



Module 9: Emerging Technologies

Session Purpose

- Introduce the concepts and state of Emerging Technologies
- Provide understanding of:
 - What are today's Emerging Technologies?
 - Why are they important?
 - What are the benefits?
 - Examples of leadership actions





What are Today's Emerging Technologies?

- Connected Automated Vehicles
- Smart Cities
- Mobility as a Service
- Big Data



What are Connected Vehicles?

- Wireless technology connecting vehicles to each other and to roadside infrastructure
- Connections may be
 - Vehicle-to-Vehicle (V2V)
 - Vehicle-to-Infrastructure (V2I)
 - Vehicle-to-Other (V2X)



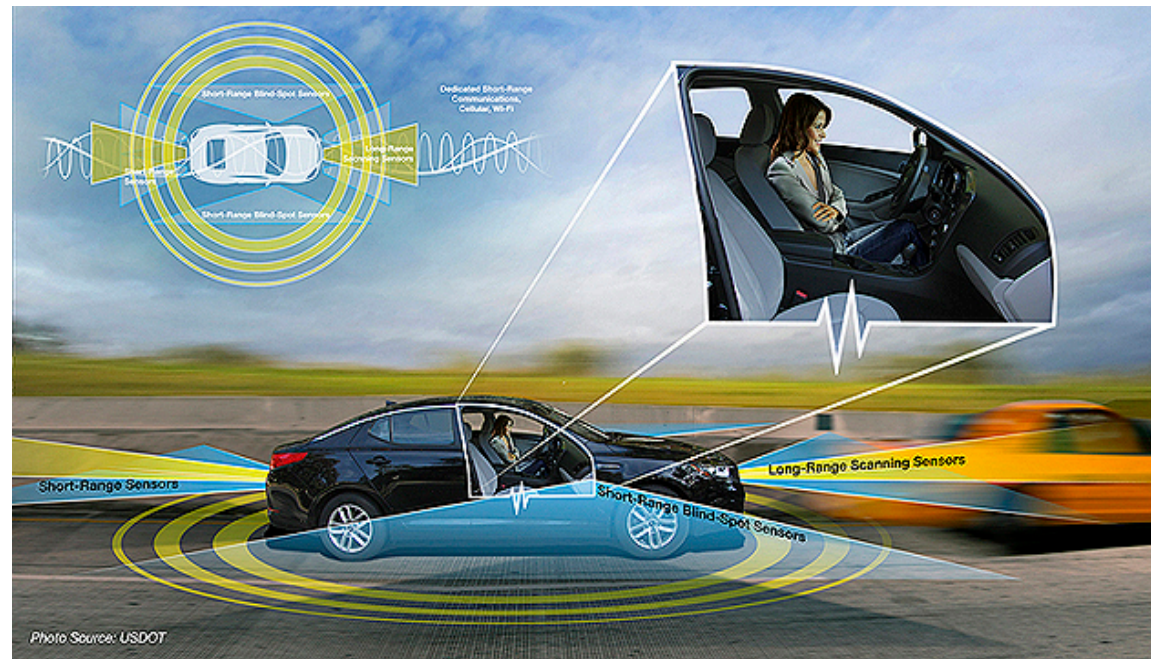
Examples of Connected Vehicles Applications

