How Talking Cars Will Transform the Future of Driving

Taxi Limousine and Paratransit Assn

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Connected Vehicles

Imagine a Transportation System in which
VEHICLES CAN SENSE & COMMUNICATE
Things That You Can't.

How Connected Vehicles Work

1. A wireless device in a car sends basic safety messages 10 times per second
2. Other nearby cars and roadside equipment receive the messages
3. Drivers get a warning of a potential crash

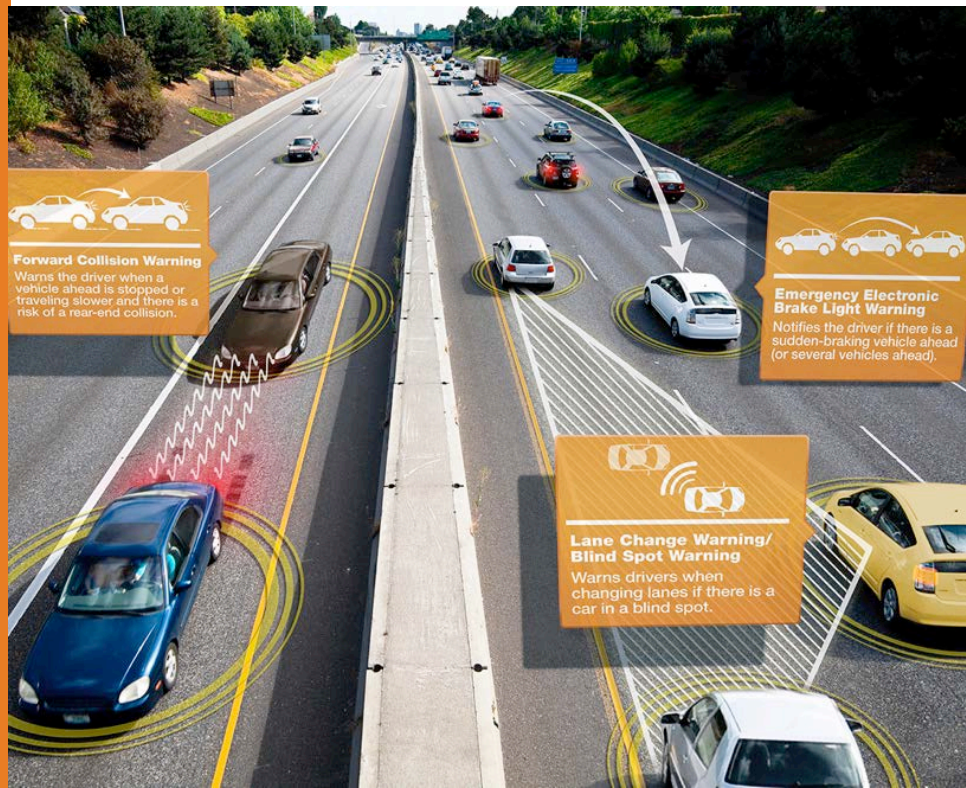
*Connected vehicles have the potential to reduce non-impaired crash scenarios by **80%****

*Source: NHTSA

Connected Vehicles

What can they do?

- Save lives by significantly reducing traffic accidents
- Make travel easier, more efficient, and more enjoyable
- Help curb pollution



Connected Vehicles: *Saving Lives*

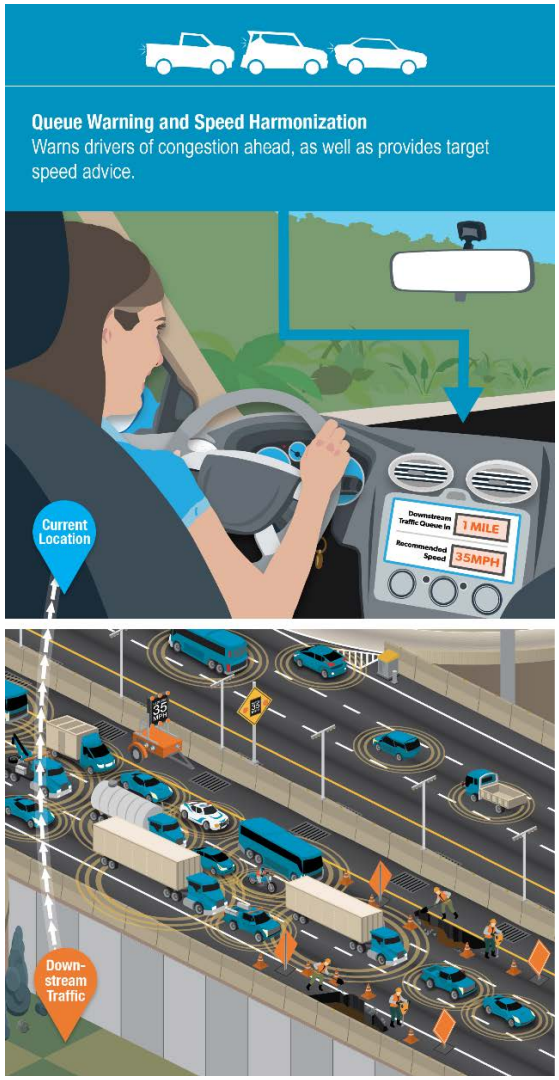
Intersection Movement Assist:

Warns the driver when it is not safe to enter an intersection—for example, when something is blocking the driver's view of opposing or crossing traffic

Connected Vehicles: Improving Mobility

Queue Warning and Speed Harmonization:

