-street-design-guide/>) and Transit Street Design Guide (<http://nacto.org/publication/transit-street-design-guide/>), while also recognizing that the actual condition and design of city streets comes in infinite varieties. The NACTO Policy Statement on Automated Vehicles also provides useful guidance in this regard such as the recommendation that “maximum operating speed in a city street environment should not exceed 25 miles per hour” (<http://nacto.org/wp-content/uploads/2016/06/NACTO-Policy-Automated-Vehicles-201606.pdf>).

### *MANUFACTURER’S TESTING PERMIT – ALL TEST VEHICLES*

#### **Manufacturer’s Testing Permit and Manufacturer’s Testing Permit – Driverless Vehicles (227.18(b))**

San Francisco believes that the proposed threshold for determining whether it is safe to operate an autonomous vehicle on public roads—a “reasonable” determination on the part of the manufacturer—is too subjective and imprecise and inadequate to provide safety assurance and confidence to the public. We therefore strongly recommend that the regulations specify performance benchmarks, and require that those benchmarks be achieved and documented in a controlled test environment that is reviewed by a third party, before a manufacturer can test or deploy their autonomous vehicles on public roads. The starting point for this assessment should be the National Highway Traffic Safety Administration’s 15-point Safety Assessment. Such consistent and objective standards will benefit the public, manufacturers, and cities alike.

### *PROHIBITIONS AND EXCLUSIONS – ALL TEST VEHICLES*

#### **Vehicles Excluded from Testing and Deployment (227.28(a))**

San Francisco believes that, before an AV vehicle can be deployed on public roads for *any*



commercial use, cities (or other regulatory body as appropriate) should issue additional regulations pertaining specifically to the commercial operation of autonomous vehicles. While some commercial uses will be excluded from AV testing or deployment by nature of the excluded vehicle types identified in 227.28(a), there are some commercial uses that do not require such vehicles (e.g., TNCs, taxis, delivery services), but require additional regulations due to their unique operating conditions. SFMTA and SFO issued a joint letter to the CPUC on this topic, which is included with our comments as Attachment A. SFMTA is pleased to note that the recently issued scoping memo for Phase III B of the CPUC's rulemaking proceedings regarding TNC service includes regulations of AV specific to TNC service. This is a good first step but does not cover the full range of commercial transportation services.

*APPLICATION REQUIREMENTS FOR VEHICLES DESIGNED TO OPERATE WITHOUT A DRIVER IN THE VEHICLE*

**Notifying Local Jurisdictions (227.38(a))**

In order for the notification of local jurisdictions to work effectively, San Francisco requests that the DMV maintain a database of autonomous vehicle contact persons for each local jurisdiction in the state. This would ease the administrative burden of the notification process for the manufacturers, and also ensure that the correct person and department for each jurisdiction is notified.

San Francisco further suggests clarifying the statement “testing has been coordinated with those local authorities.” Cities should be notified in advance regarding the testing and/or deployment of autonomous vehicles with a driver. Beyond being notified, cities should retain the power to deny testing on city streets, and designate where and when testing can occur. Finally, we suggest that a repository of notifications is maintained online, so that anyone who needs to reference this information has easy access to it. We further suggest that data be made available in a standardized electronic format (MS Excel, csv, etc.) that can be easily summarized and analyzed.

**Local Law Enforcement Engagement Plan (227.38(e))**

Due to limited local law enforcement resources, San Francisco wants to ensure that, in the event of a collision involving an autonomous vehicle, law enforcement is not required to issue a warrant to gain access to the autonomous technology data and/or video recorder. In a typical collision currently, law enforcement is able to immediately interview the driver(s) involved in the collision, and the process is relatively straightforward. In the absence of a driver, or in cases where the driver was only passively monitoring the automated vehicle, the data and/or video recorder(s) could be the only source of information about the circumstances of the collision. Collisions are one area where San Francisco believes it is going to be especially important to have maximum transparency in order to ensure public safety and earn public trust.

Toward this end, San Francisco suggests incorporating the following requirements to the law enforcement interaction plan:

- The autonomous technology data and/or video recordings must be made immediately available to local law enforcement in the event of a collision.
- The remote operator must be immediately available to engage in post collision conversations with local law enforcement.

