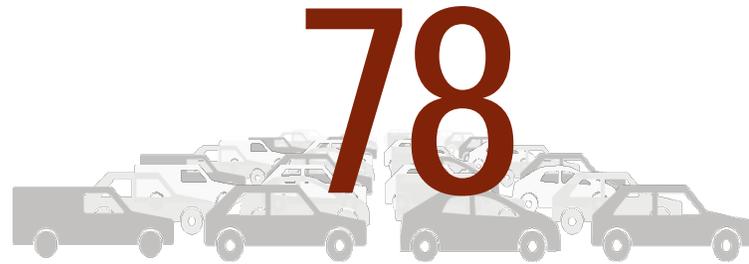


Implications of Automated Vehicles

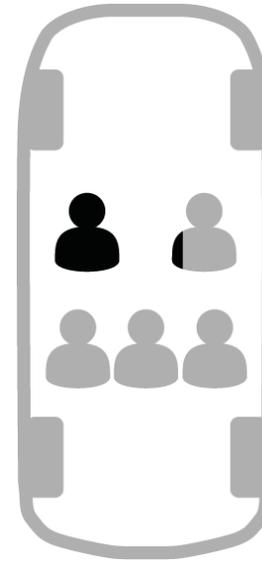
February 2017

ARUP

Disruption, please!



Average hours spent in
congestion a year
San Francisco-Oakland (2014)



1.13
Commuters/vehicle

50%



Urban land devoted to roads and parking

35%

Average public
transit farebox
recovery



What is the range of possible business models?

Personal Mobility



Owned AVs



Shared AVs (SAVs)

Transit



On Demand Services



Automated High-Capacity Transit

Logistics



Automated Delivery Drones



Autonomous Freight

Goals: positive outcomes for cities

Safety

Reduced crashes, injuries and fatalities

Economic

Job creation, economic development

Social

Improved accessibility and public health for all

Environment

Reduce emissions, energy use and GHG, increase open space and green infrastructure

