CONNECTED VEHICLE PILOT
Deployment Program

New York City

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ITS Joint Program Office

OVERVIEW

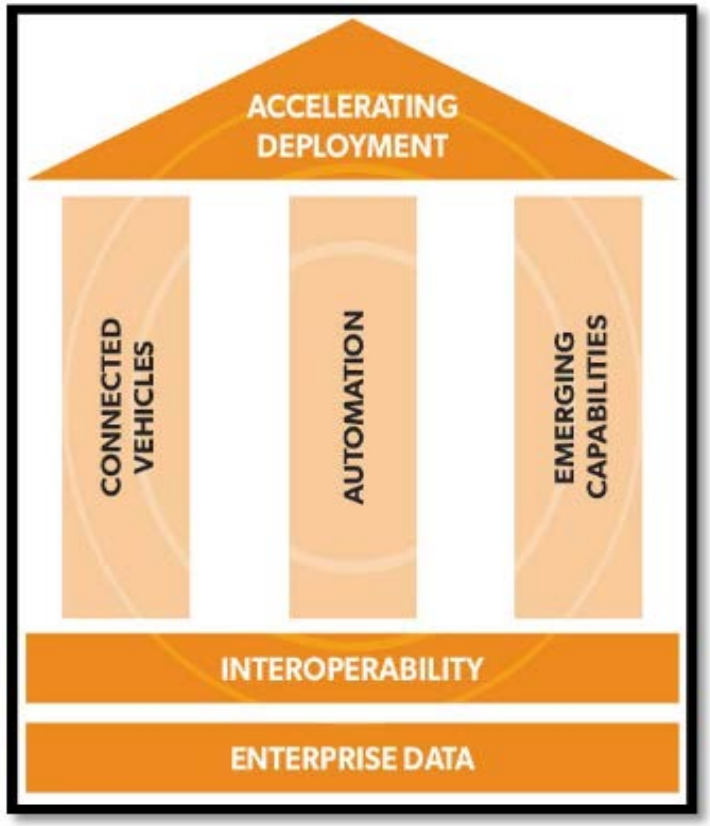
- Connected Vehicles Pilot Deployment Program Overview
  - Goals
  - Organizing Principles
  - CV Applications
  - Program Schedule and Future Milestones
  - CV Pilots Sites Wave 1 Sites:
    - ICF/Wyoming, New York City, Tampa (THEA)
- New York City (NYC) CV Pilot Deployment Overview
  - Pilot Objective
  - Pilot Deployment Site
  - Pilot Site Needs, CV Applications and Performance Measures
  - Fleet Distribution
  - Pilot Deployment Vision
  - Timeline and Phase 1 Deliverable Schedule
- How to Stay Connected

CV Pilot Deployment Program Within The USDOT ITS Strategic Plan

- The Connected Vehicle (CV) Pilot Deployment Program
  - Keystone effort in connected vehicle area
  - Also plays a key role in other strategic areas, including accelerating deployment, promoting interoperability, and enterprise data

