

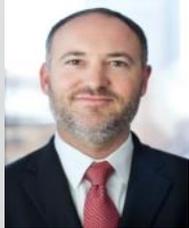


# Automated Road Vehicles: Shared Mobility and Automated Transport

Challenges, Opportunities and Next Steps

Alain Kornhauser, Scott Levine,  
Shannon McDonald, Stan Young  
January 15, 2014

# Thanks to our presenters



Will Baumgardner



Sam Lott



Guy Fraker



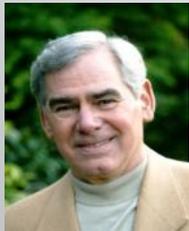
Fawzi Nashashibi



Jerry Lutin



Keller Easterling



Hon. Rod Diridon, Sr.



Andriano Alessandrini



Mohammed Yousuf

# Levels of Automation (NHTSA definitions)

- Level 0: No automation
- Level 1: Function-specific automation
- Level 2: Combined function automation
- Level 3: Limited self-driving automation
- Level 4: Full self-driving automation



# Mapping Between Technology and Issues

Level I



Level II



Level III



Level IV

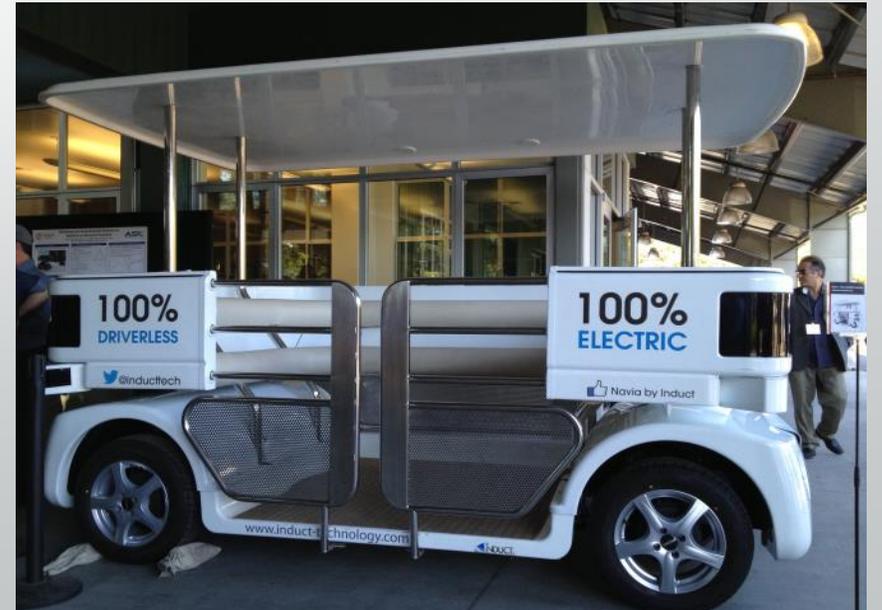


Sharing

	Issue 1	Issue 2	Issue 3	Issue 4	...
Level I					
Level II					
Level III					
Level IV					
Sharing					

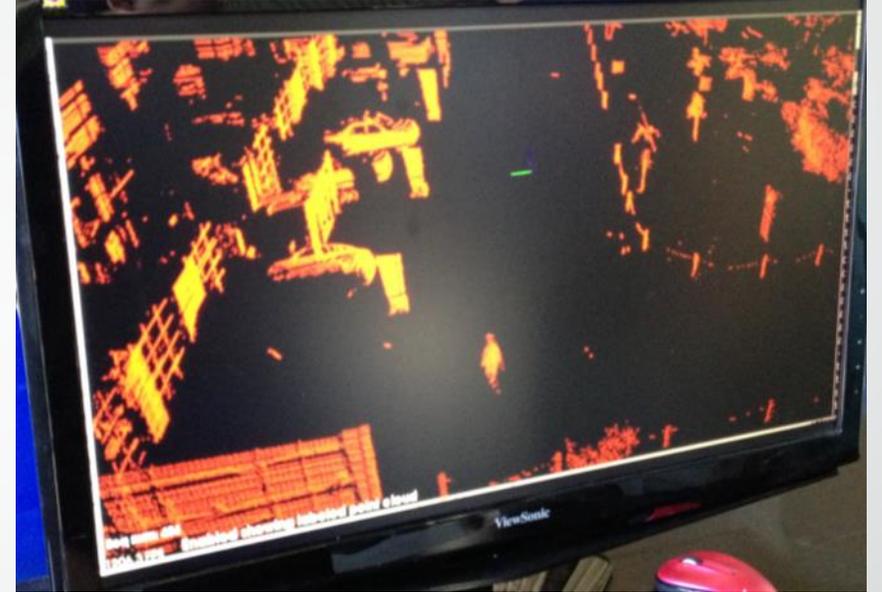
# Take home messages (1)