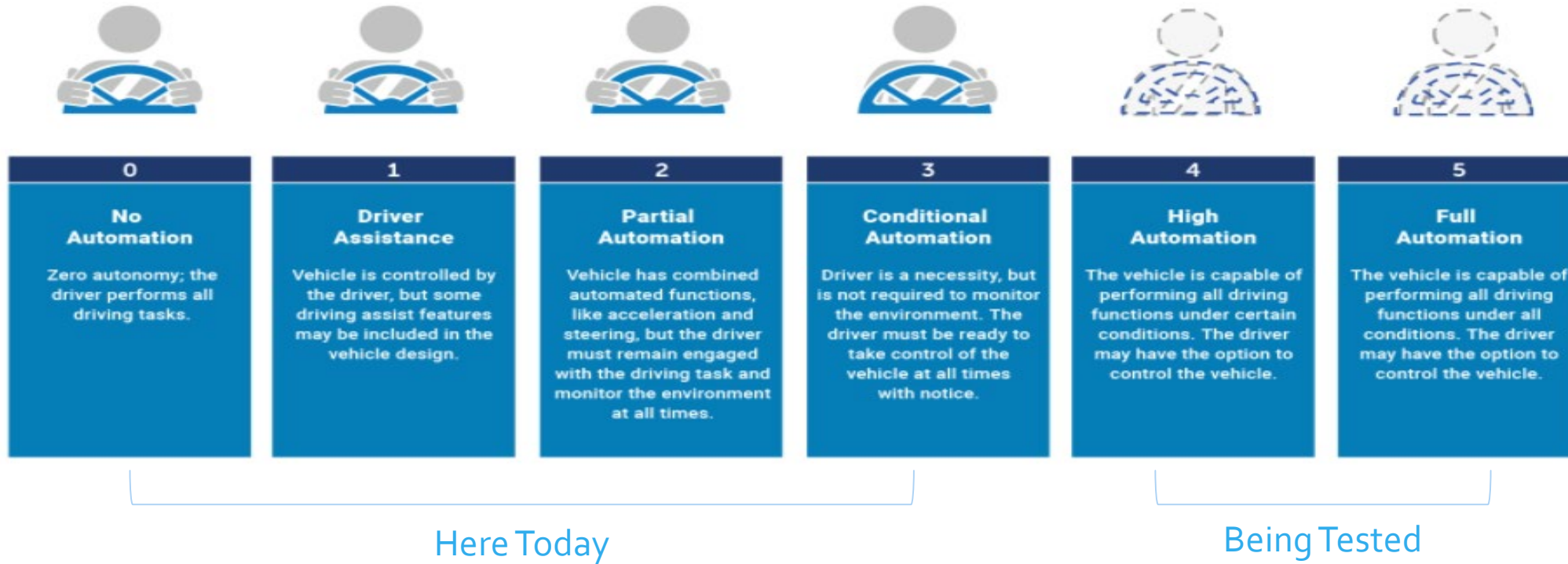
- V2I Safety
 - Red light violation warning
 - Curve speed warning
 - Stop sign gap assist
 - Reduced speed zone warning
- V2V Safety
 - Forward collision warning
 - Left turn assist
 - Blind spot/lane change warning
- Road Weather
 - Motorist advisories and warnings
 - Enhanced decision support
- Mobility
 - Signal priority
 - Emergency vehicle pre-emption
 - Dynamic speed harmonization
 - Queue warning



What are Autonomous Vehicles?

- Automated vehicles use on-board sensors, cameras, global positioning, and telecommunications to help perform safety-critical driving functions such as steering, acceleration and braking - without direct driver input
- Automated does not always mean self-driving

