Costing Out Connected Infrastructure
Sam Morrissey, PE
April 27, 2017
The Story of a Transportation Revolution!

At the dawn of a new millennium…

...a new technology was quickly gaining in popularity...

...the new technology scared some people...

People across the country asked for improvements to accommodate the technology…
“But…

we want to talk about cool self-driving cars!”

“What’s all this ‘connected’ stuff?”
What do all Autonomous Vehicles (AVs) Need?
AVs Need Roads
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<th>Role</th>
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## Agency Activity in C/AV To-Date

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## What’s Missing?

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### Table Notes:
- ✔ indicates responsibility held by the agency.
- Empty cells indicate missing responsibility.
“Metropolitan planning organizations and regional transportation planning agencies are responsible for planning, coordinating, and financing local transportation projects. Regional agencies and local governments operate and maintain approximately 303,700 lane miles (140,600 centerline miles) of public roads and streets.”

Source: Economic Analysis Branch, Division of Transportation Planning, California Department of Transportation
“You need to paint the bloody roads here!”
– Lex Kerssemakers, CEO, Volvo North America

>$500 Billion
Backlog in capital needs
Los Angeles Markings

- 28,000 lane miles of paved roadways
- Resurface approx. 550-700 miles per year (target of 2,400)
- 1 markout crew (for new striping and replacements)
- 2 “long line” crews, one for yellow and one for white lines
- 3 crews for other markings (crosswalks, etc.) and maintenance

2 “Some holes in pavement preservation” Los Angeles Times, August 14, 2016
NUMBER OF DAYS TO COMPLETE ROADWAY STRIPING AFTER PAVEMENT RESTORATION
JULY 2015–JUNE 2016

Vehicle Detectors

- 64,500 loops throughout the City
- 2 crews for loop replacement
- Replace 5% per year (approx. 3k)

Why is this Important?

How AVs see the world

- **Sensors**: Lasers, radars and cameras detect objects in all directions.
- **Interior**: Designed for riding, not for driving.
- **Electric batteries**: To power the vehicle.
- **Rounded shape**: Maximizes sensor field of view.
- **Computer**: Designed specifically for self-driving.
- **Back-up systems**: For steering, braking, computing and more.
Why is this Important? (Cont’d)
CASUALITIES
Pedestrian, female (8 y.o.)
Pedestrian, male (41 y.o.)
Dog

CASUALITIES
Passenger, female (30 y.o. pregnant)
Passenger, male (6 y.o.)
Google driverless car involved in 'worst crash yet' after van runs a red light

The incident has been blamed on the human driver of the van rather than the autonomous vehicle
Algorithm Can Detect When Cars Are About to Run a Red Light

By Rebecca Boyle  November 30, 2011

Traffic Light Prediction
A new algorithm can accurately predict when a driver is about to run a red light.
Connectivity is Key

• Autonomy is great…
• Autonomy won’t fix external human error
• Connectivity can address human error/variability/chaos
• This will be critical during transition
  o Not just for moving objects...
How Pedestrians Will Defeat Autonomous Vehicles

The ‘game of chicken’ which could be a serious problem for driverless cars

By Karinna Hurley on March 21, 2017

Construction boom is creating obstacle courses for L.A. pedestrians
What Are Agencies Doing?

• LADOT/WAZE partnership
• Online permit systems
• ITS investment
  o $43M (2015 LA Metro CFP)
  o $1.8M (FY15/16 MTC PASS)
What Are Agencies Doing?
What Can Agencies Do?

- Invest in dedicated facilities
- Investment in maintenance
- Inspection
- Enforcement

All Muni Buses Now Have Transit Lane Enforcement Cameras

By Aaron Bialick | Mar 24, 2015 | 33
Challenges

Competing priorities

The 2016-17 Budget Dollar
How the Money Is Used

Challenges (Cont’d)

Consistency

• Changing technologies
  o Investment in ITS to-date
  o Need for upgrade

• National standards
Finishing the Story: A Revolution!

“The League was founded as the League of American Wheelmen in 1880. Bicyclists, known then as ‘wheelmen,’ were challenged by rutted roads of gravel and dirt and faced antagonism from horsemen, wagon drivers, and pedestrians.

In an effort to improve riding conditions so they might better enjoy their newly discovered sport, more than 100,000 cyclists from across the United States joined the League to advocate for paved roads.

The success of the League in its first advocacy efforts ultimately led to our national highway system.”

Source: http://www.bikeleague.org/content/mission-and-history
Thank You!