- A live person must be available 24 hours a day/seven days per week to provide technical assistance to law enforcement if needed for collision or traffic investigations.
- The owner/manufacture shall release the local jurisdiction from any liability in the event that the local jurisdiction needs to move the vehicle to clear the roadway.

In addition to addressing interactions following a collision, the requirements need also define how law enforcement officers will interact with vehicles in situations such as parking and traffic violations, and ensure all AV operation enables and supports that interaction. San Francisco also suggests that the requirement for the manufacturer to review and update the law enforcement interaction plan “on a regular basis” is not specific enough. We would recommend this to be on a quarterly basis, but should be no less than on an annual basis. We also recommend that the DMV develop a standard format for the Local Law Enforcement Engagement Plan so that local law enforcement staff can quickly access the information they need from the various vehicle manufacturers.

Similar to the comment above regarding section 227.38(a), San Francisco requests that the DMV maintain a database of local law enforcement contact persons for each local jurisdiction in the state. This would ease the administrative burden of the notification process for the manufacturers, and would also ensure that the correct person has access to the law enforcement interaction plan. We also suggest that a repository of law enforcement interactions plans be maintained online, so that anyone who needs to reference this information has easy access to it.

In addition to the law enforcement interaction plan, it is recommended that the DMV establish a standard for all autonomous vehicles to prominently display the vehicle owner/remote operator, the web address where the law enforcement interaction plan can be viewed, and the phone number to call for remote operator assistance, including standard external visual identification of the vehicle as an autonomous vehicle.

#### *REPORTING OF COLLISIONS AND DISENGAGEMENTS – ALL TEST VEHICLES*

##### **Reporting Disengagement of Autonomous Mode (227.50(b))**

While we acknowledge that the number of disengagement reports currently is relatively low, with the increase in the number of permits for AV testing, and an increasing number of miles driven in automated mode, it is important for local jurisdictions to receive regular reports on disengagements. We suggest that an annual report is too infrequent and would ask that DMV establish a reporting template that can be accessed by local law enforcement, city/county traffic engineers and others on an ongoing basis. We further suggest that data be made available in a standardized electronic format (MS Excel, csv, etc.) that can be easily summarized and analyzed. In addition to the items already included in 227.50(b)(3)(B), we recommend that these reports include:

- Date and time of disengagement
- *Specific* location of the disengagement (i.e., address), not just the type of roadway or facility.
- Cause of disengagement should include a list of standardized options to select from such as: “hardware failure,” “perception failure,” “other road users,” special circumstances,” “other software failure”.

Disengagements and incidents (such as hard stops, abrupt turns, etc.) should be reported in a

consistent manner, with data sufficient to understand the cause of disengagement and the frequency of disengagements. We suggest data be submitted in a consistent, standardized electronic format, and in a data structure similar to the following, with a record for each disengagement or incident:

- VIN
- Date and time
- Incident or disengagement
- Miles since last disengagement by road way type (public freeway, public street, other public facility, and private facilities)
- Severity (collision with vehicle, collision with object, collision with human, collision with animal, lane departure, right-of-way departure)
- Location (latitude/longitude)
- Location (Facility name + mile marker or address)
- Weather conditions
- Pavement conditions
- Presence of construction
- Presence of incident

In addition to this, manufacturers should report, for each vehicle:

- VIN
- Vehicle make, model, year
- Total number of miles driven
- Total number of disengagements
- Total number of incidents

And, for the entire fleet:

- Total number of miles driven
- Total number of disengagements
- Total number of incidents

**Autonomous technology data recorder (228.02(a) and 228.06(a)(5))**

San Francisco supports the establishment of a standardized autonomous technology data recorder for all AVs. We suggest extending the required timeframe to 90 seconds prior to a collision to better capture weather and other factors that may not be available 30 seconds prior to the collision.

Furthermore, San Francisco recommends that the regulations clearly state that the manufacturer will be required to make the autonomous technology data recorder immediately available to law enforcement after any collision involving the vehicle. (See previous comments on the law enforcement interaction plan for additional details.)

### **Deployment of AVs for passenger services (228.02(c)(2))**

As noted previously, San Francisco believes that, before an AV vehicle can be deployed on public roads for *any* commercial use, cities (or other regulatory body as appropriate) should issue additional regulations pertaining specifically to the commercial operation of the autonomous vehicles. We believe this is especially necessary when the vehicles are being deployed to serve members of the public as passengers, because in those scenarios there will be unique safety, accessibility, and other considerations that are not adequately addressed by these regulations. At the same time, potential detriments to AV deployment may be best addressed through commercial (e.g., shared) operation; thus, cities have great interest in guiding how commercial use can be deployed in cities.

