The Only Certainty is Change: Emerging Topics in Transportation Planning, Part I

Connected Vehicles Pilots, Smart Cities and the FAST Act

Monday, June 27, 2016
Egan Smith
Managing Director, Intelligent Transportation System Joint Program Office (ITS JPO)
U.S. Department of Transportation (USDOT)
ITS Strategic Plan 2015-2019
Program Categories

- **Connected Vehicles** program category will be primarily focused on adoption and eventual deployment of the system.

- **Automation research** will focus on topics related to automated road-vehicle systems and related technologies that transfer some amount of vehicle control from the driver to the vehicle.

- **Emerging Capabilities** will focus on future generations of transportation systems.

- **Enterprise Data** programs will continue existing efforts in operational data capture from stationary sensors, mobile devices, and connected vehicles, and expand into research activities involving the development of mechanisms for housing, sharing, analyzing, transporting, and applying those data for improved safety and mobility across all modes of travel.

- **Interoperability** focuses on how to ensure effective connectivity among devices and systems.

- **Accelerating Deployment** advances the work from adoption to wider scale deployment in coordination with several other DOT agencies.
USDOT Action – “Facilitate the appropriate consideration of Connected Vehicles in transportation planning activities carried out by States, MPOs and local agencies”

- How should connected vehicles be considered across a range of planning activities?
- What changes are needed in techniques, tools, supporting data, organizational skills and expertise?
- What new stakeholders will be involved and how will the role of existing stakeholders change?
- How will needs vary in different contexts?
Imagine a Transportation System in which VEHICLES CAN SENSE Things That You Can’t.
Connected Vehicles (CV) are vehicles that can communicate with each other, roadside devices (traffic signals), or non-motorized users (smart phones and other advanced devices)

- Vehicle to Vehicle (V2V)
- Vehicle to Infrastructure (V2I)
- Vehicle to Anything (V2X)
AUTONOMOUS VEHICLES

- Autonomous & Driverless Car
  - Array of sensors to detect other vehicles and obstacles
  - Requires Detailed map
  - Use machine learning to make software smarter
  - Doesn’t rely on communication with other vehicles

Google’s automated vehicle
Automation builds off current driver assistance technologies such as adaptive cruise control, lane departure warning and left turn assist

- NHTSA has defined 5 levels of automation
- Various combinations of levels 1, 2, and 3 are on the road today

**LEVEL 0**  Driver Warning Systems  
Provides guidance to the driver, but makes no decisions and does not take away control.

**LEVEL 1**  Automation of Isolated Driver Functions  
Manages individual driver functions, but requires a human driver to continue performing other essential functions.

**LEVEL 2**  Automation of Several Driver Functions  
Manages several driver functions simultaneously, but still requires a human driver to handle some essential functions.

**LEVEL 3**  Limited Self-Driving Capability  
Limited autonomous operation in certain environments, with human control needed to handle complex situations.

**LEVEL 4**  Fully Autonomous Operation  
Capable of handling more advanced driving situations and environments, for fully autonomous driving from start to finish.
CONNECTED AUTOMATION - GREATEST BENEFITS

Autonomous Vehicle
Operates in isolation from other vehicles using internal sensors

Connected Vehicle
Communicates with nearby vehicles and infrastructure

Connected Automated Vehicle
Leverages autonomous and connected vehicle capabilities
CONNECTED AUTOMATION - GREATEST BENEFITS

- Improving safety
  - Reduce and mitigate crashes

- Increasing mobility and accessibility
  - Expand capacity of roadway infrastructure
  - Enhance traffic flow dynamics
  - More personal mobility options for disabled and aging population

- Reducing energy use and emissions
  - Aerodynamic “drafting”
  - Improve traffic flow dynamics

…connectivity is critical to achieving the greatest benefits
- Technologies will advance – and roles will change
  - As an example, the relationship between connected and automated will evolve and change as it matures.
- Planners don’t need to know “guts” of technology but need to track developments
  - Conceptual knowledge of systems and technological readiness
  - Timeframes for implementation (is implementation referring to technology or project?)
  - Funding – who pays and how?
  - Societal/organizational impacts
  - Adapting to disruption in both public and private sectors
  - Understand data outputs to support planning needs
The Planning Process

- Where do we/you want to go?
- How are we/you going to get there?
- What will it take?
- How did we do?
Where do we/you want to go?
...Where do we/you want to go?

