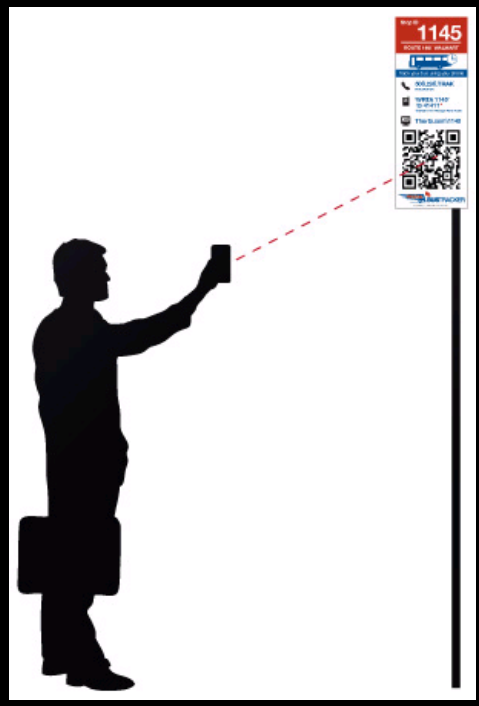

Bringing Mobility as a Service to the U.S.: Opportunities and Challenges
Le Transport Urbain du Futur

Carol Schweiger, President
Schweiger Consulting LLC

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Presentation Outline

- Setting the U.S. stage
- Opportunities
- Challenges
- USDOT Mobility on Demand
- Mobility as a Service (MaaS) examples

Setting the U.S. Stage

- Personal mobility dominated by personally owned vehicles, accounting for >80 % of trips
- Personally owned vehicles:
  - Produce 15% of U.S. emissions
  - Account for 30% of global oil combustion
  - Sit unused over 95% of the time
  - Consume 27% of income in U.S. median income households
- Reliance on costly personal vehicles leaves lower-income persons without access to affordable mobility

Source: Carlin, Kelly, Bodhi Rader, and Greg Rucks. Interoperable Transit Data: Enabling a Shift to Mobility as a Service. Rocky Mountain Institute, October 2015, http://www.rmi.org/mobility_ITD

Setting the U.S. Stage (continued)

7 major trends over the past 5-10 years:

- Demographic changes, with Baby Boomers and Millennials in large numbers
- Preferences for urban living and more flexible lifestyles
- WiFi, GPS, sensors and smartphones
- Anywhere everywhere connectivity
- Car driving/ownership preference changes
- Travel as part of life experiences
- Redefining transport through new street designs, service providers and systems

Source: Timothy Papandreou, Director, Office of Innovation at San Francisco Municipal Transportation Agency, "The (Likely) future of Urban Mobility: Key trends, issues and opportunities for cities," LinkedIn post, August 25, 2015, http://www.racfoundation.org/research/mobility/380610