- Automated vehicles are (probably) legal
- Wild west vs. dead hand of regulations
- Uncertainty and perceived risk
- Insurance industry product models under pressure
- Demand and energy consumption: murky, difficult to control
- White House: This stuff matters



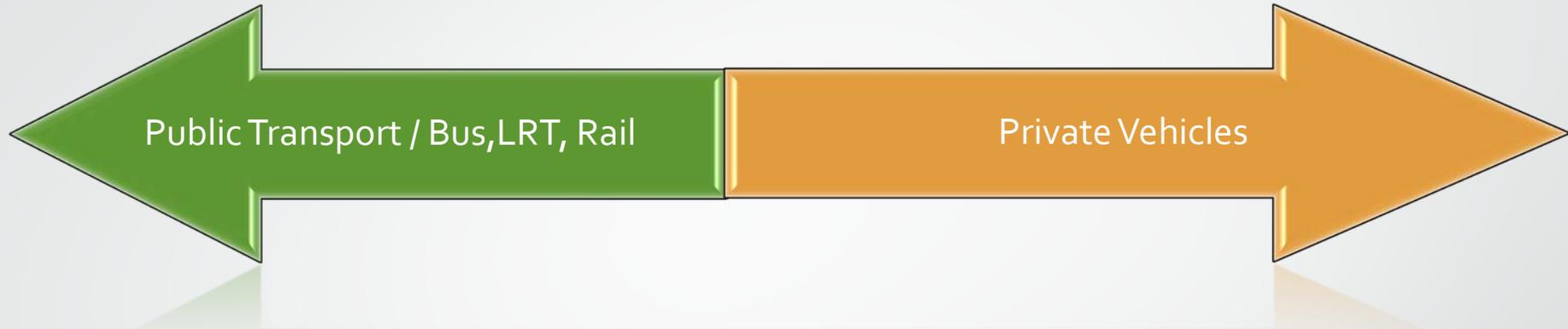
# Take home messages (2)

- Autonomous vs. connected
- Google: 5 yrs to level 4 (rumor has it)
- Cyber-security: think like a hacker
- Follow the data...
- Behavioral modelling
- A lot happens in 100M miles
- How good is "good enough" and who decides?
- TaaS: Transportation as a Service
- Transit, taxis, rentals: Less distinct?