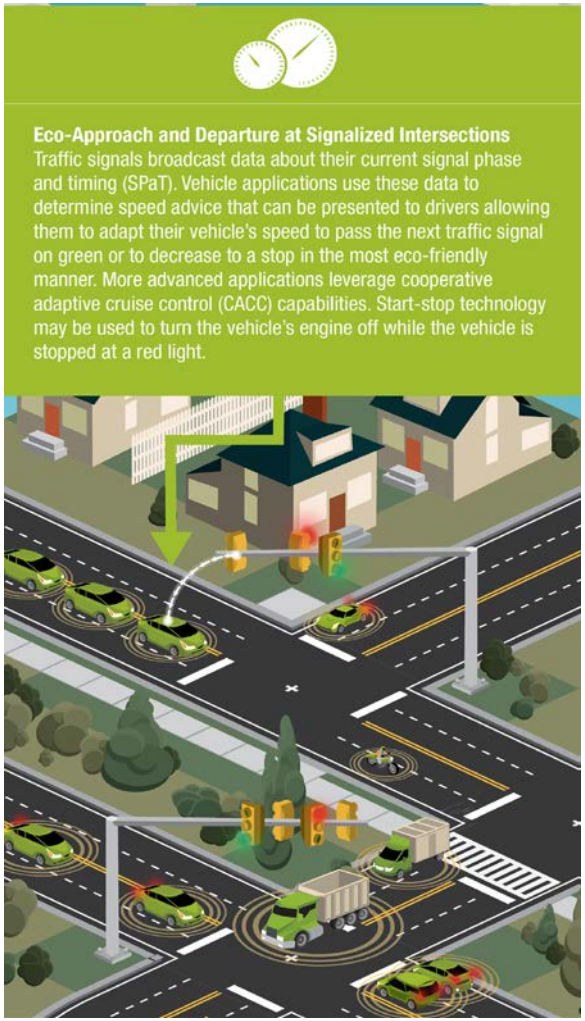
Warns drivers of upcoming congestion and provides speed recommendations



Connected Vehicles:
Protecting the Environment

Eco Approach and Departure at Signalized Intersections:

Presents information to drivers about traffic signal timing, allowing drivers to adapt their speed to pass the signal on green or decrease speed to a stop in the most eco-friendly way possible.



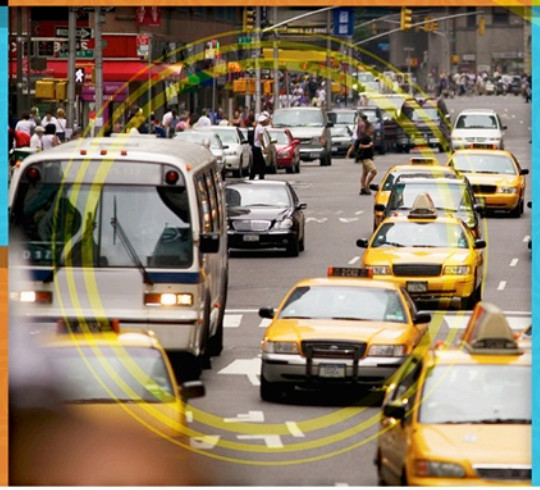
Wyoming

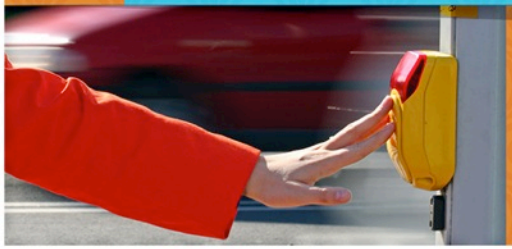
New York City

Connected Vehicle

Pilot Deployment Program

Tampa, Florida





U.S. Department of Transportation

Connected Vehicle Pilot Deployment Sites

ICF/Wyoming

- Reduce the number and severity of adverse weather-related incidents in the I-80 corridor to improve safety and reduce incident-related delays.
- Focused on the needs of commercial vehicle operators in the State of Wyoming

New York City

- Improve safety and mobility of travelers in New York City through connected vehicle technologies.
- Vehicle-to-vehicle (V2V) technology installed in up to 10,000 vehicles in Midtown Manhattan, and vehicle-to-infrastructure (V2I) technology installed along high-accident rate arterials in Manhattan and Central Brooklyn.

Tampa (THEA)

- Alleviate congestion and improve safety during morning commuting hours.
- Deploy a variety of connected vehicle technologies on and in the vicinity of reversible express lanes and three major arterials in downtown Tampa to solve the transportation challenges.

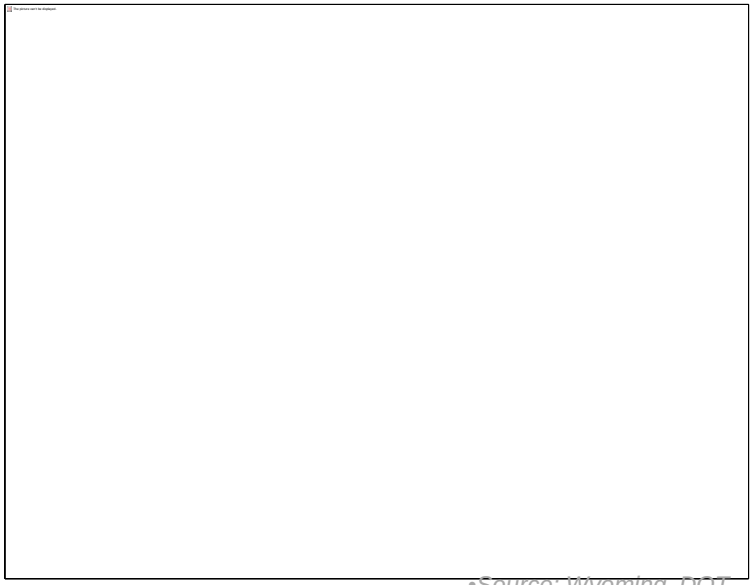
ICF/WYDOT PILOT DEPLOYMENT OVERVIEW

Objective:

- Reduce the number and severity of adverse weather-related incidents (including secondary incidents) in the I-80 Corridor in order to improve safety and reduce incident-related delays.
  - Focused on the needs of the commercial vehicle operator in the State of Wyoming

Approach:

- Equip fleet vehicles (combination of snow plows, maintenance fleet vehicles, emergency vehicles, and private trucks) that frequently travel the I-80 corridor to transmit basic safety messages (BSMs), collect vehicle and road condition data and provide it remotely to the WYDOT TMCs
- Deploy DSRC roadside equipment (RSE) to supplement existing assets and initiatives
- Road weather data shared with freight carriers who will transmit to their trucks using exiting in-vehicle systems

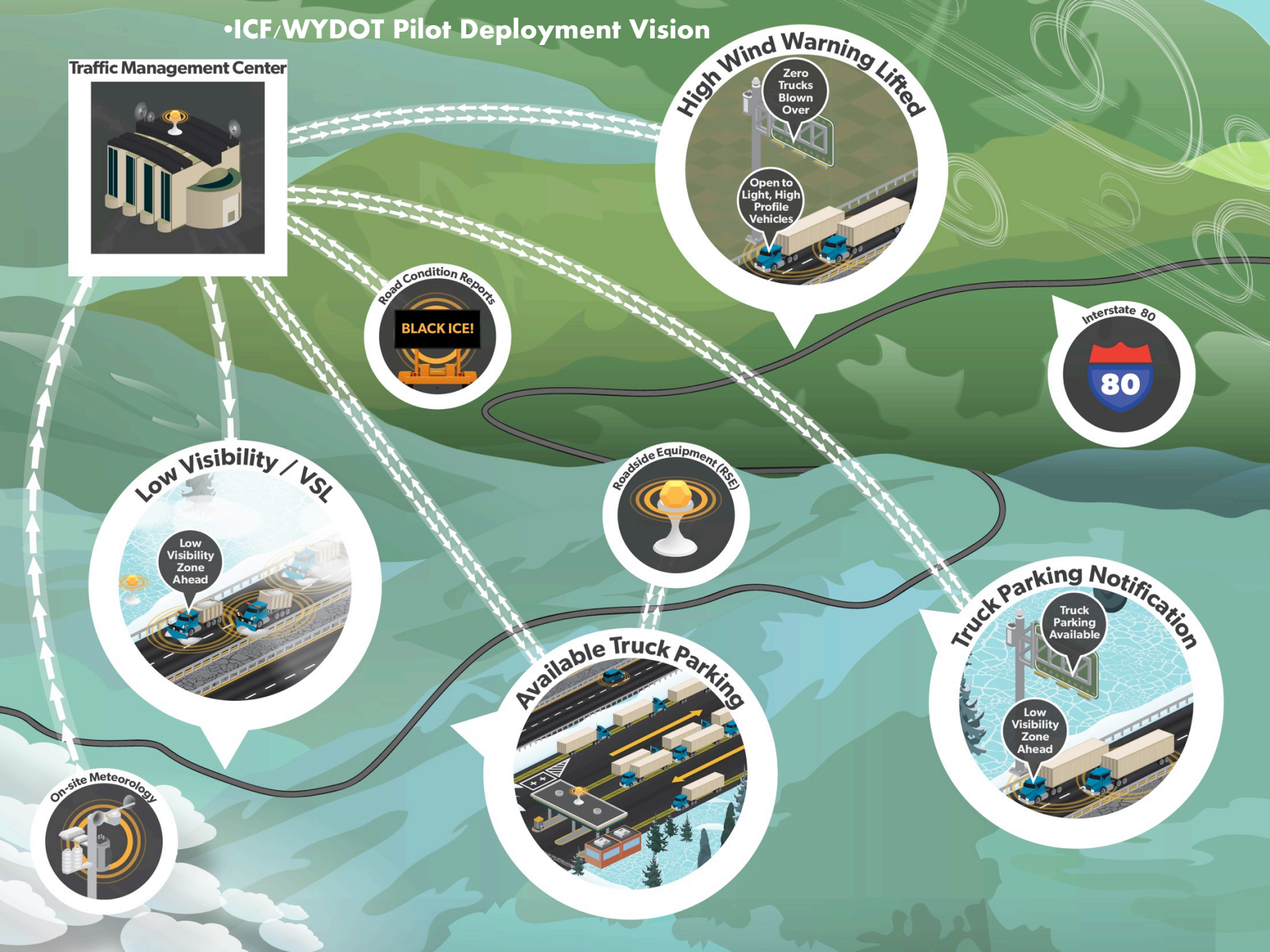


•Source: Wyoming DOT

Deployment Team:

- Prime Consultant: ICF International; Partner State: Wyoming DOT
- Sub Consultants: Trihydro Corporation, National Center for Atmospheric Research, University of Wyoming, Catt Laboratory and McFarland Management

•ICF/WYDOT Pilot Deployment Vision



NYCDOT Pilot Deployment Overview

Objective:

- Improve safety and mobility of travelers in New York City through connected vehicle technologies
  - Aligned with the NYC's Vision Zero initiative, which seeks to reduce crashes and pedestrian fatalities, and increase safety of travelers in all modes of transportation

Approach:

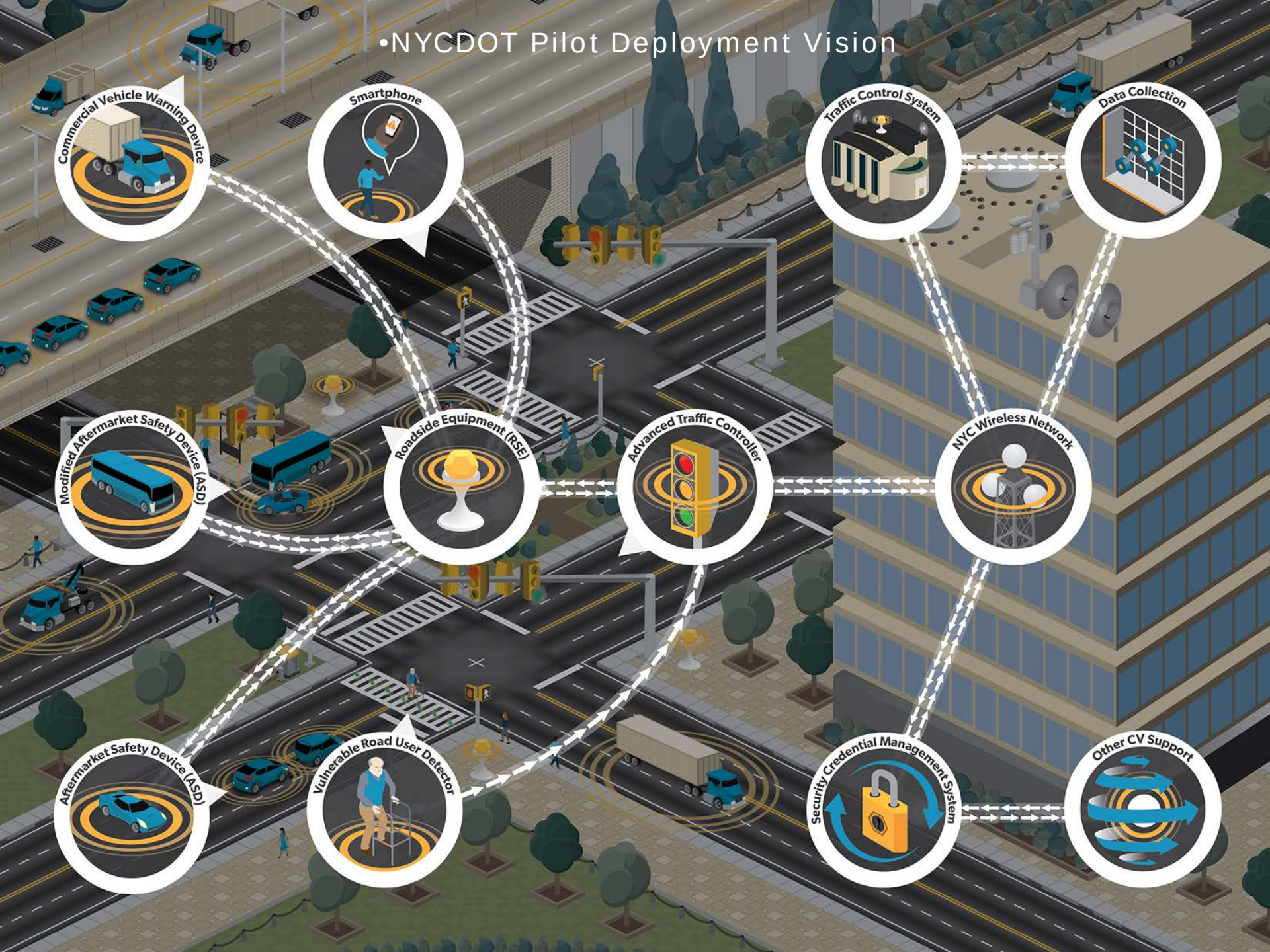
- Equip up to 10,000 vehicles (taxis, buses, commercial fleet delivery trucks, and City-owned vehicles) that frequently travel in Midtown Manhattan and Central Brooklyn to transmit and receive connected vehicle data
- Install V2I technology at high-accident rate arterials:
  - Upgrade 239 traffic signals along 1st, 2nd, 5th, and 6th Avenues in Manhattan and Flatbush Avenue in Central Brooklyn (emergency evacuation route)
  - Deploy Roadside equipment (RSE) along FDR Drive

•*Source: NYC DOT*

Deployment Team:

- Prime Consultant: NYC DOT
- Sub Consultants: JHK Engineering, Battelle, Cambridge Systematics, KLD Engineering, Security Innovation and Region 2 University Transportation Research Center

•NYCDOT Pilot Deployment Vision



TAMPA (THEA) PILOT DEPLOYMENT OVERVIEW

Objective:

- The primary objective of this deployment is to alleviate congestion and improve safety during morning commuting hours.
  - Deploy a variety of vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) safety, mobility, and agency data applications to create reinforcing benefits for motorists, pedestrians, and transit operation.