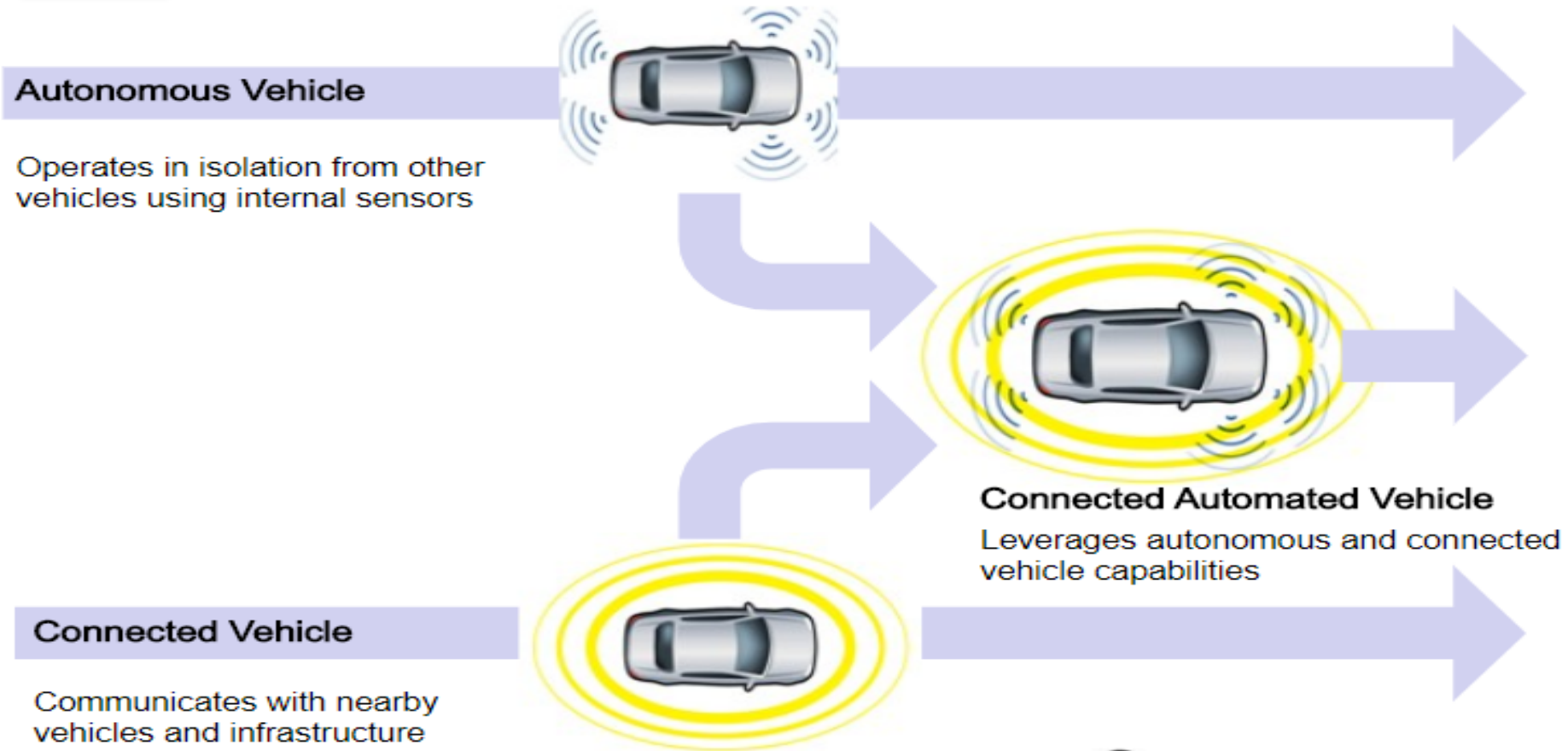




Levels of Vehicle Automation



Merging into CAV Terminology



Policy Issues Still Being Explored

- Privacy
- Cyber-Security
- Data ownership
- USDOT authority
 - NHTSA: Regulate safety equipment in vehicles
 - FHWA: Provide guidance on roadside infrastructure
- Driver and vehicle licensing
 - NHTSA distraction guidelines
- Market driven
 - 5G vs. DSRC





Discussion

- Are connected and autonomous vehicles operating in your region?
- What planning opportunities are there for CAV at your agency?
- Have you deployed, or considered deploying roadside infrastructure to support CAV?



What is a Smart City?

- Urbanized areas that use data and connectivity to improve mobility
- Common challenges to address
 - First/last-mile service for transit users
 - Goods movement efficiency
 - Coordinating data collection and dissemination across systems
 - Reducing inefficiency in parking systems and payment
 - Reducing carbon emissions
 - Optimizing traffic flow



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Example Technologies from Smart City Challenge

- Autonomous vehicles for first and last-mile
- Dynamic curb parking reservation and space sensing to expedite freight loading and unloading
- Improved and expanded charging systems for electric vehicles
- Connected vehicles, bicyclists and pedestrians
- Unified data analytics platforms across modes to improve decision making

What is Mobility as a Service (MaaS)?