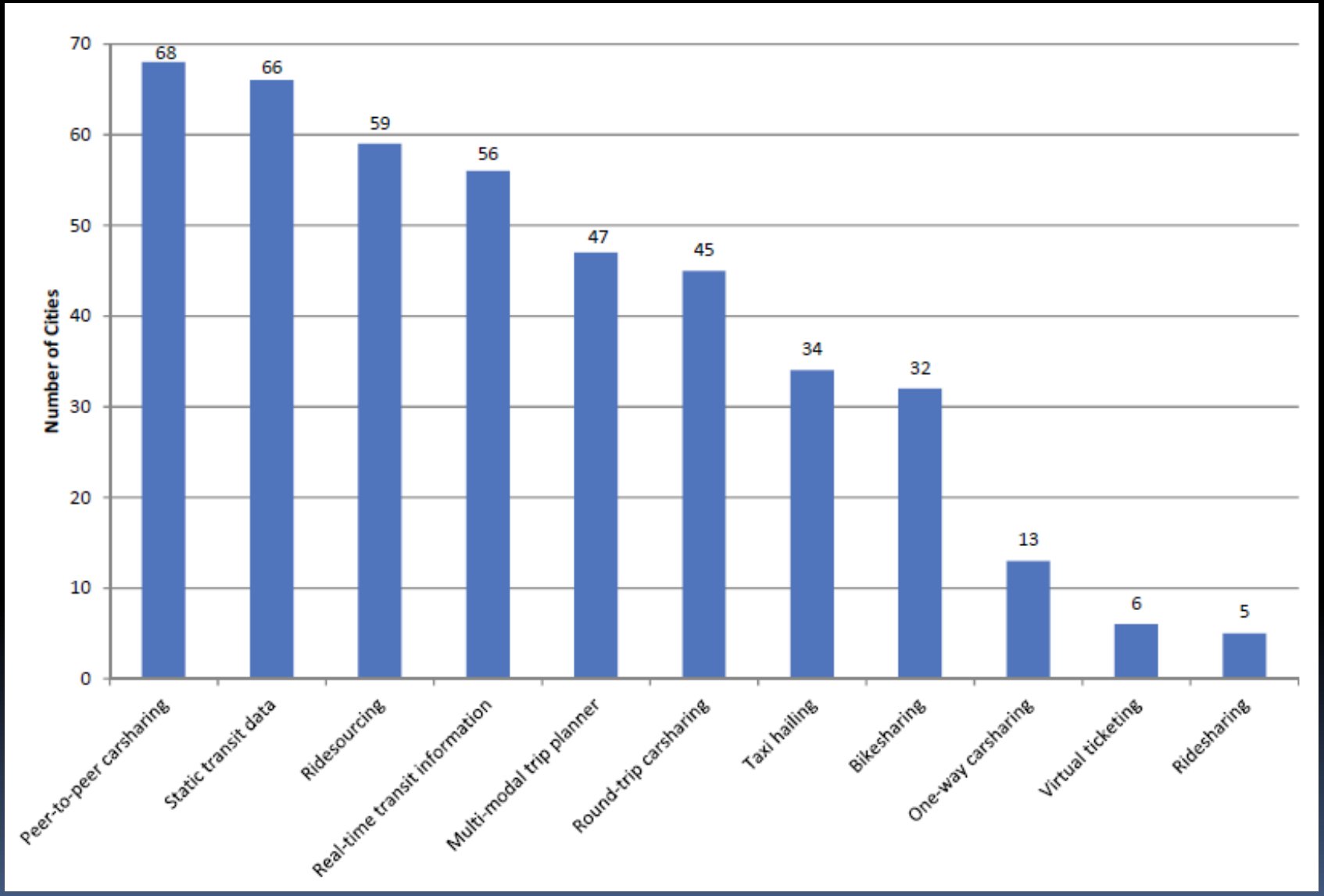
Setting the U.S. Stage (concluded)

Trends over the next 5-10 years:

- Synchronizing and connecting every network
- Performance-based public–private partnerships becoming the norm rather than the exception
- Diversification and consolidation of transport manufacturers and providers
- Modular, combined shared e-mobility systems to scale in urban areas
- Commercial deliveries and phased introduction of drones
- Driverless vehicles and their potential
- MaaS, with routing, booking, payment, unlocking, gamification and trading

Source: Timothy Papandreou, Director, Office of Innovation at San Francisco Municipal Transportation Agency, "The (Likely) future of Urban Mobility: Key trends, issues and opportunities for cities," LinkedIn post, August 25, 2015, http://www.racfoundation.org/research/mobility/380610

Extent of Service Availability in U.S.



Source: Lindsey Hallock and Jeff Inglis, "The Innovative Transportation Index: The Cities Where New Technologies and Tools Can Reduce Your Need to Own a Car," February 2015

Opportunities

- **Redefine "public transportation"**
- Change travel modeling to account for:
  - New mode choice behavior
  - Incorporating incentives or rewards
  - Integrating technology-enabled transportation tools
  - Incorporating effects of new transportation tools – both individually and in combination
- Implement integrated payment systems (see next slide)
- Explore potential of new tools to meet mobility needs of those currently poorly served by transportation system

Integrated Payment=Improved Mobility

- Use of mobile devices driving this
  - US mobile market: 77% are smartphone owners, 75% said electronic ticketing would make travel easier and 78% expect to buy tickets via mobile device in coming year
- Mobile payment can be deployed much faster than ticketing systems
- Banks competing with other payment players
- Contactless NFC technology standard feature in mobile devices:
  - Public transport payment
  - Toll payment, allowing hands-free and payment without having to stop
  - Open payment system advantages - lower ticket issuance and distribution costs, and achieve interoperability
- Creation of mobile ticketing ecosystem in which no single entity or stakeholder group controls value chain (e.g., Open Mobile Ticketing Alliance)

Opportunities (continued)

- Provide public access to transit data (see next slide)
- Expand data available to the public
- Adopt open data and open source software policies
- Data sharing to:
  - Better understand goods and people movements
  - Predict how those movements will change in the future
- Continue development of open protocols

Data is the New Oil!