•*Source: THEA*

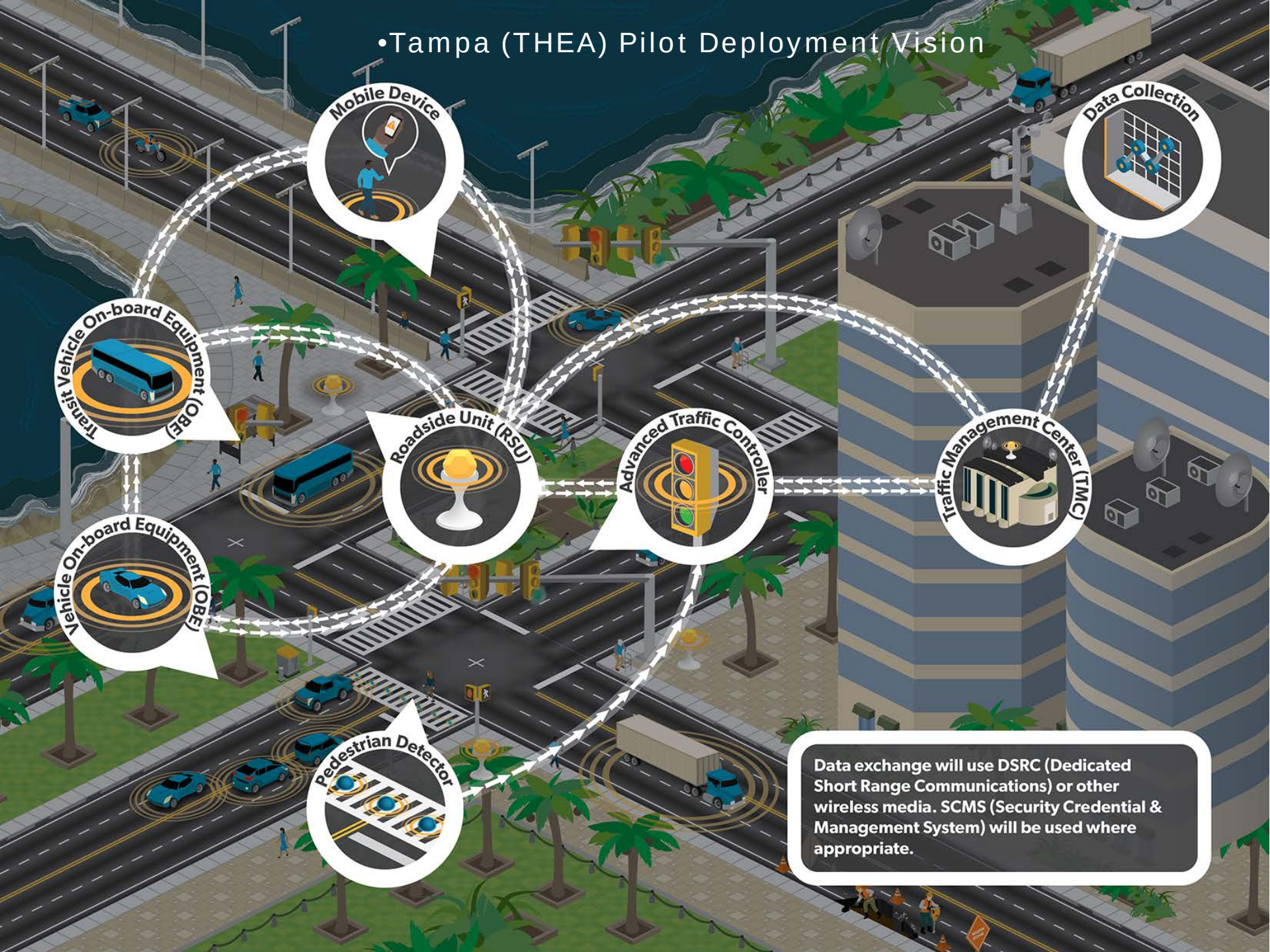
Approach:

- Deploy a variety of connected vehicle technologies on and in the vicinity of reversible express lanes and three major arterials in downtown Tampa to solve the following transportation challenges:
- Morning peak hour queues, wrong-way entries, pedestrian safety, bus rapid transit (BRT) signal priority optimization, trip time and safety, streetcar trolley conflicts, and enhanced signal coordination and traffic progression.

Deployment Team:

- Prime Consultant: Tampa Hillsborough Expressway Authority (THEA)
- Sub Consultants: HNTB Corporation, Siemens Industry, Inc., Booz Allen Hamilton, Center for Urban Transportation Research at University of South Florida and Global-5 Communications

•Tampa (THEA) Pilot Deployment Vision



Overview of Pilot Deployment Proposed CV Applications

Category	Tampa (THEA) – CV Application
V2V Safety	Forward Collision Warning (FCW)
V2I/I2V Safety	**I2V Situational Awareness***
	Work Zone Warnings (WZW)*
	Spot Weather Impact Warning (SWIW)*
V2I and V2V Safety	**Distress Notification (DN)**
V2I Safety	Curve Speed Warning (CSW)
	Pedestrian in Signalized Crosswalk Warning (PED-X)
	Red Light Violation Warning (RLVW)
V2V Safety	Emergency Electronic Brake Lights (EEBL)
	Forward Collision Warning (FCW)
	Intersection Movement Assist (IMA)
	Vehicle Turning Right in Front of a Transit Vehicle (VTRFTV)
Mobility	Mobile Accessible Pedestrian Signal System (PED-SIG)
	Intelligent Traffic Signal System (I-SIG)
	Transit Signal Priority (TSP)
Agency Data	Probe-enabled Data Monitoring (PeDM)
V2I/I2V Safety	Speed Compliance
	Curve Speed Compliance
	Speed Compliance/Work Zone
	Red Light Violation Warning
	Oversize Vehicle Compliance
	Emergency Communications and Evacuation Information
V2V Safety	Forward Crash Warning (FCW)
	Emergency Electronics Brake Lights (EEBL)
	Blind Spot Warning (BSW)
	Lane Change Warning/Assist (LCA)
	Intersection Movement Assist (IMA)
	Vehicle Turning Right in Front of Bus Warning
V2I/I2V Pedestrian	Pedestrian in Signalized Crosswalk
	Mobile Accessible Pedestrian Signal System (PED-SIG)
Mobility	Intelligent Traffic Signal System (I-SIGCVDATA)