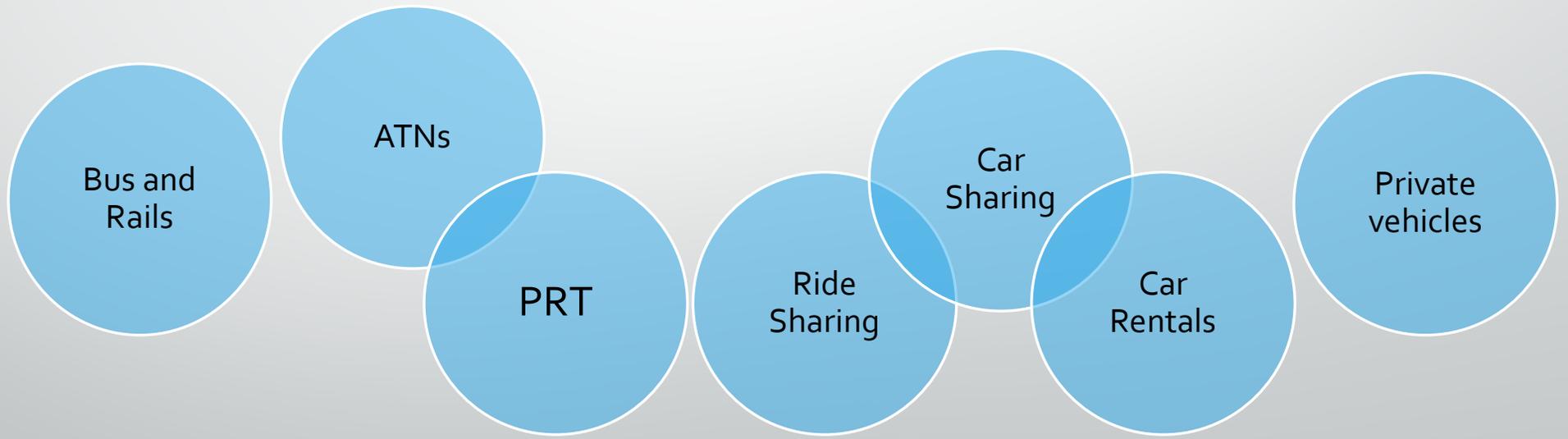


# Public and Private Transportation

20<sup>th</sup>  
Century



Soon to Be



# RNS Themes

- **Automation Impact on Mobility Impaired**
  - Demographics and trends
  - Existing mobility options contrasted to automation concepts
  - Mohammed Yousuf, Ron Boenau, Scott Levine, Shannon McDonald
- **Practical / Near-term Issues of Automation in Transit Agencies**
  - Level I/II automation concepts
  - Realistic cost/benefits of existing technology
  - Objective evidence data from known deployments
  - Retrofitting, standards, and planning for upgrades
  - Jerry Lutin, Alain Kornhauser, Will Baumgardner, Ramses Madou, Louis Merlin

# RNS Themes

- **Shared Mobility**

- Shared vehicles/ownership business models
- Impacts to para-transit and other typical public transit functions
- Induce greater public transit use, walking, biking
- Jeral Poskey, Scott Levine, Jerry Lutin, Mohammed Yousuf, Dan Fagnant, Guy Fraker, Ramses Madou, Eugene Willard

- **Hazards Framework for Automated Transport Safety**

- Safety discussion difficult due to proprietary, closed-door approaches
- APM industry benefitted from a standard hazards' framework
- Framework for RVA could reduce confusion, foster collaboration in industry & government, advance the timeline to viable products
- Sam Lott, Paul Godsmark, Ron Boenau

# RNS Themes

- **Future Alternative Analysis for MPOs and NEPA Processes**
  - Primer and training for impact of automation and vehicle sharing concepts
  - Update of Characteristic of Urban Transport Systems (CUTS)
  - Current capabilities vs. future possibilities
  - Will Baumgardner, Sam Lott, Stephan Parker, Laura Stuchinsky, Stan Young
- **Promise of auto-parking : panacea or shifting the problem**
  - Realistic modeling of impact of auto-parking
  - What problems are solved / created? Airport implications
  - Realistic benefits for space management, parking consolidation
  - Shannon McDonald, Stan Young, Alain Kornhauser

# RNS Themes

- **Performance Measures for Automated Mobility in Urban Settings**
  - In terms of Mobility, Safety, Comfort, and Service
  - Do current automation concepts have unforeseen long term consequences/impacts
  - It isn't just travel time!!!!
  - Fawzi Nashashibi, Louis Merlin, Dan Fagnant, Eva Frederich
- **Exclusive Guideway vs Open Road**
  - ARV on open roads will evolve to greater automation
  - ARV on dedicated guideways will evolve to more complex environments
  - Tradeoffs of Exclusive Infrastructure vs Re-Use of existing Roadway
  - Laura Stuchinsky, Alain Kornhauser, Louis Merlin, Stan Young

# RNS Themes

- **Legal Framework For Automated Driverless Transit**
  - Systems vs automated vehicles on a highway
  - Synergism with City Mobile 2 concept
  - Fixed guideway as well as evolving to mixed use on roadways
  - Andriano Alessandrini
- **Integration of Automation and Shared Mobility into the Urban Fabric**
  - Benefits/detriments
  - Spatial constraints/opportunities/land planning
  - Perspective of quality of life, architecture, and development
  - Shannon McDonald, Adriano Alessandrini, Louis Merlin, Will B., Paul Godsmark, Ron Boenau, Dan Fagnant, Ramses Madou

# Future Direction

- Continued emphasis (Task Force) on Delivering the Potential of Automation in Public Transportation and Shared Mobility
  - Programming of Research Statements from 2013
- 2014 Automated Road Vehicle – San Francisco
  - Emphasis on ARV and its impact on Urban Fabric
    - “A hands on workshop for autonomous vehicles: Imagining and creating visions for their relationships with the built environment”