- Big, small and open data – oh my!
- Data sharing not prevalent among all transport operators, but that is changing!
- More and more open data does not mean that we understand the data
- Data often free but not always easy to find
- Insight to transport operators from:
  - Data collected from apps to understand people movement (rather than vehicles) fused with
  - Other data sources (e.g., public transport payment data)

Opportunities (concluded)

- Clarify regulations on new services, such as Transportation Network Companies (TNC)
- Encourage complementary public transportation and new mobility tools
- Make better use of existing technology and infrastructure: Rethink – Optimize – Rebuild – Build new
- People-aware not vehicle-aware systems and infrastructure (see next slide)
- Expand access to cellular networks, Wi-Fi, and electric outlets in transit stations, and aboard transit vehicles

Vehicle-aware to People-aware Systems

- Should be:
  - Mapping people movements and intent onto available options
  - Providing people with actionable information then use simulation and better demand modelling
- Examples:
  - Where pedestrians travel using pedestrian counting - Melbourne, Australia using infrared sensors
  - Bicycle awareness/counting employed to better time bicycle lights (which are typically phased for cars)
- San Francisco Metropolitan Transportation Authority - “level of traffic stress” based on physical / lateral separation, auto lane width, bicycle facility width, adjacent traffic speed, facility blockages, intersection crossings, and terrain

Vehicle-aware to People-aware Systems (continued)

- Still struggling with traveler information – whether:
  - Crowdsourced (e.g., Moovit) or from
  - Comprehensive/integrated system for multiple regional operators (e.g., Triplinx in Toronto)
- Do not always monitor information provided to the public
- Focus on personalized mobility (one person's way of traveling will not be the same as the next person's)

Challenges: Institutional

- Existing institutional environment key factor:
  - Have institutions worked together or coordinated before?
  - Do application vendors provide open solutions and share information with their competitors?
  - Changes may be necessary within participating organizations
- Participating organizations may conduct business in a different way:
  - Reorganization or change in way service is operated and dispatched, and way that customer service is structured
  - New tools for operations and customer service staff, meaning individual roles and responsibilities may change.
- From a traveler perspective:
  - Access to more information with which they can make more informed choices
  - Help travelers make trips that they may not have made
  - Implications of decline in or even the demise of taxi companies in places where low-income, disabled, and older persons rely on taxis, including wheelchair-accessible taxis, for lifeline services

Challenges: Institutional (continued)

- Financing necessary for technology procurement, implementation, and on-going operations and maintenance
- Changes required to the existing institutional environment in the location(s)/region(s)
- Coordination with other providers and agencies in order to jointly procure systems and/or exchange data and information
- Lacking ITS technical experience - this can relate to either human or computer resources
- Changes needed in the technology vendor community to successfully develop and implement new systems

Challenges: Operational

- Many transit agencies operate independently and do not coordinate their services
- Changes in the way agencies schedule and operate their services
- Provide transit services under an array of policies and objectives from different governmental and regulatory agencies, while trying to satisfy the needs of the traveling public simultaneously
- Interface(s) among existing and proposed technology
- Role of each agency and their operations in both the entire transportation system and in MaaS ecosystem
- Changes caused by deployment of MaaS

Challenges: Technical

- Old (and perhaps unintelligent) infrastructure in location/region – how to incorporate this into MaaS physical and logical architecture
- If technology fails, how to manually perform MaaS functions
- Travelers without credit accounts cannot necessarily access new MaaS services
- Travelers without mobile device capable of functions needed to interact with MaaS applications - “information equity”
- Automation of functions - alienate agency staff as well as customers, thus benefit of technology may not be realized
- Nature of existing ITS/technologies and ability to use or integrate these with new technologies
- Lack of technical guidance and information for agency staff
- Lack of ITS infrastructure, especially in rural areas

USDOT's Mobility on Demand (MOD)