## **ARTICLE 3.8 – DEPLOYMENT OF AUTONOMOUS VEHICLES**

### **Manufacturer Self Certification (228.06(a)(10))**

As noted previously in our comments on Section 227.18(b), San Francisco strongly suggests that, rather than relying on manufacturer self-certification, the regulations specify robust performance benchmarks, and require that those benchmarks be achieved and documented in a controlled test environment that is reviewed by a third party, before a manufacturer can deploy their autonomous vehicles on public roads. Again, such consistent and objective standards will benefit the public, manufacturers, and cities alike.

## **GENERAL COMMENTS**

In addition to the comments above that pertain to particular sections of the regulations, San Francisco would like to make the following general comments:

- Data Sharing requirements should be based upon the NACTO City Data Sharing Principles (<http://nacto.org/wp-content/uploads/2017/01/NACTO-Policy-Data-Sharing-Principles.pdf>).

<b>Data Category</b>	<b>For all AVs</b>	<b>For AVs deployed for commercial purposes</b>
Better Data for Transportation Planning	<ul style="list-style-type: none"> <li>• Speed</li> <li>• Volume</li> <li>• Travel time</li> </ul>	<ul style="list-style-type: none"> <li>• Pick-up location and time</li> <li>• Drop-off location and time</li> <li>• Vehicle occupancy</li> <li>• Non-revenue vehicle miles traveled</li> <li>• Vehicle dwell times</li> </ul>
New Tools for Safety	<ul style="list-style-type: none"> <li>• Collision occurrence</li> <li>• Collision severity</li> <li>• Rapid acceleration</li> <li>• Rapid deceleration</li> <li>• Disengagements</li> </ul>	
Equity in Mobility Options		Number, date and time of: <ul style="list-style-type: none"> <li>• Unfulfilled rides</li> <li>• Declined rides</li> <li>• Cancelled rides</li> </ul>

- These regulations should explicitly permit any local regulations that are not inconsistent with the DMV regulations, as cities may have need to apply or develop additional regulations tailored to specific local jurisdictional needs, including the ability to price access to city streets.
- California DMV should convene regular (e.g., quarterly) public meetings which include local jurisdictions and AV companies to discuss upcoming activities and address issues.
- Testing or deployment of AVs shall not interfere with the operations of any public transit routes, impact schedules, or cause delays. Driving and stopping behaviors that have the potential to interfere with public transit service include double parking, parking in bus only zones, and picking up/dropping off passengers in travel lanes and/or bus loading zones should be prohibited.
- The vehicles need to operate in a manner that is consistent with the California Vehicle Code (CVC), not just with National Highway Traffic Safety Administration standards. For example, the CVC has a unique definition for jaywalking, and the vehicle needs to be programmed to understand that definition as well as other unique state regulations.
- Provisions should be added that allow local jurisdictions to formally appeal to the DMV to revoke a manufacturer's testing and/or deployment permit expeditiously if the local jurisdiction believes that additional steps are needed to ensure the safety of the public.

Thank you again for the opportunity to submit comments. If you have any questions, please contact Darton Ito ([darton.ito@sfmta.com](mailto:darton.ito@sfmta.com)). We look forward to working with DMV and other stakeholders to ensure the safe and effective testing and deployment of AVs in San Francisco and in California.

Sincerely,



**Edward D. Reiskin**  
**Director of Transportation**  
**City and County of San Francisco**



**Tilly Chang**  
**Executive Director**  
**San Francisco County Transportation Authority**

cc: Mayor Edwin M. Lee  
 SFMTA Board of Directors  
 Ivar Satero, SFIA Airport Director  
 William Scott, SF Police Department

Tom Maguire, SFMTA  
 Kate Breen, SFMTA  
 Kate Toran, SFMTA  
 Jeff Hobson, SFCTA  
 Darton Ito, SFMTA

May 17, 2017

The Honorable Senator Steven Bradford  
State Capitol, Room 2062  
Sacramento, CA 95814

Subject: San Francisco County Transportation Authority Opposition to Senate Bill 182