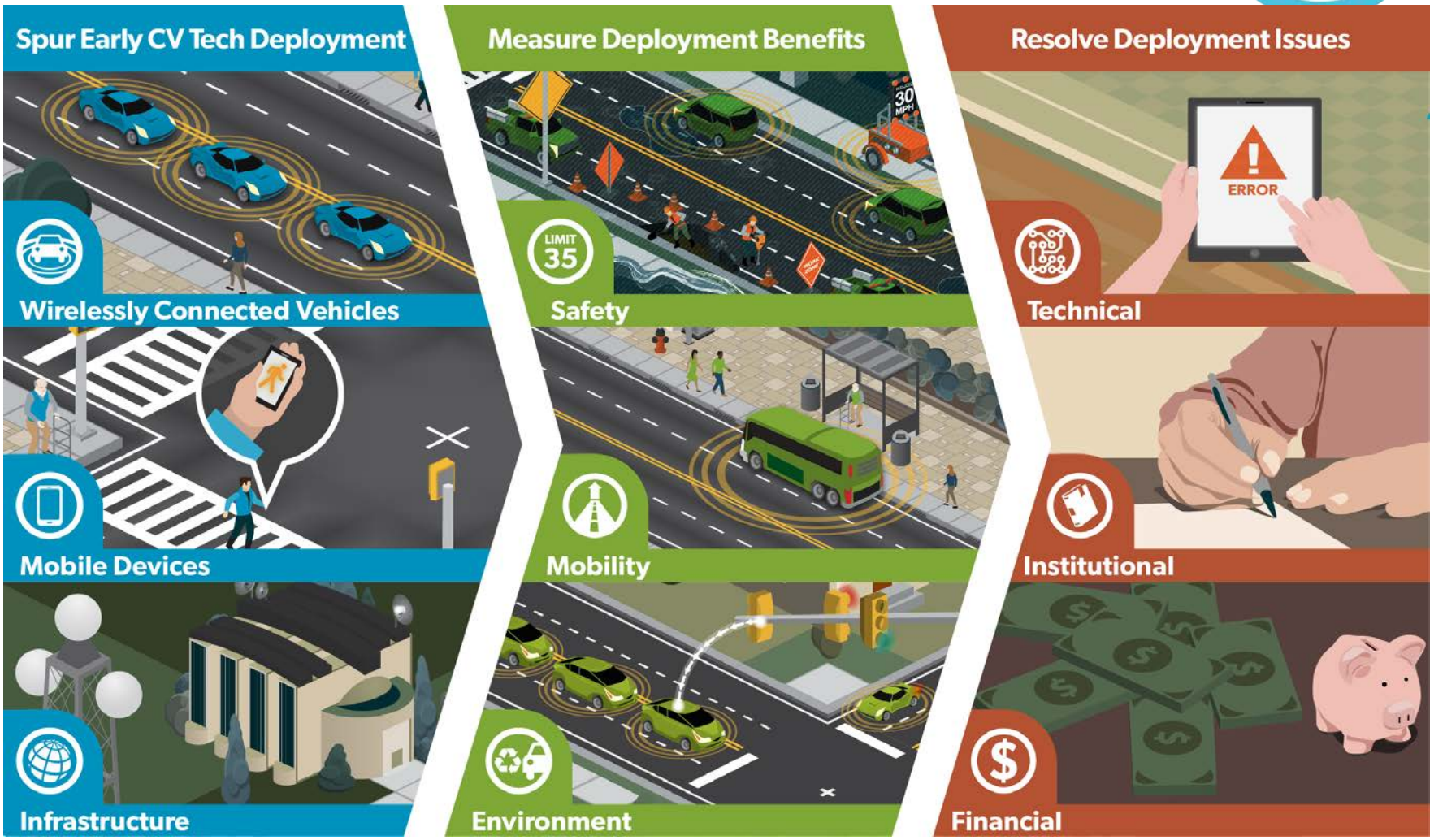
- CV Pilot Deployments offer a unique opportunity related to getting CV technology to the field and making a difference in many areas, including:
  - Needs-driven planning and investment
  - Integrated performance measurement
  - Lowering barriers to deployment

USDOT ITS Strategic Plan, pg. 14



http://ntl.bts.gov/lib/54000/54400/54481/Strat_Plan_Final_Version.pdf

CV Pilot Deployment Program Goals



CV Pilot Organizing Principles

- CV Pilots are *pilot deployments*, that is, real-world environment deployments
  - The successful, deployed technologies are expected to remain as permanent operational elements

- Deployment concepts are needs-driven
  - Each site has different needs, focus and applications
    - That is, each pilot deployment will address critical problem(s)
    - The needs of each site will drive the deployment process