- Today
- Future CV Environment
Transportation Challenges

Safety
32,675 highway deaths in 2014
- 6.1 million crashes in 2014
- Leading cause of death for ages 11, 16-24

Mobility
- 6.9 billion hours of travel delay
- $160 billion cost of urban congestion

Environment
- 3.1 billion gallons of wasted fuel
- 56 billion lbs of additional CO₂

Data Sources:
Quick Facts: 2014 Data, National Highway Traffic Safety Administration (January 2016); 2015 Annual Urban Mobility Report, Texas Transportation Institute (Aug 2015); Centers for Disease Control

U.S. Department of Transportation ITS Joint Program Office
Connected Vehicles: *What Can They Do?*

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

Vehicle Manufacturers
- BMW
- GM
- VOLVO
- HONDA
- DAIMLER
- TOYOTA
- NISSAN
- Ford
- Chrysler
- Mercedes-Benz
- Freightliner
- HYUNDAI
- KIA MOTORS

Academia
- Texas Transportation Institute
- PATH
- University of Iowa
- GEORGE MASON UNIVERSITY
- MONTANA STATE UNIVERSITY
- CVPC

Public Agencies
- MDOT
- VDOT
- ADOT
- NYSDOT
- OAK RIDGE National Laboratory
- MCDOT

Industry
- Booz Allen Hamilton
- Telcordia
- Siemens
- Visteon
- Delcan
- Denso
- ECONOLITE
- CAMBRIDGE SYSTEMS

Associations/Standards Developers
- ATR
- ITE
- IEEE
- APTA
- IEEE
- SAE International
- Battelle
- ITRI
- ITS America
- Public Vehicle Safety Alliance
- MacroSys
- MIXON Hill
- OmniAir
- Arinc
- CohdaWireless
- ARADA Systems
- Cognia

Planning Stakeholders

Public Agencies
- United States Environmental Protection Agency
- Federal Transit Administration
- U.S. Department of Housing and Urban Development

Governance & Planning Associations
- National Association of Regional Councils (NARC)
- National League of Cities
- National Association of Development Organizations (NADO)
- National Association of Counties (NACo)
- National Association of Home Builders (NAHB)
- American Planning Association (APA)
- Association for Community Transportation (ACT)

Transportation Associations
- American Public Transportation Association (APTA)
- Association for Commuter Transportation
- U.S. Department of Transportation
The Public
How are we/you going to get there?
Video Safety Pilot
Successfully Piloting Connected Vehicles

*Safety Pilot laid the groundwork for understanding how this technology interacts in a real-world setting and how drivers respond to it*

- Data collection exceeded our expectations
- Regular drivers experienced proven technology
- Connectivity was achieved across various types and modes
- Risk reductions were achieved
73 miles of instrumented roadway with 27 roadside units in Ann Arbor, MI

Over 2,800 vehicles equipped with a variety of device types

Various V2V and V2I applications

Testing of prototype security mechanisms and device certification processes

1 year of data collection to support 2013 NHTSA decision

Transitioned to an operational environment
Key Policy Program Focus Areas

I. SECURITY POLICY
II. COMMUNICATIONS POLICY
III. DATA POLICY
IV. INTEROPERABILITY POLICY
V. DEPLOYMENT STRATEGIES and DEPLOYMENT READINESS
VI. FEDERAL ROLE IN POLICY
Key Technical Program Focus Areas

I. SECURITY CREDENTIAL MANAGEMENT SYSTEM
II. CERTIFICATION
III. ARCHITECTURE
IV. STANDARDS
V. INTERNATIONAL HARMONIZATION
Guidance and Rulemaking

I. V2V Rulemaking
II. V2I Guidance
III. Performance Management
IV. Planning
In September 2015, Secretary Foxx announced that New York City, Wyoming, and Tampa, FL were selected for the Connected Vehicle Pilot Deployment Program - to pilot next-generation technology in infrastructure and in vehicles to share and communicate with each other and their surroundings in real time, reducing congestion and greenhouse gas emissions, and cutting the unimpaired vehicle crash rate.
CV PILOT DEPLOYMENT PROGRAM GOALS