- A shift from personally-owned vehicles, toward transportation provided as a service
- Enhanced through better integration of modes
 - Use multiple modes to complete trips
 - Payments coordinated across modes



Examples of Mobility as a Service

- Ridesharing
- E-hailing
- Bike sharing
- Car sharing
- On-demand transit
- Scooters



What is Big Data?

- Use of data across modes and transportation sectors to perform analysis, make decisions and provide information to improve mobility
- New methods to collect, transmit, sort, store, share, aggregate, fuse, analyze, and apply these data will be needed for management and operations of transportation systems



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Example Uses of Big Data

- Using data sets to perform complex simulations and identify congestion causes and mitigation
- Building comprehensive origin-destination models to identify potential alternatives for commuters
- Analyzing transit usage and passenger first and last-mile needs to adjust service
- Analyzing changes in transportation network to better understand impact on travelers
- Using real-time data to actively manage transportation systems



Why are Emerging Technologies Important?

- Auto industry is moving forward with CAV
 - Crash Avoidance Metrics Partnership (CAMP) with USDOT is developing V2V safety apps for connected vehicles
- There are private-sector autonomous vehicles on roadways already
 - EasyMile, Waymo (Google) and Uber
 - Audi claims to have Level 4 vehicles and Cadillac has Level 3
 - Tesla users operating in “autopilot” mode, but really just Level 3
 - Has had high profile crashes due to unsafe operation by owners



Why are Emerging Technologies Important?

- Smart Cities can provide integration between transportation network and other city elements
- Smart Cities can cost-effectively leverage existing data and systems to improve mobility
- Mobility as a Service is increasing in demand, especially among younger travelers
- Mobility as a Service may require changes in transportation infrastructure
 - Parking for shared cars
 - Facilities for changing modes during trips



What are the Benefits?

- Improved mobility and efficiency
 - Makes travel available to more people
 - Reduces costs related to vehicle ownership
 - Smoother traffic flow and coordination with traffic operations
- Improved safety
 - Crash avoidance
 - Better information about roads for drivers and vehicles
 - More awareness of interaction between vehicles, pedestrians and bicyclists



What are the Benefits?

- More efficient freight, transit and emergency vehicle operations
 - Better truck staging and flow in traffic
 - Improved signal priority for transit and emergency services
- Enhances existing data to perform more accurate analysis and real-time operations



Discussion



- What data do other agencies have that would benefit your operations?
- What data do you have that you can share with other agencies?
- What challenges do you anticipate your agency having in supporting Mobility as a Service?



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Leadership Actions

- Engage in institutional collaborations
 - V2I Deployment Coalition – SPaT Challenge
 - Transportation Research Board
- Be aware of and engage in discussion of major policy issues
 - Policies regarding connected and autonomous vehicles
 - Data privacy concerns
 - Funding for emerging technologies versus traditional transportation strategies



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Leadership Actions

- Take advantage of learning and training opportunities
 - National Highway Institute
 - USDOT Professional Capacity Building (Connected Vehicle 101 and 102)
- Learn how to plan, design and deploy
 - Understand integration with existing services
 - Understand impact to infrastructure
 - Learn the needs of your community



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Resources

- Connected Vehicle Pilot Deployment Program
 - <https://www.its.dot.gov/pilots/>
- V2I Deployment Coalition
 - <https://transportationops.org/V2I/V2I-overview>
- USDOT Automated Vehicle Activities
 - <https://www.transportation.gov/AV>
- USDOT Smart City Challenge
 - <https://www.transportation.gov/smartcity>
- Transportation Research Board Innovative Mobility Services: Issues and Opportunities
 - <http://www.trb.org/PolicyStudies/InnovativeUrbanMobilityServicesIssuesOpportunities.aspx>
- USDOT Enterprise Data
 - https://www.its.dot.gov/research_areas/enterprise.htm