Roadspace

Reallocate road space for more productive uses

Parking

Repurpose parking, reduce burden and impact of parking construction

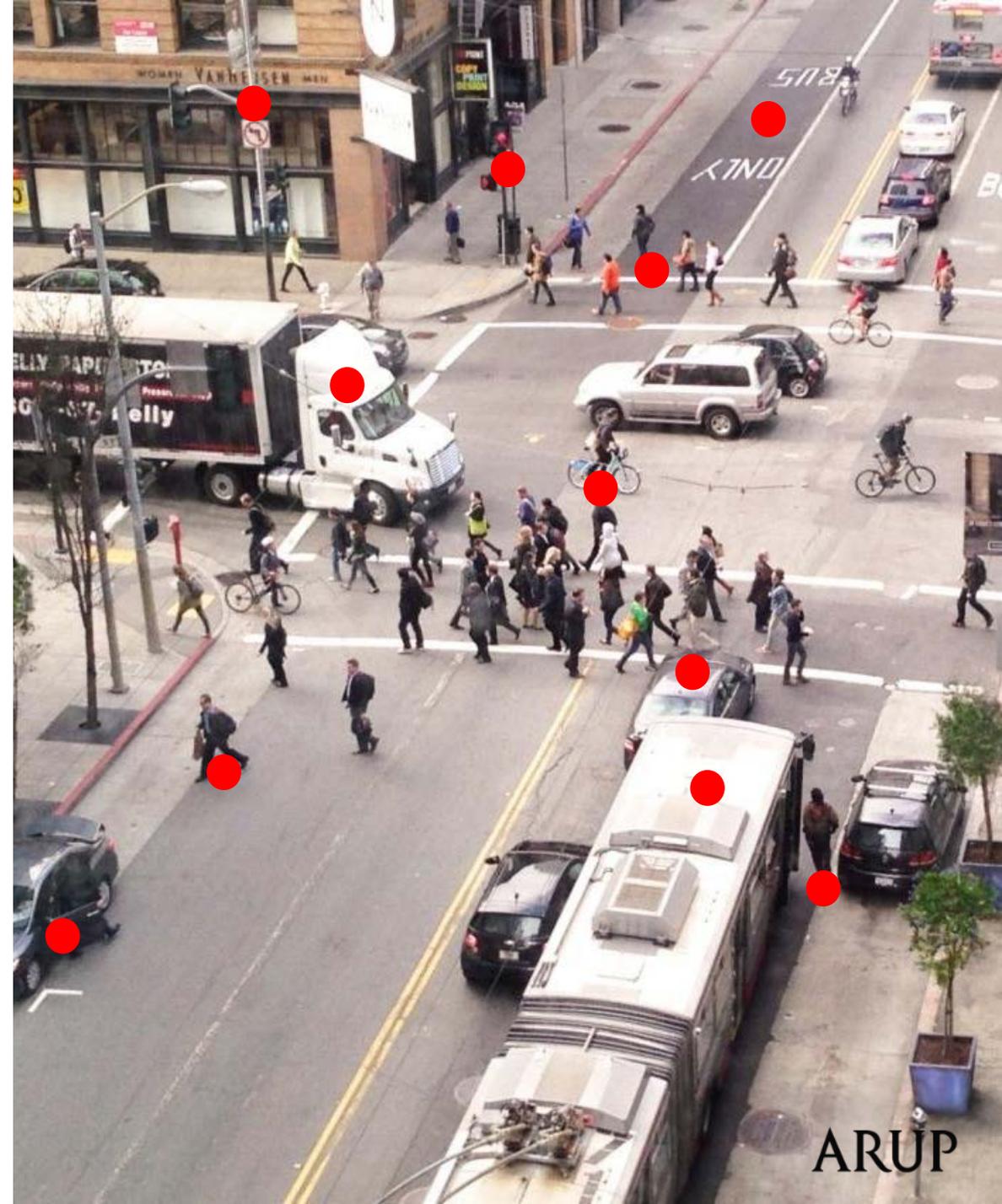
Data

Shared, real-time data for improved operations, predictive analytics and decision-making