Spur Early CV Tech Deployment
Wirelessly Connected Vehicles
Mobile Devices
Infrastructure

Measure Deployment Benefits
Limit 35
Safety
Mobility
Environment

Resolve Deployment Issues
Technical
Institutional
Financial
### PILOT SITES AND DEPLOYMENT SCHEDULE

- **Pilot Sites**
  - ICF/WYDOT
  - NYCDOT
  - Tampa (THEA)

- **Overall Deployment Schedule**

  **Connected Vehicle Pilot Deployment (up to 50 months)**

  **Phase 1** (up to 12 months)
  - Concept Dev.
  - In Progress

  **Phase 2** (up to 20 months)
  - Design/Deploy/Test
  - Progress Gate

  **Phase 3** (minimum 18 months)
  - Maintain/Operate Pilot
  - Progress Gate
  - Transition
  - Routine Operations (ongoing)
  - Post-Pilot Operations

- Follow-On Cooperative Agreement

**Phase 1** – Creates the foundational plan to enable further design and deployment

**Phase 2** – Detailed design and deployment followed by testing to ensure deployment functions as intended (both technically and institutionally)

**Phase 3** – Focus is on assessing the performance of the deployed system

**Post Pilot Operations** (CV tech integrated into operational practice)
### Concept Development Activities and Public Events

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Task 1 – Program Mgt.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Task 2 – Concept of Operations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Task 3 – Security Concept</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Task 4 – Safety Plan</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Task 5 – Performance Measurement</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Task 6 – System Requirements</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Task 7 – App Planning</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Task 8 – Human Use Approval</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Task 9 – Training Plan</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Task 10 – Partnership</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Task 11 – Outreach Plan</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Task 12 – Deployment Plan</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Task 13 – Readiness Summary</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Public webinars to share the concept development activities from the three sites (see website for exact dates and times)
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

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
PROPOSED CV APPLICATIONS: SUMMARY

<table>
<thead>
<tr>
<th>CV Application</th>
<th>WYDOT Snow Plows</th>
<th>WYDOT Maintenance Fleet Vehicles</th>
<th>Emergency Vehicles</th>
<th>Private Trucks/Commercial Vehicles</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Road Weather Advisories for Trucks and Vehicles</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>2. Automatic Alerts for Emergency Responders</td>
<td></td>
<td></td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>3. CV-enabled Weather-Responsive Variable Speed Limits</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>4. Spot Weather Impact Warning</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>5. Work Zone Warnings</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>6. Situational Awareness</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>7. Truck Parking Availability for Freight Carriers</td>
<td></td>
<td></td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td>8. Freight-Specific Dynamic Travel Planning</td>
<td></td>
<td></td>
<td></td>
<td>✔</td>
</tr>
</tbody>
</table>
ICF/WYDOT Pilot Deployment Vision

Traffic Management Center

122 VSL Signs

Low Visibility / VSL

300 Miles of I-80

On-site Meteorology

High Wind Warning Lifted

Zero Trucks Blown Over

Open to Light, High Profile Vehicles

30-50 RSU

Available Truck Parking

55 Parking Locations

Truck Parking Notification

450 - 500 Equipped Trucks:
- 100 WYDOT Snow Plows/Highway Patrol vehicles
- 200-250 Other WYDOT Maintenance, Cities & Fleet Vehicles
- 150-200 Commercial vehicles

Note: The number is a rough estimate for the concept development phase.
New York City DOT

Jonathan Walker (FHWA), NYCDOT CV Pilot Site COR
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

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 SITE

Manhattan Grid
- Closely spaced intersections (600’ x 250’)
- Day vs. Night conditions
- Residential/commercial mix
- High accident rate (red dot) (2012-2014)
  - 20 fatalities
  - 5,007 injuries
- 204 intersections

Central Brooklyn – Flatbush Ave
- Over-Height restrictions
  - Tillary St.; Brooklyn Bridge
- High accident rate (red dots) (2012-14)
  - 1,128 injuries
  - 8 fatalities
- Average AM speed 15 mph
- 35 intersections

Manhattan – FDR Drive
- Limited access highway
- Excludes trucks/buses
- Short radius of curvature
- Over-Height restrictions
- $1,958,497 in Over-Height incident delay costs (2014)
  - 24% of City-wide total