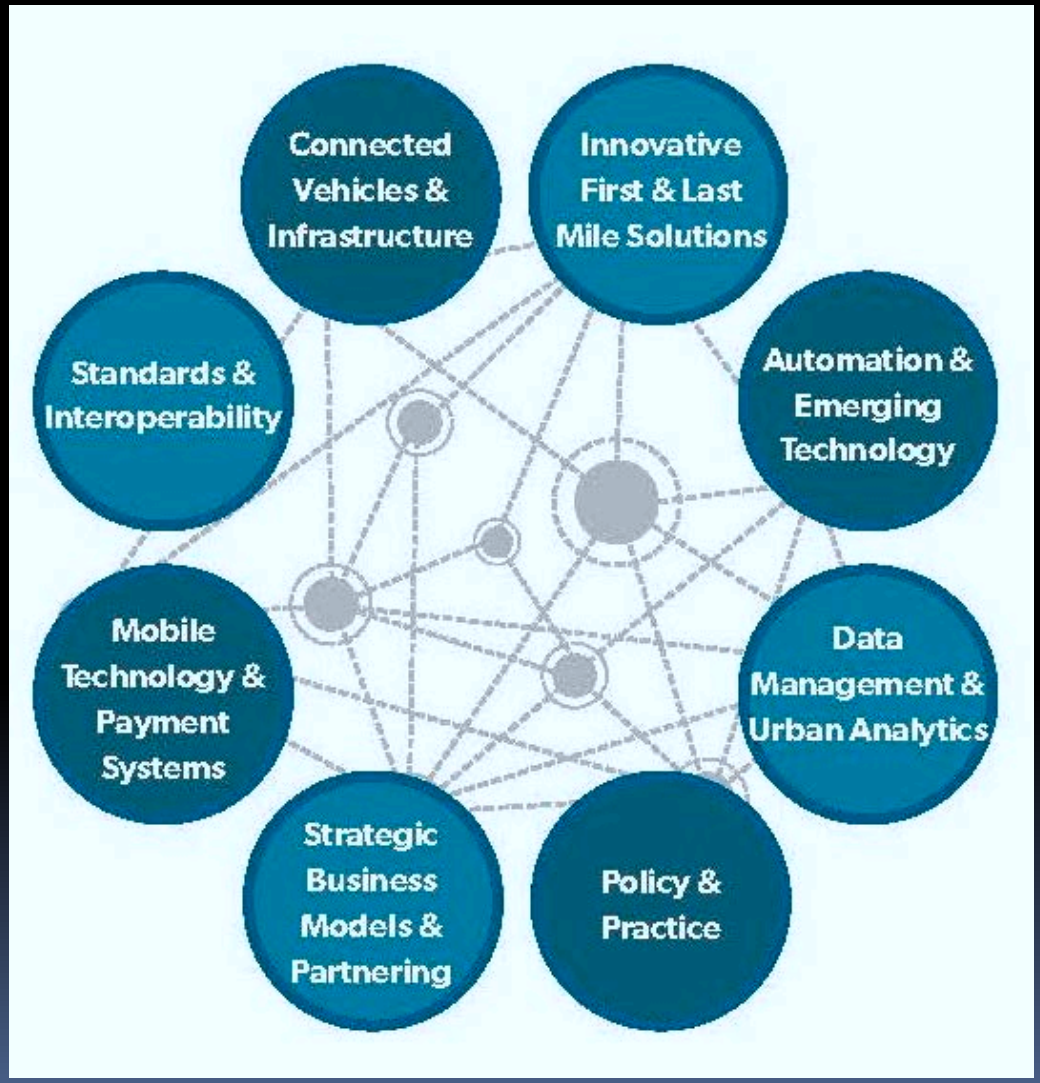
- Long term strategic vision for a multimodal, integrated and connected transportation system
- Concept which imagines ***mobility as a commodity and a service***
- Conceptual notions of MOD:
  - Promotes choice in personal mobility
  - Leverages emerging and existing technologies, and big data capabilities
  - Encourages multimodal connectivity and system interoperability
  - Promotes new business models that improve service quality

Source: Jamie Pfister, Federal Transit Administration, "FTA Mobility on Demand (MOD) Program," presentation at American Association of State Highway and Transportation Officials (AASHTO) Standing Committee on Public Transportation (SCOPT)/Multi-State Transit Technical Assistance Program (MTAP), Winter Meeting, December 3, 2015