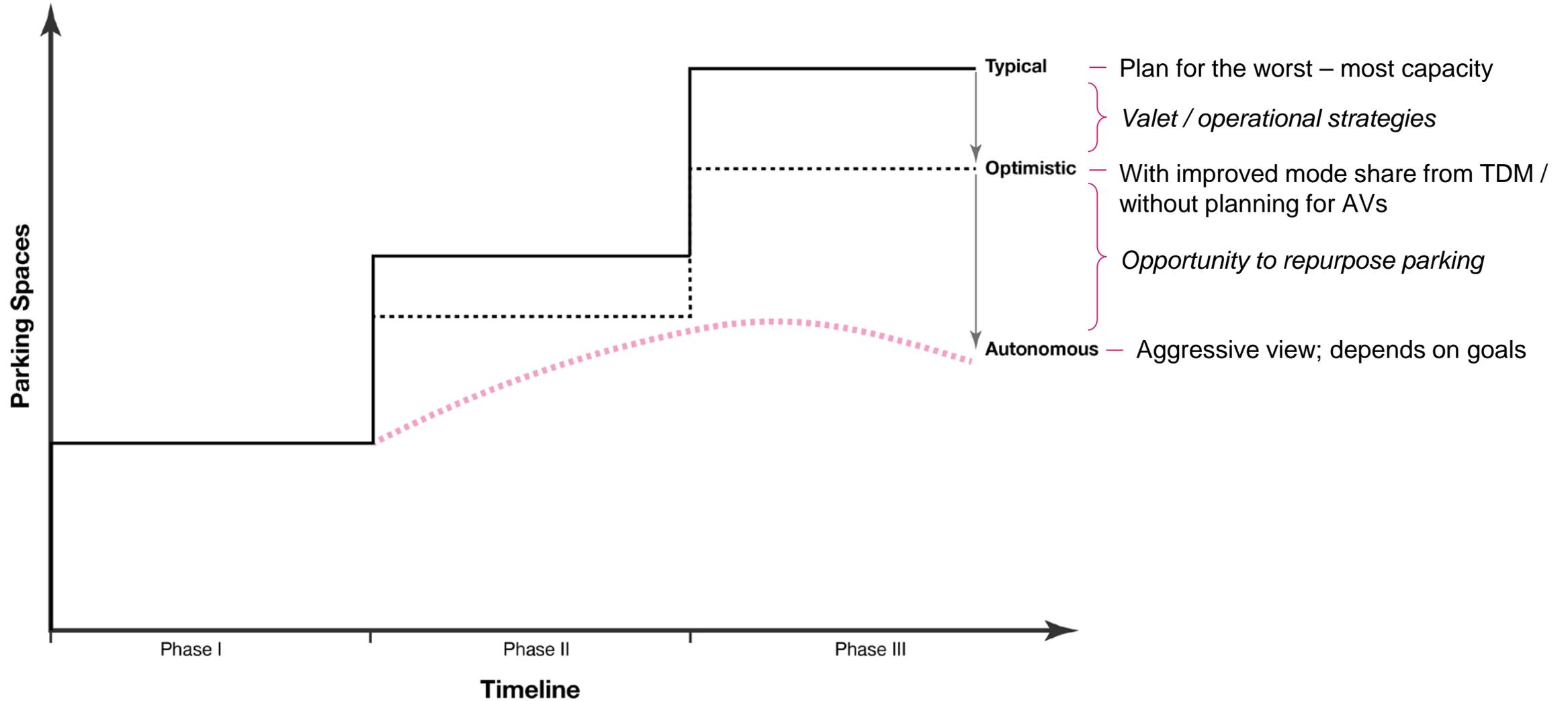


Implications for Cities

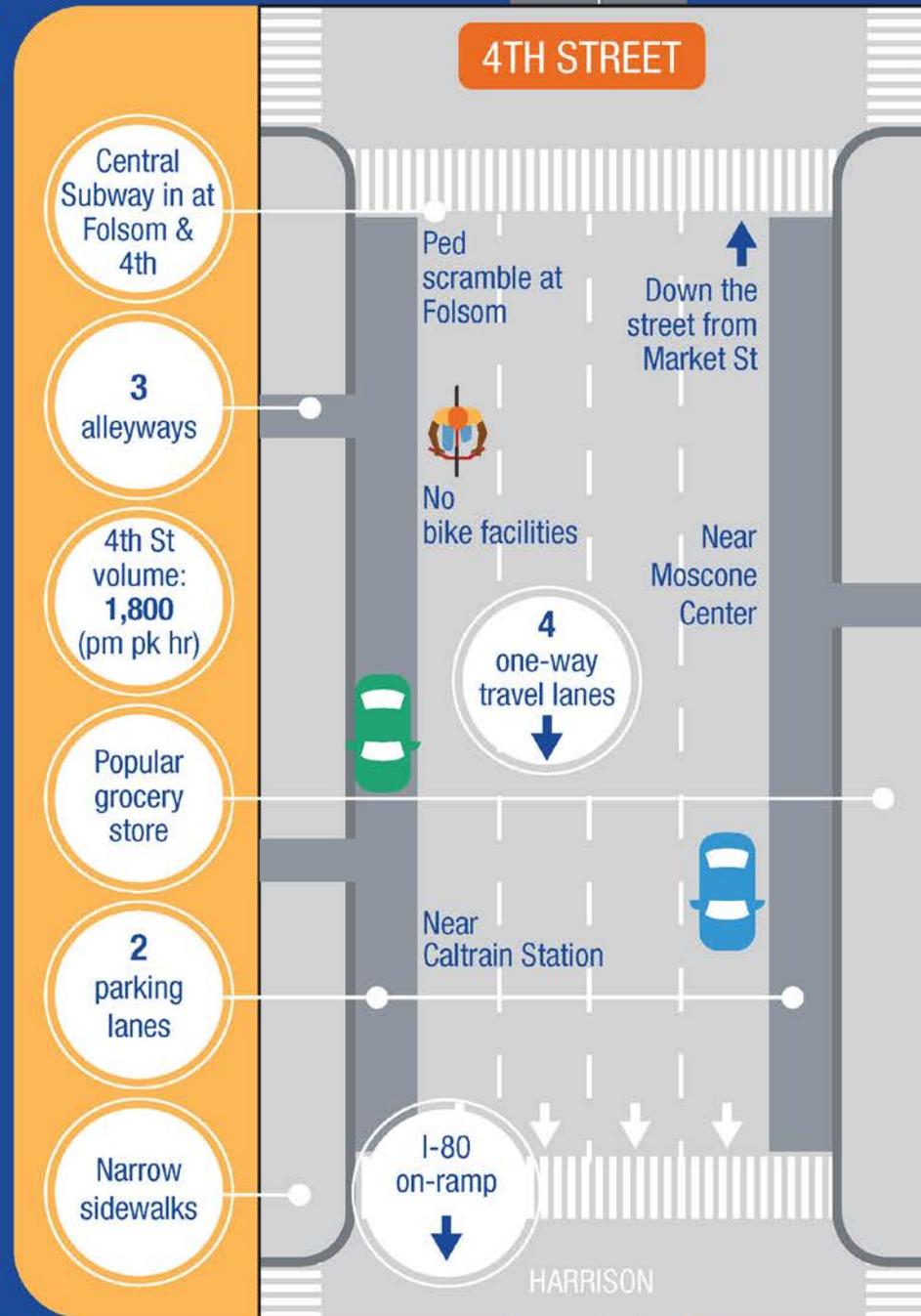
- Parking location
- Parking supply
- Street network
- Street design / space allocation
- Curbside demand
- Dedicated low-speed zones
- Transit stop locations / design
- Logistics network
- Sensors
- Communications
- Traffic signals / management