Source: NYC DOT
## NYCDOT Pilot Deployment Proposed CV Application - Fleet Distribution

<table>
<thead>
<tr>
<th>CV Application</th>
<th>Taxi &amp; Limousine</th>
<th>NYC DOT/ Sanitation</th>
<th>MTA/ NYCTA Buses</th>
<th>Commercial Vehicles</th>
<th>Pedestrian</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Speed Compliance</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>2. Red Light Violation Warning</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>3. Ped. in Signalized Crosswalk Warn.</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>4. RT Vehicle in Front of Bus Warning</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Mobile Accessible Ped Signal Sys.</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>6. Curve Speed Compliance</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>7. Oversize Vehicle Compliance</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>8. Work Zone Speed Compliance</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>9. I-SIG</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>10-14. V2V Applications (5)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>15. Evacuation Information</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>
NYCDOT Pilot Deployment Vision

1,500 MTA Buses
500 UPS Vehicles
1,500 MTA Buses
500 Sanitation & DOT vehicles
7,500 Taxis
500 UPS Vehicles
239 Intersections with RSE coverage

Note: The numbers are rough estimates for the concept development phase.
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.

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 SITE
AN OVERVIEW OF DOWNTOWN TAMPA
TAMPA (THEA) PILOT DEPLOYMENT SITE NEEDS: ISSUES AND APPLICATIONS RELATIONSHIP

**CV APPLICATIONS**

- **V2I SAFETY**
  - Curve Speed Warning
- **V2V SAFETY**
  - EEBL and FCW
- **V2I SAFETY**
  - Pedestrian in Signalized X-walk
- **V2I SAFETY**
  - Mobile Accessible Pedestrian Signal PED-SIG
- **V2I SAFETY**
  - IMA
- **MOBILITY**
  - I-Sig
- **AGENCY DATA**
  - Probe Enabled Traffic Monitoring
- **MOBILITY**
  - TSP
- **V2V SAFETY**
  - Vehicle Turning in Front of Bus

**USE CASE/NEED**

- **MORNING BACKUPS**
- **PEDESTRIAN CONFLICTS**
  - PEDESTRIAN SAFETY
- **WRONG WAY ENTRIES**
- **TRAFFIC PROGRESSION**
- **BRT OPTIMIZATION**
  - TRIP TIMES
  - SAFETY
- **STREETCAR/AUTO/PED/BIKE CONFLICTS**

**LOCATION**

- REL at Twiggs Street
- Twiggs Street - Courthouse
- REL at Twiggs Street
- Meridian Avenue
- MacDill AFB
- BRT-REL to Marion Street
- Channelside
Tampa (THEA) Pilot Deployment Vision

2,000 Vehicles Equipped with VAD

Note: The numbers are rough estimates for the concept development phase.

1,000 Vehicles Equipped with OBU

• 180 Equipped Buses
• 20 Equipped Trolleys

2,500 Equipped Pedestrians

40 Intersections (I-SIG, TSP, PED-SIG)

Data exchange will use DSRC (Dedicated Short Range Communications) or other wireless media. SCMS (Security Credential & Management System) will be used where appropriate.
Performance Measurement
- Means of assessing the progress made towards attaining established goals
- Not just about data collection, verification, and cleaning but also about using the data to understand the system

Performance Monitoring
- Ongoing tracking of performance to assess if targets have been or likely to be met
- Enables system managers to take corrective and proactive actions to control and manage the system
- Allows system managers to understand the impacts of investments and policies

Performance Evaluation
- Systematic and objective examination of measures and outcomes to understand the impacts of investments and policies have on performance, thus improving current and future planning and investment decisions
- Conducted by an independent party who has no vested interest or stake in the project
How Can This Approach Help You to Achieve a Successful CV Deployment?

- **Successful deployment begins with disciplined Concept Development and System Planning**
  - To mitigate technical, institutional, and financial risk
  - To design and deploy on schedule and within budget
  - To routinely assess safety, mobility and environmental impacts
  - To create long-term technical and financial sustainability

- **Leverage Material from the CV Pilots (on-line)**
  - Tasks and deliverables
  - Guidance and technical assistance material (e.g., on-line webinars)
  - Examples from 3 Pilot Sites
  - Available @ [http://www.its.dot.gov/pilots/index.htm](http://www.its.dot.gov/pilots/index.htm)
THE BIG PICTURE
A city that uses information and communications technology to enhance its livability, workability, and sustainability.