Guiding Principles of MOD Vision

- System Integration of existing MOD products and services; development of new will be considered
- Partnership Driven - evidence of commitment to support MOD both technically and institutionally
- Innovative Business Model where individually proven products can partner to collectively deliver better service to travelers
- Equity of Service Delivery - Demonstrate and promote unique role transit holds in providing equitable service for all potential travelers

MOD Enablers



MOD Focus Areas

MOD Challenges and Opportunities

- First/Last Mile Solutions
- Paratransit/Demand Response Services
- Integrated Fare Payment
- Trip planning
- Open Data/Data Sharing
- Land Use and/or Service Planning
- Equity and accessibility
- Evolving definition of Public Transportation?
- Performance Metrics (e.g., Ridership)
- “The 3 Rs” – Rules, Requirements and Regulations

MaaS in the U.S.: Joint Venture in Silicon Valley

- Reduce private auto usage
- "Mobility Aggregator" gathers all services into unified smartphone app with
  - Easy fare payment
  - One-stop billing
  - Integrated employer subsidies
- Dissolve boundaries between modes
- Provide more customer-centered experience while improving efficiency of entire transport system
- Aspire to accelerate software integration between mobility apps and employer programs

Joint Venture Goals and Action Plan

- Goals:
  - Make it more convenient for anyone, anywhere, at any time to have a competitive option to driving alone
  - Measurably increase mobility, convenience and productivity
  - Reduce stress, congestion and GHG emissions
  - Make mobility service software more interoperable and better integrated
  - Break down barriers that reduce user convenience
- Action Plan:
  - Pursue an entrepreneurial, lean startup approach with a series of pilots, technology accelerations and hackathons
  - Explore ways to provide faster, more reliable employee commutes
  - Maintain and expand our regional MaaS partnership with selected cities, agencies and major employers

Silicon Valley Context: auto-centric

Versus Finland's MaaS effort:

	Auto-centered Silicon Valley	Transit-centered Helsinki	Difference
SOV rate	76%	38%	½
Transit rate	3.3%	40%	12X
Bike/Walk	3.8%	18%	4X
Cars/capita	0.84	0.55	2/3
Parking cost/hr	Free	$2.25	∞
Gas price/gal	$3.50	$8.00	2X
New car fees	10%	85%	8X
Pop per sq mi	5,000	45,000	9X
Avg Commute	13 mi	8 mi	½

"Silicon Valley is insane. We charged for parking in New York, so we should charge here."
– VTA Genl Mgr Nuria Fernandez (ex NY MTA COO)

Joint Venture SILICON VALLEY

Comprehensive Commute Trip Reduction

Enterprise CTR software + smartphone Mobility Aggregation

Employer pilots: Incentives and/or parking charge ➔ shift mode

Gap filling (electric scooter/bike, Lyft Driver Destination, etc)

Pricing public policy: City Councils, SVLG/BAC 101/Caltrain, MTC, etc

Seamless public transit – cross county lines, fare structure

Infrastructure – HOV4 freeway lane? HOV4 El Camino lane?