- Pilot deployments are expected to be both *large-scale with multiple applications*
  - *Large-scale* implies pilot deployments will have measureable impact, not a specific minimum geographic or vehicle fleet size
  - Sites will deploy *multiple applications* drawing on the products of USDOT and other connected vehicle research

CV Pilot Deployment Requirements

- Multiple connected vehicle applications will be deployed together
- Pilot deployments should leverage USDOT-sponsored research
- Pilot deployments include the capture of data from multiple sources
  - Integrated or carry-in devices for connected vehicles capable of generating an SAE J2735 Basic Safety Message (BSM)
  - Look to pilot deployment data while protecting privacy and intellectual property
- Dedicated Short Range Communications (DSRC) 5.9 GHz will be utilized as the communications technology
- Well-defined, focused, quantitative performance measures
  - Support an independent evaluation effort
- Security and credentialing management system

CONNECTED VEHICLE APPLICATIONS

- The USDOT has made a significant investment in foundational research and initial development of 50+ connected vehicle applications
  - Concepts of Operations
  - System Requirements
  - Prototype Design and Testing
  - Prototype Impacts Assessment
  - Analytics, Modeling and Simulation to Assess Potential Long-Term Impacts

- Not all CV Application efforts are in the same state of maturity, few are complete
  - But a large number of application development efforts across multiple programs have been completed
  - GOAL: move deployment-ready application concepts forward into integrated deployments addressing key performance concerns

USDOT Sponsored CV Applications

V2I Safety

- Red Light Violation Warning
- Curve Speed Warning
- Stop Sign Gap Assist
- Spot Weather Impact Warning
- Reduced Speed/Work Zone Warning
- Pedestrian in Signalized Crosswalk Warning (Transit)

V2V Safety

- Emergency Electronic Brake Lights (EEBL)
- Forward Collision Warning (FCW)
- Intersection Movement Assist (IMA)
- Left Turn Assist (LTA)
- Blind Spot/Lane Change Warning (BSW/LCW)
- Do Not Pass Warning (DNPW)
- Vehicle Turning Right in Front of Bus Warning (Transit)

Environment

- Eco-Approach and Departure at Signalized Intersections
- Eco-Traffic Signal Timing
- Eco-Traffic Signal Priority
- Connected Eco-Driving
- Wireless Inductive/Resonance Charging
- Eco-Lanes Management
- Eco-Speed Harmonization
- Eco-Cooperative Adaptive Cruise Control
- Eco-Traveler Information
- Eco-Ramp Metering
- Low Emissions Zone Management
- AFV Charging / Fueling Information
- Eco-Smart Parking
- Dynamic Eco-Routing (light vehicle, transit, freight)
- Eco-ICM Decision Support System

USDOT Sponsored CV Applications (cont.)

Mobility

- Advanced Traveler Information System
- Intelligent Traffic Signal System (I-SIG)
- Signal Priority (transit, freight)
- Mobile Accessible Pedestrian Signal System (PED-SIG)
- Emergency Vehicle Preemption (PREEMPT)
- Dynamic Speed Harmonization (SPD-HARM)
- Queue Warning (Q-WARN)
- Cooperative Adaptive Cruise Control (CACC)
- Incident Scene Pre-Arrival Staging Guidance for Emergency Responders (RESP-STG)
- Incident Scene Work Zone Alerts for Drivers and Workers (INC-ZONE)
- Emergency Communications and Evacuation (EVAC)
- Connection Protection (T-CONNECT)
- Dynamic Transit Operations (T-DISP)
- Dynamic Ridesharing (D-RIDE)
- Freight-Specific Dynamic Travel Planning and Performance Measurement (F-ATIS)
- Drayage Optimization (DR-OPT)

Road Weather

- Motorist Advisories and Warnings (MAW)
- Enhanced MDSS
- Vehicle Data Translator (VDT)
- Weather Response Traffic Information (WxTINFO)