Dear Senator Bradford,

On behalf of the San Francisco County Transportation Authority (Transportation Authority), I am writing to express our opposition to Senate Bill 182, which would allow Transportation Network Company (TNC) drivers to obtain only a single business license to operate in all local jurisdictions statewide, irrespective of where they operate their business. As the Congestion Management Agency for San Francisco, the Transportation Authority has a vested interest in ensuring San Francisco's transportation network operates as safely, efficiently, and equitably as possible. If implemented, SB 182 would make it more difficult to meet that mandate by limiting the City's ability to mitigate TNC's impacts on its transportation system and to provide consumer and labor protections regarding TNCs the way it does for other businesses operating in our jurisdiction.

Currently, the City requires registration for anyone "engaging in business" in San Francisco, including TNC drivers and others driving on San Francisco streets for profit. There are approximately 20,000 TNC drivers currently registered in San Francisco, of a total of estimated 45,000 total drivers operating commercially. TNCs have a significant impact on existing transportation infrastructure and resources adding wear and tear on city streets (estimated at \$2-4 million/year) and placing an increased burden on traffic enforcement resources. Additional concerns include TNC's growing impact on congestion and the safe operation of our streets.

Unfortunately, the City and Transportation Authority's requests to TNCs and the California PUC for TNC trip data have been unsuccessful to date. Therefore, it is critical for San Francisco to have the ability to regulate TNCs through a local business licensing process in order to understand the nature of TNC operations in our city and manage the sector appropriately. Business license fees collected would also help offset maintenance required due to the additional local road wear and tear, and fund additional on-street law enforcement staff to maintain public safety.

We strongly support maintaining the City's ability to register TNC drivers as local businesses and oppose SB 182.

Sincerely,

Aaron Peskin  
Chair, San Francisco County Transportation Authority

cc: Sen. Wiener, Asm. Chiu, Asm. Ting  
Mayor Ed Lee, G. Gillett, City and County of San Francisco  
E. Reiskin, K. Breen, K. Toran- SFMTA  
TC, MEL, JC, JH



*Plan, Fund, Deliver*

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EXECUTIVE DIRECTOR

FILE NO. 170306

RESOLUTION NO. 114-17

1 [Urging the California State Legislature to Amend the California Vehicle and Public Utilities  
2 Codes Related to Regulation of Transportation Network Companies]

3 **Resolution urging the California state legislature to amend the California Vehicle and**  
4 **Public Utilities Codes to enable local jurisdictions to access trip data for**  
5 **Transportation Network Companies (TNCs) and to permit and conduct enforcement of**  
6 **TNCs as warranted to ensure safety and disability access, and manage congestion.**

7  
8 WHEREAS, The San Francisco Municipal Transportation Agency (SFMTA) is  
9 responsible for the operation and management of San Francisco city streets under the City's  
10 Transit First policy and is leading the city's Vision Zero initiative and implementation of the  
11 City's Transit First Policy, in an effort to combat traffic congestion and carbon emissions; and

12 WHEREAS, The San Francisco County Transportation Authority (SFCTA) is the county  
13 congestion management agency and its adopted long-range countywide transportation plan  
14 calls for study of the ridesharing sector leading to recommendations for management of this  
15 rapidly growing sector; and

16 WHEREAS, Pursuant to these roles, both agencies have made repeated requests to  
17 the CA PUC for annual reports submitted by each TNC detailing the number of rides  
18 requested by customers and accepted/not accepted by TNC drivers within each zip code  
19 where the TNC operates and provision of trips in accessible vehicles, and the CA PUC has  
20 consistently denied these requests; and

21 WHEREAS, In denying local requests for TNC data, CA PUC cited the current  
22 Commission Decision (D. 13-09-045) that requires TNCs to provide verified reports to the it's  
23 Safety and Enforcement Division (SED) documenting operational data and requires TNCs to  
24 file these reports confidentially unless in Phase II the Commission requires public reporting  
25

1 from Transportation Charter Party (TCP) companies, and therefore D. 13-09-045 prohibits  
2 SED from releasing the information SFMTA and SFCTA requested; and

3 WHEREAS, The CA PUC further cited provisions of the California Evidence Code  
4 Section 1040(b)(2) that authorize the Commission to refuse to disclose official information if  
5 disclosure is against the public interest, and stated that "...the Commission has determined  
6 that preserving confidentiality outweighs disclosure in the interests of justice at least until  
7 Phase II of this rulemaking;" and