Innovative business model /
6 way “win” for main stakeholders

Joint Venture Silicon Valley

City of Palo Alto

VTA Santa Clara Valley Transportation Authority

City of San Jose, Capital of Silicon Valley

City of Mountain View

City of Fremont

Commute.org
Working Together to Improve Our San Mateo County Commute

Microsoft

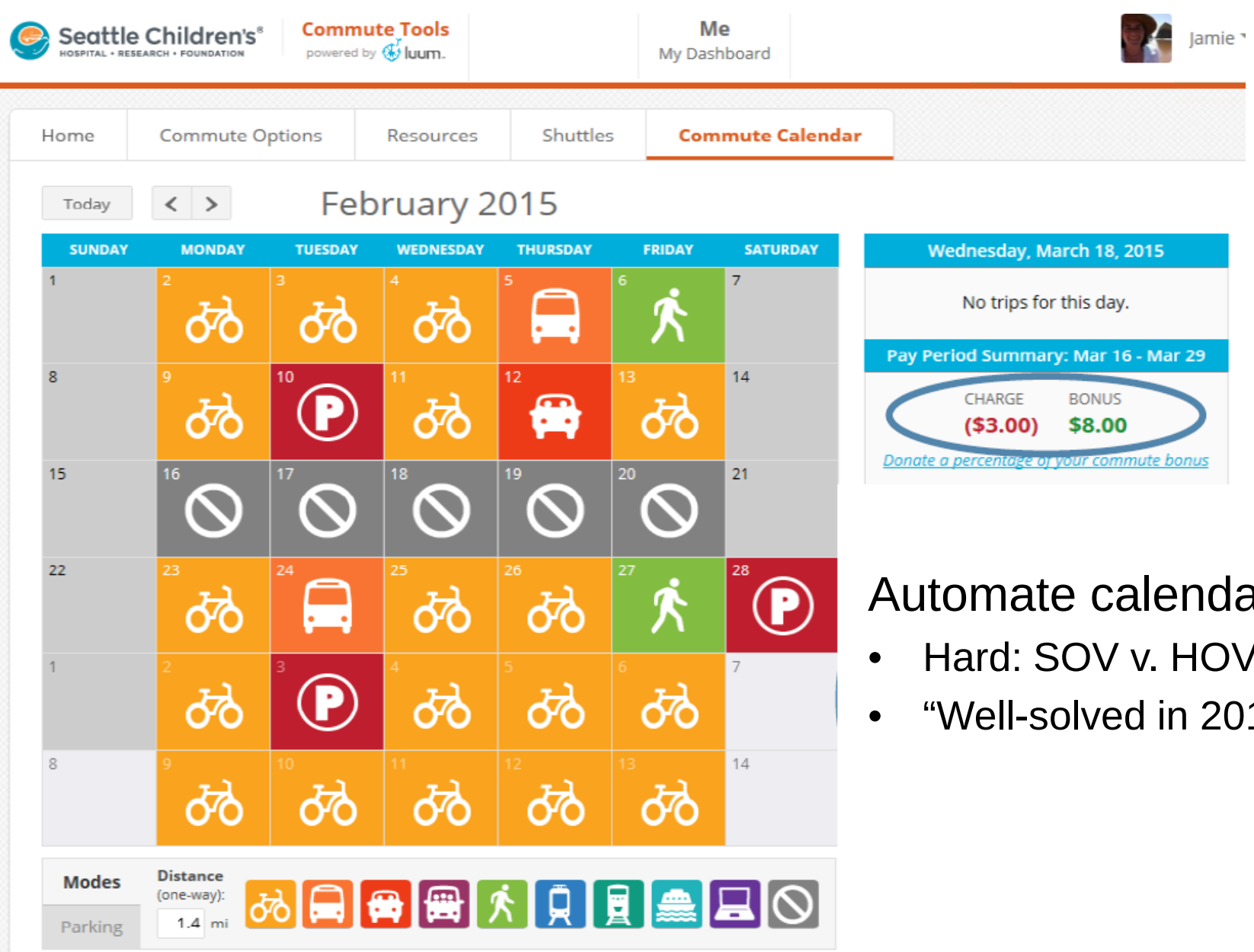
RIDESCOUT™

lyft

Google

Joint Venture Silicon Valley

Enterprise CTR: Commute Benefits Integration

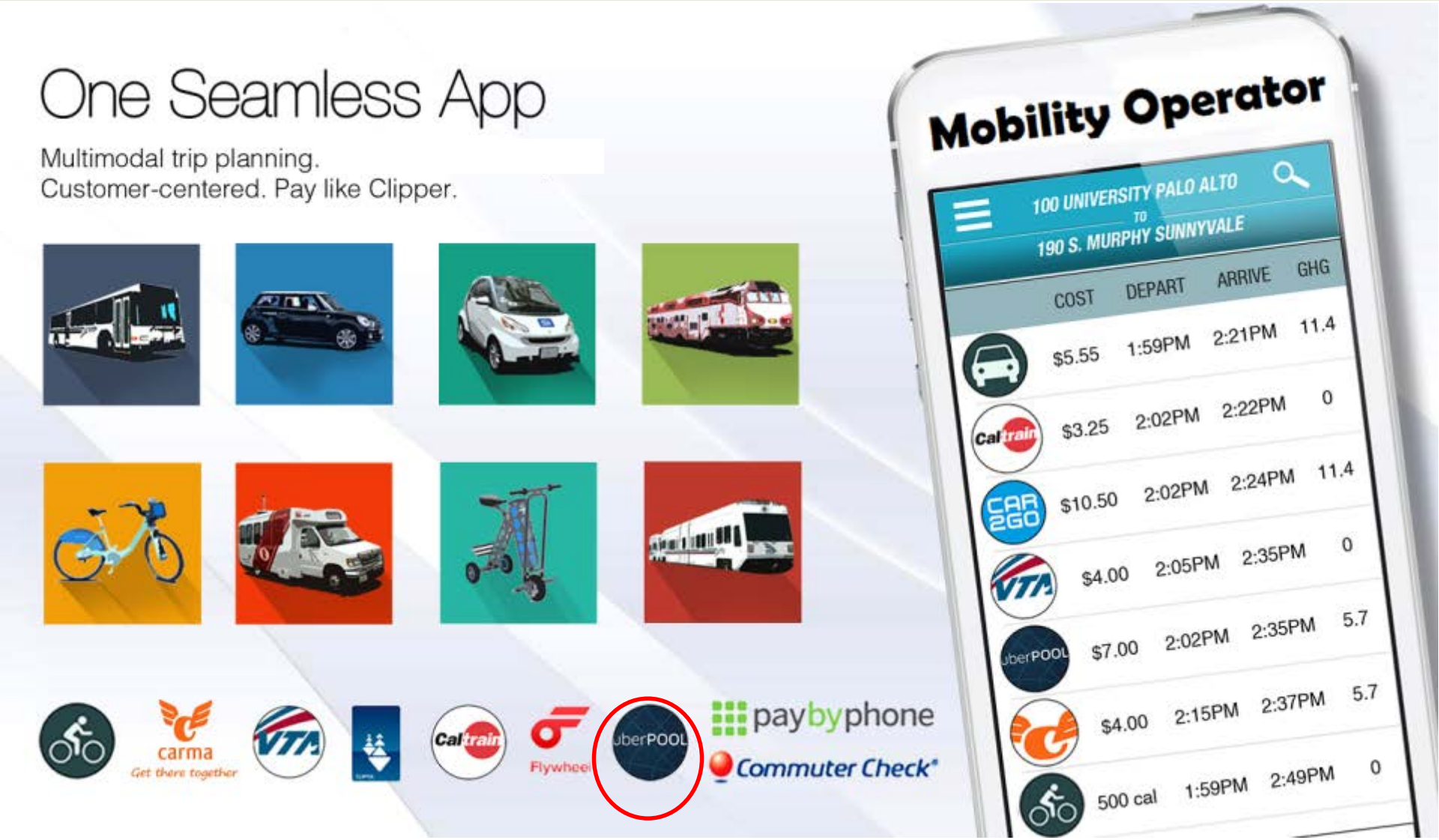


Automate calendar-filling

- Hard: SOV v. HOV v. bike
- “Well-solved in 2017.”