The Smart Cities Council
“Beyond Traffic 2045”

The USDOT’s new 30 Year Framework for the future addresses many of the issues around Smart Cities and provides additional food for thought

- How will we move?
- How will we move things?
- How will we move better?
- How will we adapt?
- How will we align decisions and dollars, and invest the trillions of dollars our transportation system needs in the smartest way possible?

Source: USDOT

http://www.dot.gov/BeyondTraffic
Technology convergence will revolutionize transportation, dramatically improving safety and mobility, enhancing ladders of opportunity, and reducing environmental impacts.

Benefits:
- Order of magnitude safety improvements
- Reduced congestion
- Reduced emissions and use of fossil fuels
- Improved access to jobs and services
- Reduced transportation costs for gov’t and users
- Improved accessibility and mobility
Smart City Challenge Finalists

ARIZONA
- Scottsdale
- Tucson

CALIFORNIA
- Chula Vista
- Fremont
- Fresno
- Long Beach
- Moreno Valley
- Oakland
- Oceanside
- Riverside
- Sacramento
- San Francisco
- San Jose

COLORADO
- Denver

CONNECTICUT
- New Haven

FLORIDA
- Jacksonville
- Miami
- Orlando
- St. Petersburg
- Tallahassee
- Tampa

GEORGIA
- Atlanta
- Brookhaven
- Columbus

INDIANA
- Indianapolis

IOWA
- Des Moines

KENTUCKY
- Louisville

LOUISIANA
- Baton Rouge
- New Orleans
- Shreveport

MARYLAND
- Baltimore

MASSACHUSETTS
- Boston

MICHIGAN
- Detroit
- Port Huron/Marysville

MINNESOTA
- Minneapolis/St. Paul

MISSOURI
- Kansas City
- St. Louis

MISSISSIPPI

MISSOURI
- Kansas City
- St. Louis

NEBRASKA
- Lincoln
- Omaha

NEVADA
- Las Vegas
- Reno

NEW JERSEY
- Jersey City
- Newark

NEW MEXICO
- Albuquerque

NEW YORK
- Albany/Schenectady/Troy/Saratoga Springs
- Buffalo
- Yonkers/New Rochelle/Mt. Vernon
- Rochester

NEVADA
- Las Vegas
- Reno

OHIO
- Akron
- Canton
- Cleveland

OKLAHOMA
- Oklahoma City
- Tulsa

OREGON
- Portland

PENNSYLVANIA
- Pittsburgh

RHODE ISLAND
- Providence

SAN DIEGO
- San Diego

TEXAS
- Austin
- Lubbock

TENNESSEE
- Chattanooga
- Knoxville
- Memphis
- Nashville

THE DISTRICT OF COLUMBIA

WASHINGTON, DC

WASHINGTON
- Seattle
- Spokane

WEST VIRGINIA

WISCONSIN
- Madison

WYOMING

U.S. Department of Transportation 55
In March, U.S. Transportation Secretary Anthony Foxx announced seven finalists for the USDOT Smart City Challenge. The finalists are: Austin, TX; Columbus, OH; Denver, CO; Kansas City, MO; Pittsburgh, PA; Portland, OR; and San Francisco, CA.

The USDOT will pledge up to $40 million to help define what it means to be a “Smart City” to fully integrate innovative technologies – self-driving cars, connected vehicles, and smart sensors – into the transportation network.
Columbus Smart City video
What will it take?
## Funding for ITS Deployment

- **General eligibility**
  - CV deployments are eligible for Federal aid funding where eligibility for ITS investments have been previously established

<table>
<thead>
<tr>
<th>Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Highway Performance Program</td>
</tr>
<tr>
<td>Surface Transportation Block Grant Program</td>
</tr>
<tr>
<td><em>Transportation Alternatives Set-aside</em></td>
</tr>
<tr>
<td><em>Recreational Trails Program Set-aside</em></td>
</tr>
<tr>
<td><em>Surface Transportation Block Grant Program (net of TA &amp; Rec Trails)</em></td>
</tr>
<tr>
<td>Congestion Mitigation &amp; Air Quality Improvement</td>
</tr>
<tr>
<td>Highway Safety Improvement Program</td>
</tr>
<tr>
<td>Railway-Highway Crossings Program</td>
</tr>
<tr>
<td>Metropolitan Planning</td>
</tr>
<tr>
<td>National Highway Freight Program</td>
</tr>
</tbody>
</table>