8 WHEREAS, San Francisco Board of Supervisors seeks a public hearing on the basis of  
9 the public interest claims of the CA PUC in favor of TNCs over local jurisdictions and on the  
10 status of the Phase II Rulemaking; and

11 WHEREAS, There is growing concern and evidence that the large number of TNCs  
12 operating in San Francisco is having a negative effect on congestion, safety and equitable  
13 access based on 1) the City Treasurer's estimate that up to 50,000 TNC drivers are required  
14 to apply for business permits in order to drive for TNC companies, 2) corridor-level data from  
15 San Francisco International Airport which shows that the rate of TNC use more than tripled  
16 during January 2015 to October 2016, while BART SFO extension ridership declined over the  
17 same period; 3) news reports of TNC drivers operating for excessive hours potentially  
18 jeopardizing passenger and traffic safety; and 4) the average number of monthly paratransit  
19 trips provided by wheelchair accessible ramp taxis has declined markedly over the past three  
20 years, a decline SFMTA attributes to the rise of TNCs and decreasing availability in on-  
21 demand service for people with disabilities; and

22 WHEREAS, Given the scale of TNC services in California and given the small number  
23 of CA PUC transportation enforcement staff who are expected to conduct statewide  
24 enforcement of TNCs, a recent independent audit of the CA PUC's Transportation  
25 Enforcement Branch (TEB) indicated that TEB is not meeting its mandated activities; and



1           WHEREAS, The impact of TNC service is experienced at the local level and SFMTA  
2 has expertise in regulating private transportation modes and could enhance the public safety  
3 by conducting enforcement; and

4           WHEREAS, A recent study of New York City TNC activity estimated that TNCs  
5 added 600 million miles of vehicular traffic and account for 3.5% of vehicle miles driven by all  
6 vehicles and its author advises cities experiencing similar conflicts with TNCs to seek  
7 regulatory authorities to manage TNCs, among other strategies; now, therefore, be it

8           RESOLVED, That the San Francisco Board of Supervisors urges the California State  
9 Legislature to amend the Vehicle and Public Utilities Code to permit CA PUC to share TNC  
10 trip data with local California jurisdictions; and, be it

11           FURTHER RESOLVED, That the San Francisco Board of Supervisors urges the  
12 California State Legislature to allow local jurisdictions to Permit TNC operations and conduct  
13 Enforcement as warranted to ensure safety and access, and manage congestion; and, be it

14           FURTHER RESOLVED, That the City Lobbyist for the City and County of San  
15 Francisco shall advocate for this policy; and, be it

16           FURTHER RESOLVED, That the San Francisco Board of Supervisors hereby directs  
17 the Clerk of the Board to transmit copies to the members of San Francisco State Legislative  
18 Delegation with a request to take any and all action necessary to achieve the objectives of this  
19 resolution.



City and County of San Francisco

Tails Resolution

City Hall
1 Dr. Carlton B. Goodlett Place
San Francisco, CA 94102-4689

File Number: 170306

Date Passed: April 04, 2017

Resolution urging the California state legislature to amend the California Vehicle and Public Utilities Codes to enable local jurisdictions to access trip data for Transportation Network Companies (TNCs) and to permit and conduct enforcement of TNCs as warranted to ensure safety and disability access, and manage congestion.

April 04, 2017 Board of Supervisors - ADOPTED

Ayes: 11 - Breed, Cohen, Farrell, Fewer, Kim, Peskin, Ronen, Safai, Sheehy, Tang and Yee

File No. 170306

I hereby certify that the foregoing Resolution was ADOPTED on 4/4/2017 by the Board of Supervisors of the City and County of San Francisco.

Signature of Angela Calvillo
for Angela Calvillo
Clerk of the Board

Unsigned
Mayor

4/14/2017
Date Approved

I hereby certify that the foregoing resolution, not being signed by the Mayor within the time limit as set forth in Section 3.103 of the Charter, or time waived pursuant to Board Rule 2.14.2, became effective without his approval in accordance with the provision of said Section 3.103 of the Charter or Board Rule 2.14.2.

Signature of Angela Calvillo
Angela Calvillo
Clerk of the Board

4/14/17
Date