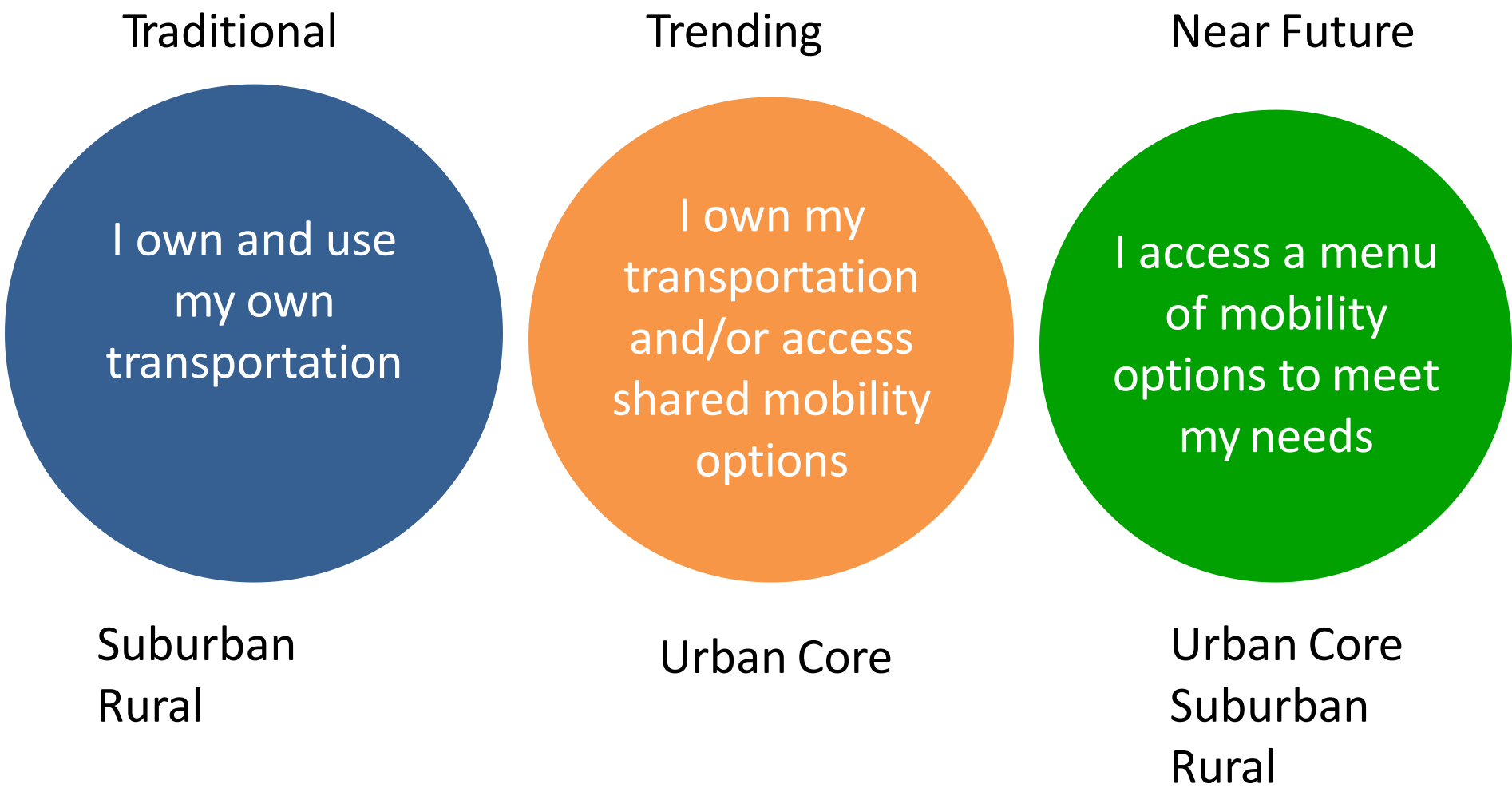
Mobility Aggregation

RideScout, MoovIt, Transit App, Urban Engines, Xerox (GoLA), etc



Joint Venture SILICON VALLEY

San Francisco Municipal Transportation Agency: Access Over Ownership



Source: Timothy Papandreou, Director, Office of Innovation at San Francisco Municipal Transportation Agency (SFMTA), @tpap_

Multiple modes, little or no integration; multiple payments, multiple bookings, etc.

Privately-Owned Vehicles

Public Transit, Rail, Bus, Ferry

Regional & Intercity Services: Rail, High-Speed Rail, Air

Shared Fleet Vehicles

Employer Shuttles, Jitneys Commercial Deliveries

Taxi, Limousine & Transportation Network Companies

Source: Timothy Papandreou, Director, Office of Innovation at San Francisco Municipal Transportation Agency (SFMTA), @tpap_

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Mobility Minutes for a Mobility Menu

A complete customer focused experience

1.0 Public Operators & Information

1.2 Diversification Private Operators & Info providers

2.0 Consolidation of Providers, Operators & Data Aggregators

3.0 Mobility Minutes for local, regional, international travel

$150 My City Plan
1000 city minutes

100 Rideshare min
100 Carshare min
400 Transit min
400 Bikeshare min
Walking Credits
Share Minutes

$500 My Travel Plan
300 Flying minutes
700 City minutes

Concept: Timothy Papandreou

Source: Timothy Papandreou, Director, Office of Innovation at San Francisco Municipal Transportation Agency (SFMTA), @tpap_

Is Mobility minutes the next big trend….

References

- Lindsey Hallock and Jeff Inglis, “The Innovative Transportation Index: The Cities Where New Technologies and Tools Can Reduce Your Need to Own a Car,” February 2015
- TRB Special Report 319, “Between Public and Private Mobility Examining the Rise of Technology-Enabled Transportation Services,” Committee for Review of Innovative Urban Mobility Services, 2015

Thank You!

Carol Schweiger

President

Schweiger Consulting LLC

+1 781-424-2208

clschweiger@comcast.net