Mobility on Demand (MOD) Sandbox: Provides a venue through which integrated MOD concepts and solutions are demonstrated in real-world settings. FTA seeks to fund $8M for project teams to innovate, explore partnerships, develop new business models, integrate transit and MOD solutions, and investigate new, enabling technical capabilities. **Proposals Due: 7/5/16** [https://www.transit.dot.gov/research-innovation/mobility-demand-mod-sandbox-program](https://www.transit.dot.gov/research-innovation/mobility-demand-mod-sandbox-program)
Transportation Investment Generating Economic Recovery (TIGER)
  ▪ Application Deadline: April 29, 2016

University Transportation Center (UTC)
  ▪ Application Deadline: May 13, 2016

FTA – Buses and Bus Facilities & Low or No Emission
  ▪ Application Deadline: May 13, 2016
FTA – Tribal Transit Program
  ▪ Application Deadline: May 13, 2016

FRA – Railroad Safety Technology for Positive Train Control (PTC)
  ▪ Application Deadline: May 19, 2016

FHWA – Surface Transportation System Funding Alternatives (SFTSA) Program
  ▪ Application Deadline: May 20, 2016
FTA – Enhanced Mobility/Rides to Wellness/Innovative Coordinated Access
  ▪ Application Deadline: May 31, 2016

FTA – Mobility on Demand
Application Deadline: July 5, 2016

EDA – Regional Innovation Strategies (RIS) Program
  ▪ Application Deadline: June 25, 2016
Keys to the Federal-Aid Program – Through the Planning Process
On Friday, May 27, 2016, the U.S. Department of Transportation’s (USDOT) Federal Highway Administration (FHWA) and Federal Transit Administration (FTA) published the Final Rule on Statewide and Nonmetropolitan Transportation Planning and Metropolitan Transportation Planning in the Federal Register.

This rule implements the changes to the planning process established by the Moving Ahead for Progress in the 21st Century Act (MAP-21) and the Fixing America’s Surface Transportation Act (FAST Act).

The Notice of Proposed Rulemaking (NPRM) was published in the Federal Register on June 2, 2014.
The final rule on Statewide and Nonmetropolitan Transportation Planning and Metropolitan Transportation Planning, published May 27, implements certain planning and environmental provisions of MAP-21 and the FAST Act changes to the transportation planning process, including:

- requiring a performance-based approach to planning
- a new emphasis on the nonmetropolitan transportation planning process, by requiring States to have a higher level of involvement with nonmetropolitan local officials and providing a process for the creation of regional transportation planning organizations
- adding a structural change to the membership of large metropolitan planning organizations (MPOs) to include representation of transit providers
- adding a framework for voluntary scenario planning
- implementing new authority for integrating the planning and environmental review processes as well as programmatic mitigation plans
MAP-21 transformed the Federal-aid program by establishing new requirements for performance management and performance based planning and programming to ensure the most efficient investment of Federal transportation funds.

The FAST Act continued the performance management and performance based planning and programming requirements of MAP-21 with minor changes.

Performance management and performance based planning and programming increases the accountability and transparency of the Federal-aid program and provides for a framework to support improved investment decision making through a focus on performance outcomes for key national transportation goals.

The State DOTs and MPOs are expected to use the updated regulations to make better informed transportation planning and programming decisions.

The new performance aspects of the Federal-aid program would allow FHWA and FTA to better communicate a national performance story and more reliably assess the impacts of Federal funding investments.
Potential Benefits of ITS – Key Solution

- **Safety.** The injuries and fatalities of both vehicle occupants and vulnerable road users will be reduced and mitigated.
- **Mobility.** The information about travel conditions and options for both system users and operators will be increased and improved.
- **Environment.** The impact of vehicle travel will be reduced by promoting greener transportation choices and driver/vehicle behavior.
- **Data.** New and cost-effective data sources and collection methods will be introduced that will improve asset management, network operations, just-in-time maintenance, and incident response, among other functions.