- ** The applications have mobility/ efficiency as a secondary benefit.*

Overview of Pilot Deployment Proposed Devices

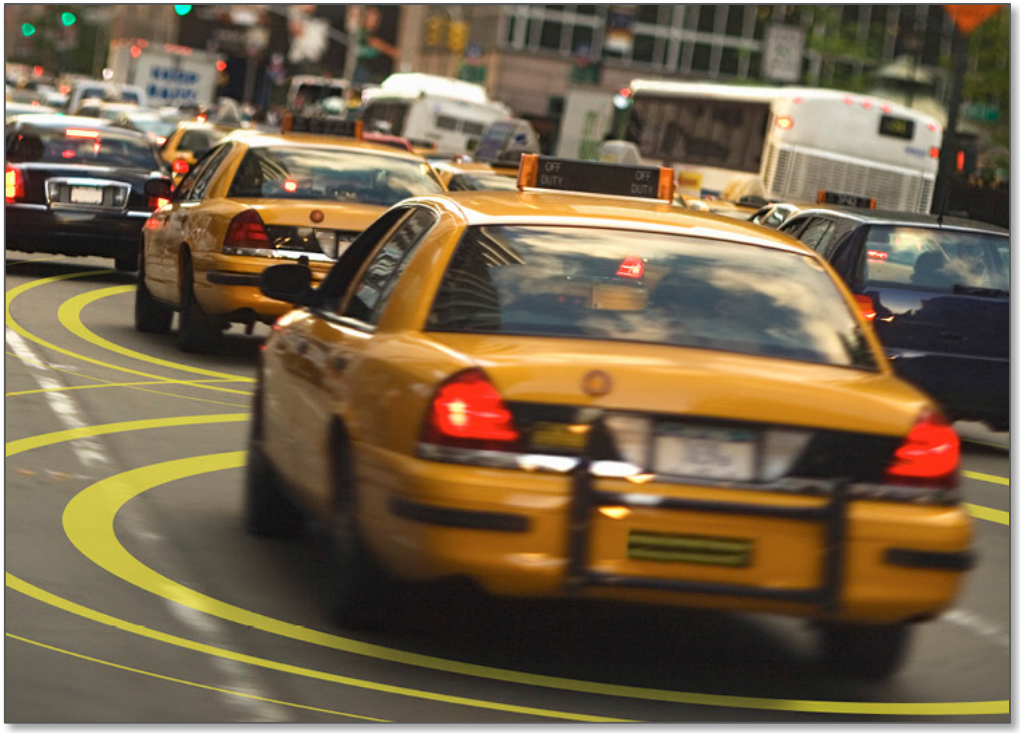
WYDOT – Devices	Estimated Number
Roadside Unit (RSU)	75
WYDOT Fleet Subsystem On-Board Unit (OBU)	100
Integrated Commercial Truck Subsystem OBU	150
Retrofit Vehicle Subsystem OBU	20-30
Basic Vehicle Subsystem OBU	100-150
Total Equipped Vehicles	400

Tampa (THEA) – Devices	Estimated Number
Roadside Unit (RSU) at Intersection	40
Vehicle Equipped with On-Board Unit (OBU)	1,500
Pedestrian Equipped with App in Smartphone	500
HART Transit Bus Equipped with OBU	10
TECO Line Street Car Equipped with OBU	10
Total Equipped Vehicles	1,520

NYCDOT – Devices	Estimated Number
Roadside Unit (RSU) at Manhattan and Brooklyn Intersections and FDR Drive	353
Taxi Equipped with Aftermarket Safety Device (ASD)*	5,850
MTA Fleet Equipped with ASD*	1,250
UPS Truck Equipped with ASD*	400
NYCDOT Fleet Equipped with ASD*	250
DSNY Fleet Equipped with ASD*	250
Vulnerable Road User (Pedestrians/Bicyclists) Device	100
PED Detection System	10 + 1 spare
Total Equipped Vehicles	8,000