Parking reduction over time

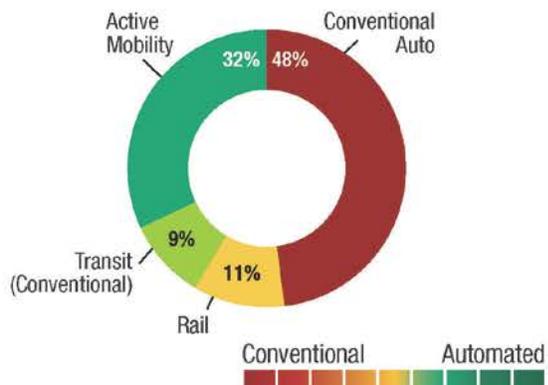


4TH ST, SAN FRANCISCO

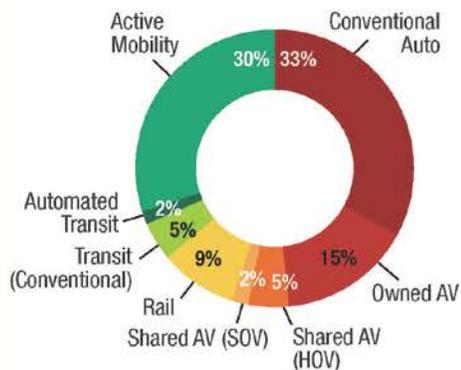


FUTURE SCENARIOS

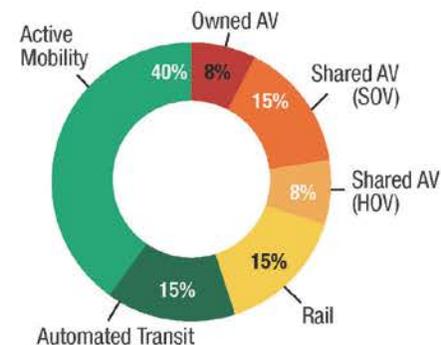
BASELINE FUTURE



EVOLUTIONARY

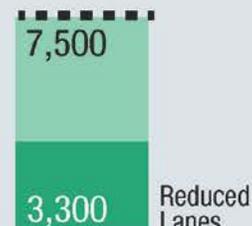


REVOLUTIONARY

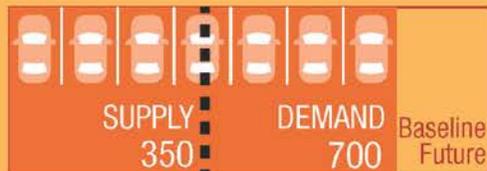


STREET TRAFFIC

TOTAL INTERSECTION CAPACITY



PARKING DEMAND



CURB UTILIZATION



Implications for infrastructure

Industry perspective: The role of infrastructure is supplemental and complementary; not primary.

Key reasons

- High cost of broad-based infrastructure rollout
- Interoperability concerns / requires standardization
- Technology can be deployed and updated faster on vehicles than on infrastructure
- Industry is designing vehicles to minimize reliance on infrastructure

Benefits of smart infrastructure

- Safety
 - Local road condition information (ice/snow hazards, broadcast location of temporary obstructions)
 - Relay emergency braking messages between vehicles; coordinate vehicles at blind intersections
- Efficiency
 - Coordinate / reduce traffic congestion at intersections
 - Route vehicles efficiently across the entire network

Implications for Infrastructure

Level of Effort

Light adoption

- No design changes
- Standard road markings and signs
- Regular maintenance
- Materials (reflective thermoplastic paint; remove Botts dots)

Supportive Actions

- Communications infrastructure
 - High speed data backbone
 - Wireless communications
- Embedded road condition sensors
- Differential GPS service
- Detailed, updated 3D mapping
- Broadcast sign and traffic signal locations
- Broadcast traffic signal messages
- Real time / predictive traffic management





Thank you!

ARUP

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