*Benefits are expected to grow over time as more vehicles, infrastructure and travelers are equipped.*
Typical Planning Products and Processes

- Long-range visioning
- Metropolitan Transportation Plan
  Statewide/regional long-range transportation plan
- Transportation Improvement Program
- Short-range transportation plan
- Congestion management plan
- Asset management plan
- ITS and operations plan
- ITS Architecture
- State implementation plan
- Strategic Highway Safety Plan
- Highway Safety Improvement Program
- Transit development plan
- Transportation demand management plan
- Non-motorized (bicycle and pedestrian) plan
- Corridor studies (modal or multimodal)
- Public participation/involvement plan
- Freight plans
- Financing plans
Both States and MPOs develop long-range transportation plans (LRTPs)

MTPs guide decision-making and investments across all modes of surface transportation over a 20+ year horizon

During this 20+ year horizon, emerging CV technology may revolutionize transportation, making it important that long range plans start including plans for the infrastructure, data, etc. that regions will need to support CV

CV will also provide more comprehensive, more granular, and (in some cases) more reliable data to track performance measures in performance-based planning
On Friday, April 22, the Federal Highway Administration (FHWA) published in the Federal Register a Notice of Proposed Rulemaking (NPRM) to propose national performance management measure regulations to assess the performance of the National Highway System, Freight Movement on the Interstate System, and the Congestion Mitigation and Air Quality Improvement Program, as required by the Moving Ahead for Progress in the 21st Century Act (MAP-21) and the Fixing America's Surface Transportation Act ("FAST Act").
This NPRM proposes regulations that would make progress towards the following national goals:

- Congestion reduction - To achieve a significant reduction in congestion on the NHS.
- System reliability - To improve the efficiency of the surface transportation system.
- Freight movement and economic vitality - To improve the national freight network, strengthen the ability of rural communities to access national and international trade markets, and support regional economic development.
- Environmental sustainability - To enhance the performance of the transportation system while protecting and enhancing the natural environment.

In addition, this NPRM:

- Provides for greater consistency in the reporting of condition/performance;
- Proposes requirements for the establishment of targets that can be aggregated at the national level;
- Proposes reporting in a consistent manner on progress achievement; and
- Proposes a process for determining a State DOT's significant progress.
How did we do?
LESSONS LEARNED IN CV PILOTS CONCEPT DEVELOPMENT PHASE

- Stakeholder interaction early and often leads to better concepts and more buy-in
- Sites are eager to consume USDOT technical assistance
  - Deployments are complex, requiring a lot of diverse elements to come together in an integrated system (technical, security, privacy, performance measurement, institutional, financial, etc.)
- Site-to-site coordination can be useful (since not set up as competitive)
  - Cooperation on security, vendor interaction, stakeholder coordination (UPS in WY and NYC)
  - Participation in virtual roundtables
- Building in performance measurement to a deployed system requires some serious thinking in the concept development phase
- We didn’t forget a key area in Phase 1 (so far), e.g., training or safety management
- The deliverables from the sites are creating examples for others to follow
  - E.g., good lessons learned from Safety Pilot Model Demonstration (SPMD) on installation planning/training
- Concept development takes some time to conduct – prior to procuring/designing/installing equipment
- Using standards (intelligently) can help to advance sites systems engineering
Join us for the *Getting Ready for Deployment Series*

- Discover more about the 2015 CV Pilot Sites
- Learn the Essential Steps to CV Deployment
- Engage in Technical Discussion

**Website:** [http://www.its.dot.gov/pilots](http://www.its.dot.gov/pilots)

**Twitter:** [@ITSJPODirector](https://twitter.com/ITSJPODirector)

**Facebook:** [https://www.facebook.com/USDOTResearch](https://www.facebook.com/USDOTResearch)

**Contact for CV Pilots Program:**
Kate Hartman, Program Manager
Kate.Hartman@dot.gov

**Contact for Pilot Sites:**
- Kate Hartman, ICF/Wyoming Site COR
  Kate.Hartman@dot.gov
- Jonathan Walker, NYC Site COR
  Jonathan.b.Walker@dot.gov
- Govind Vadakpat, THEA Site COR
  G.Vadakpat@dot.gov