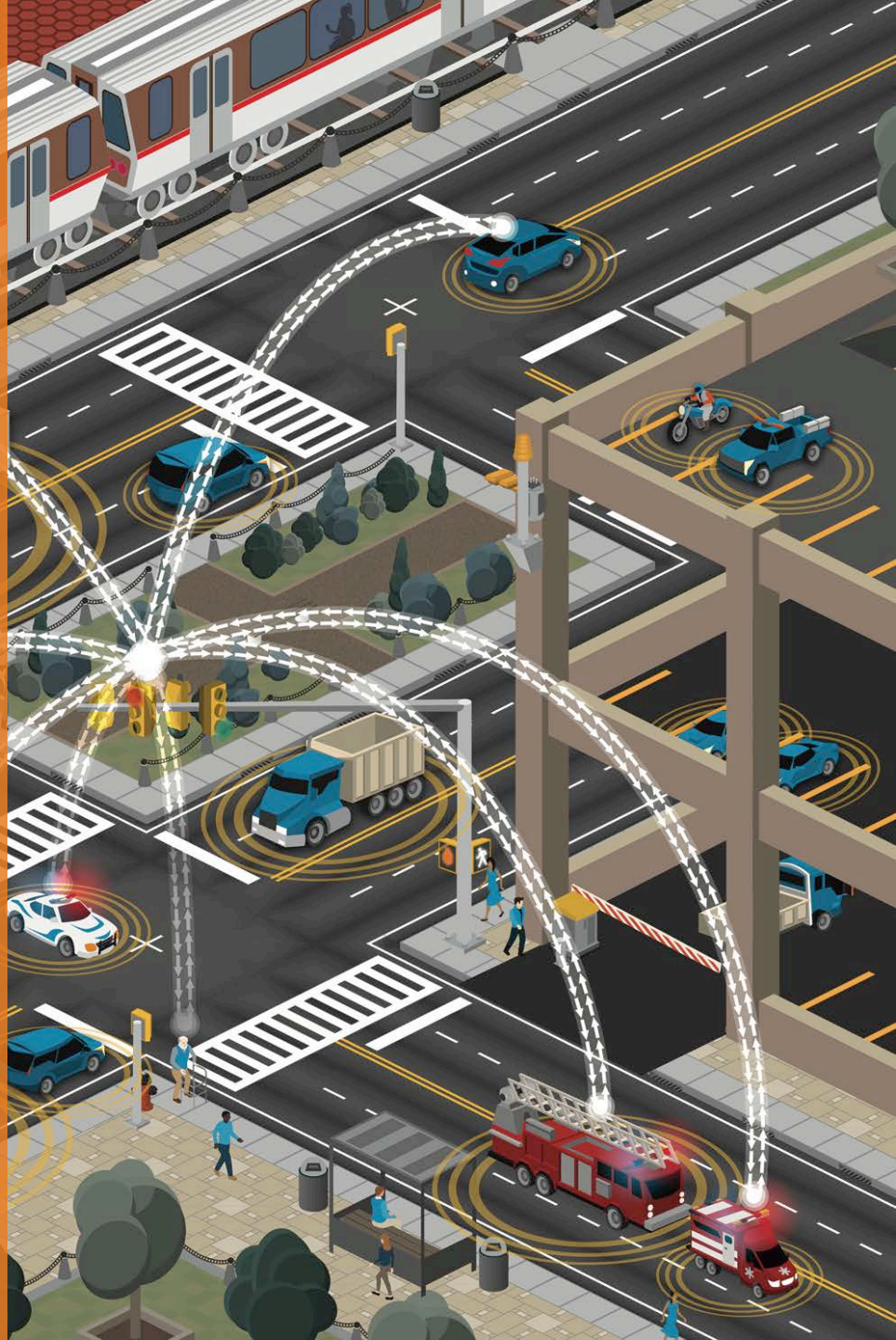
Connecting Taxis and Limos

Working with three Ann Arbor taxi and limousine companies, the University of Michigan has installed aftermarket devices in **56 vehicles** that can communicate with more than **3,000 vehicles** in the area



Smart Cities and Connected Vehicles

Smart Cities incorporate and expand connected transportation to ensure that connected transportation data, technologies and applications – as well as connected travelers – are fully integrated with other systems across a city, and fulfill their potential to improve safety, mobility and environmental outcomes in a complexly interdependent and multimodal world that supports a more sustainable relationship between transport and the city.



Source: The City of Columbus

https://www.youtube.com/watch?v=bFobyi6eRGI

Enhanced Human Services (EHS)

Source: The City of Columbus

Accessible Transportation Technology Research Initiative (ATTRI)

- A U.S. DOT Multi-Year, Multimodal, Multi-Agency Research and Development Effort
- Identifying user needs of travelers with disabilities to develop new transformative applications to increase personal mobility
- Building collaborative research and deployment partnerships with other US and International research communities, both public and private
- Unique opportunity to develop and deploy novel applications for accessible transportation and extend those benefits to all travelers

The Challenge

Persons with Disabilities

- 56.7 million; 19% US population
- Unemployment Rate – 13.2 %; Income: $38,400 ($61,000)
- Poverty: 24.7% (9.0%)
- Rise in Autism: 1 in 150 (2000) to 1 in 68 (2010)
- Fed expenditures: $226 B (2002); $357 B (2008)

Veterans with Disabilities

- 21.4 million Americas are Veterans
- Disability claims: 104,819 (2006) vs. 634,743 (2012)
- 2.6 million deployed in 2012, 45% of eligible Veterans file claims for disability
- Spending: $0.93 billion (2006) vs. $5.95 billion (2012)

Older Adults

- Disability rates rise as people get older
- 43.1 million age 65 + in 2012 or 1 in 7 people
- 28% live alone
- Expected to reach 72.1 million by 2030

- WHO estimates that more than One Billion people in the world live with some form of disability
- The global GDP lost annually due to disability is estimated to be **$1.37 trillion** to **$1.94 trillion**
- Australian study: reducing the gap in workforce participation by **1/3** would result in a **$43 billion** increase in GDP over **10 years**

Solutions

Wayfinding & Navigation Solutions

- Focus on integration of map data and standardized infrastructure descriptions from various sources
- New data unique and specific to ATTRI users should be developed

ITS & Assistive Technologies

- Focus on remote assistance for stakeholders and opportunities to inform and aid barrier traversal
- Modernizing assistive technology maintenance and asset management (area for advanced research)

Automation & Robotics

- Shared neighborhood autonomous vehicles which are cost effective and aid at traversing distances between transit stops, homes, and places of employment.
- Assist service models, electric vehicles, and autonomous vehicles create opportunities for novel accessible designs

Data Integration

- Reduce complexity and identify coordination in service matchmaking through open data and services
- Develop environment for community generated data

Enhanced Human Services Transportation

- Support initiatives by ridersharing services to involve ATTRI stakeholders and develop accessible versions of these services.
- Support mode shift through private on-demand ride services

Technology Scan Final Reports: Due Spring 2016

Mobility Services for All Americans (MSAA)

MSAA is about ensuring mobility for everyone:

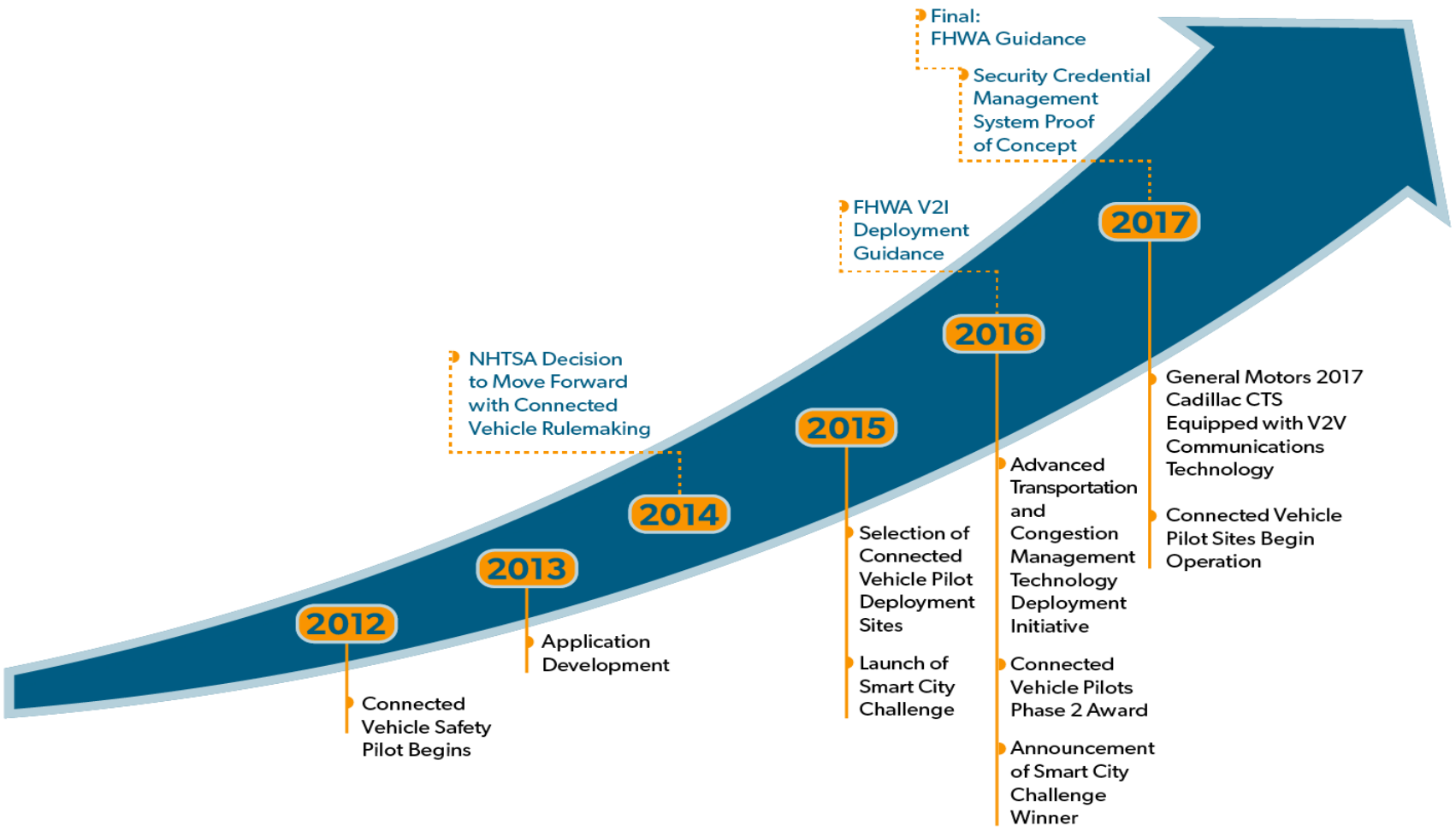
- Improves transportation services and access to employment, healthcare, education, and other community activities for the people who need the services most—particularly seniors, persons with disabilities, and the economically disadvantaged.
- Coordinates services and integrates technology to develop a physical or virtual travel management coordination center that networks all parties together.

Aiken, SC, Camden, NJ, Paducah, KY

•THE BIG PICTURE

ITS Joint Program Office

Paving the Way for the Connected Vehicle Ecosystem



What the Taxi Industry Should Do Now

Consider the kinds of applications that will appeal to your customers. Examples:

Apps that can help avoid crashes

Apps that can help the driver maneuver through sharp curves

Apps that can help curb auto pollution

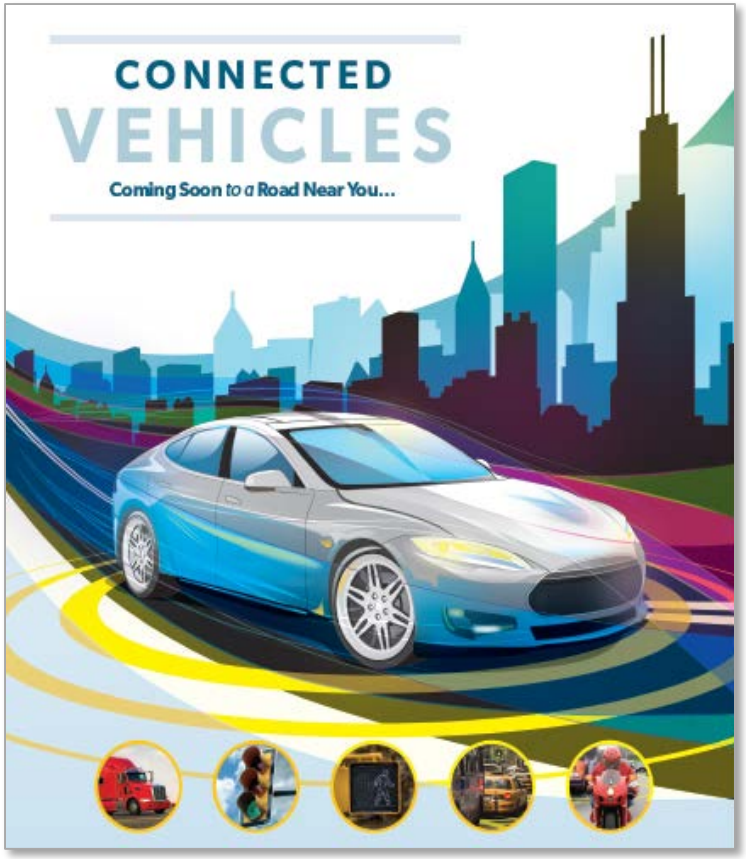
Apps that can help in bad weather

Apps that can help to avoid traffic congestion

Apps that can help you find a parking space

The Bottom Line

- Connected vehicles will make your vehicles safer, more efficient and less polluting.
- National deployment of connected vehicles is likely by 2020
- Aftermarket devices will bring older vehicles into the connected environment



For More Information

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