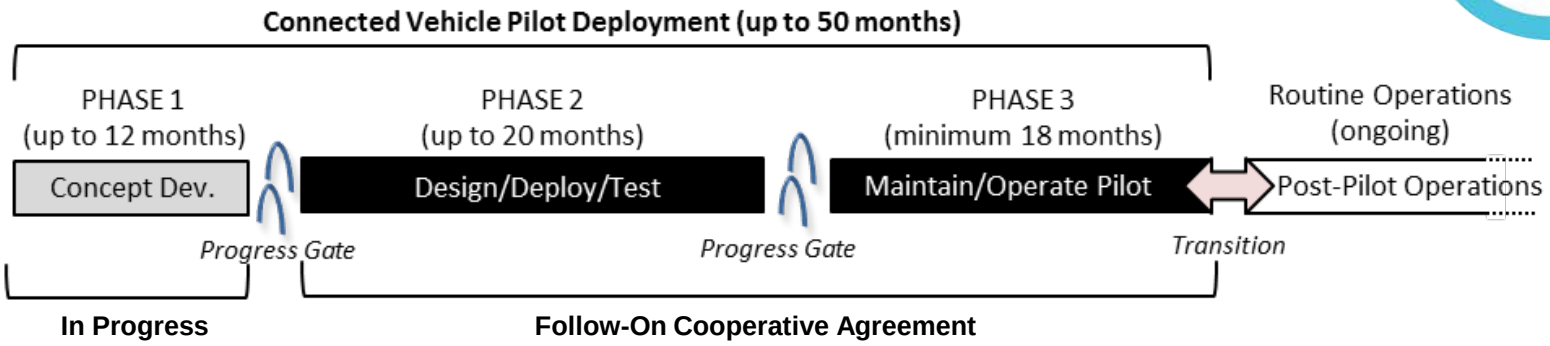
Smart Roadside

- Wireless Inspection
- Smart Truck Parking

Agency Data

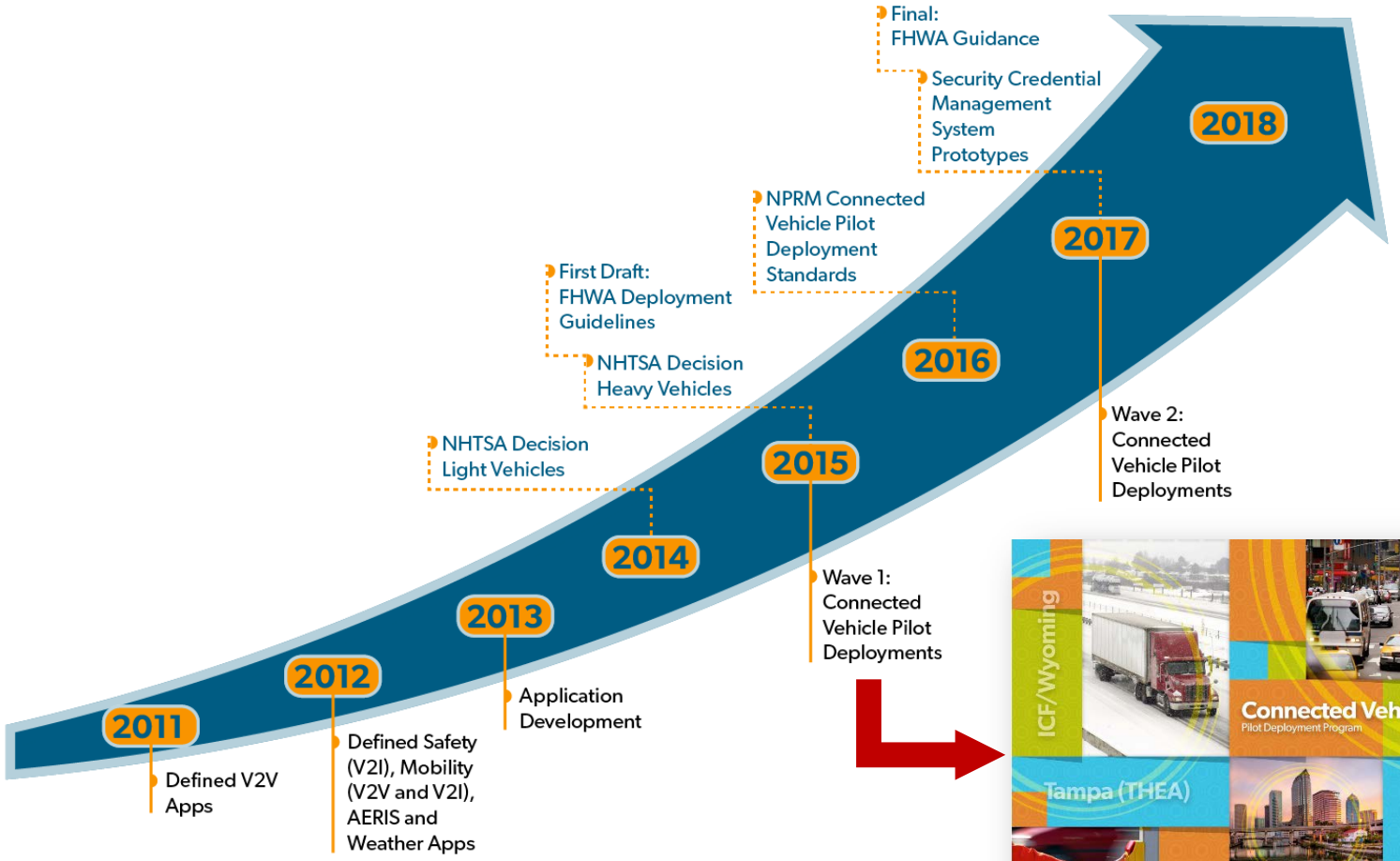
- Probe-based Pavement Maintenance
- Probe-enabled Traffic Monitoring
- Vehicle Classification-based Traffic Studies
- CV-enabled Turning Movement & Intersection Analysis
- CV-enabled Origin-Destination Studies
- Work Zone Traveler Information

CV Pilot Deployment Program Schedule: Wave 1 (Phases 1-3)



- Phase 1: Concept Development (Current Phase)
  - Creates the foundational plan to enable further design and deployment
  - **Progress Gate: Is the concept ready for deployment?**
- Phase 2: Design/Deploy/Test
  - Detailed design and deployment followed by testing to ensure deployment functions as intended (both technically and institutionally)
  - Progress Gate: Does the system function as planned?
- Phase 3: Maintain/Operate
  - Focus is on assessing the performance of the deployed system
- Post Pilot Operations (CV tech integrated into operational practice)

Moving Forward: Additional Milestones



Connected Vehicle
Wave 1 Phase 1 Sites Selected

Solicitation Date:
1/30/2015

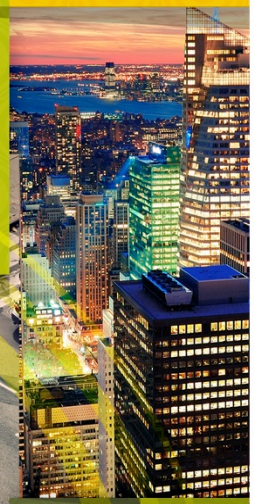
Award Date:
09/14/2015

Period of Performance:
09/14/2015 – 09/13/2016

Photo Courtesy: MTA New York City Transit


Photo Courtesy of: MTA New York City Transit

New York City



New York City (NYC) Pilot Deployment Objective and Approach

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

Status:

- Kickoff conducted on 9/29-10/1
- ConOps under development

NYC Pilot Deployment Team

Project Sponsor	U.S. Department of Transportation	ITS Joint Program Office
Prime Consultant	NEW YORK CITY DOT	New York City DOT
Sub Consultants	JHK Engineering	JHK Engineering
	Battelle	Battelle
	CAMBRIDGE SYSTEMATICS	Cambridge Systematics
	KLD ENGINEERING, P.C.	KLD Engineering
	Security Innovation	Security Innovation
		Region 2 University Transportation Research Center

NYC 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

NYC Pilot Deployment Site Needs: Mobility and Environmental

Balance Mobility in Heavily Congested Areas

Maintain 25 mph Speed Limit (Discourage spot speeding)

Intelligent Traffic Signal System (I-SIG)

Potential Performance Measures

- Average speed
- Average wait time at stops
- Average travel time
- Average throughput at intersections
- Number of hard accelerations/decelerations

Modified Eco-Speed Harmonization

Potential Performance Measures

- Average stop
- Average speed
- Average emission
- Number of hard acceleration/ deceleration events

NYC Pilot Deployment Site Needs: Pedestrian Safety

Improve Pedestrian Safety on Heavily Traveled Bus Routes

Pedestrian in Signalized Crosswalk Warning

Potential Performance Measures

- Pedestrian collisions with transit buses
- Number of warnings generated

Improve Safety of Visually Impaired Pedestrians

Mobile Accessible Pedestrian Signal System

Potential Performance Measures

- Waiting time at intersections for crossing
- Number of pedestrian crossing violation reductions

NYC Pilot Deployment Site Needs: Transit Bus Safety

Reduce Bus Related Crashes on Heavily Traveled Bus Routes

Vehicle Turning Right in Front of Bus Warning

Potential Performance Measures

- Number of warnings generated

NYC Pilot Deployment Site Needs: Truck Safety and Productivity

Improve Truck Safety on Curves

Curve Speed Warning

Potential Performance Measures

- Accident at ramps
- Number of warnings generated

Address Bridge Low Clearance Issues

Freight Dynamic Travel Planning

Potential Performance Measures

- Number of warnings generated

Enforce Truck Route Restrictions and Improve Productivity

Freight Dynamic Travel Planning

Potential Performance Measures

- Truck route violations
- Truck load/offload zone delays
- Truck travel times

NYC Pilot Deployment Site Needs: Intersection and Work Zone Safety

Reduce Accidents at High Incident Intersections

Red Light Violation Warning

Potential Performance Measures

- Signal violations
- Accidents at intersections

Improve Work Zone Safety

Reduced Speed/ Work Zone Warning

Potential Performance Measures

- Average speed at work zone compared to posted speeds

NYC Pilot Deployment Site Needs: Potential V2V Safety and Evacuation

Reduce crashes and injuries

Provide evacuation and unusual situation alerts

V2V Applications (FCW, EEBL, BSW, LCA, IMA, SVA)

Potential Performance Measures

- Crash incidence
- Injury incidence
- Property damage costs
- Comparisons between instrumented and non-instrumented arterials

In-vehicle information

Potential Performance Measures

- Acceptance and driver interviews

NYC Pilot Deployment Proposed CV Applications: Summary

V2I Safety

- Red Light Violation Warning
- Curve Speed Warning
- Reduced Speed/Work Zone Warning
- Pedestrian in Signalized Crosswalk Warning (Transit)

V2V Safety

- Emergency Electronic Brake Lights (EEBL)*
- Forward Collision Warning (FCW)*
- Intersection Movement Assist (IMA)*
- Blind Spot Warning (BSW)*
- Lane Change Assist (LCA)*
- Stationary Vehicle Ahead (SVA)*
- Vehicle Turning Right in Front of Bus Warning (Transit)

Mobility

- Advanced Traveler Information System
- Intelligent Traffic Signal System (I-SIG)
- Mobile Accessible Pedestrian Signal System (PED-SIG)
- Emergency Communications and Evacuation (EVAC)
- Freight-Specific Dynamic Travel Planning and Performance Measurement (F-ATIS)

Environment

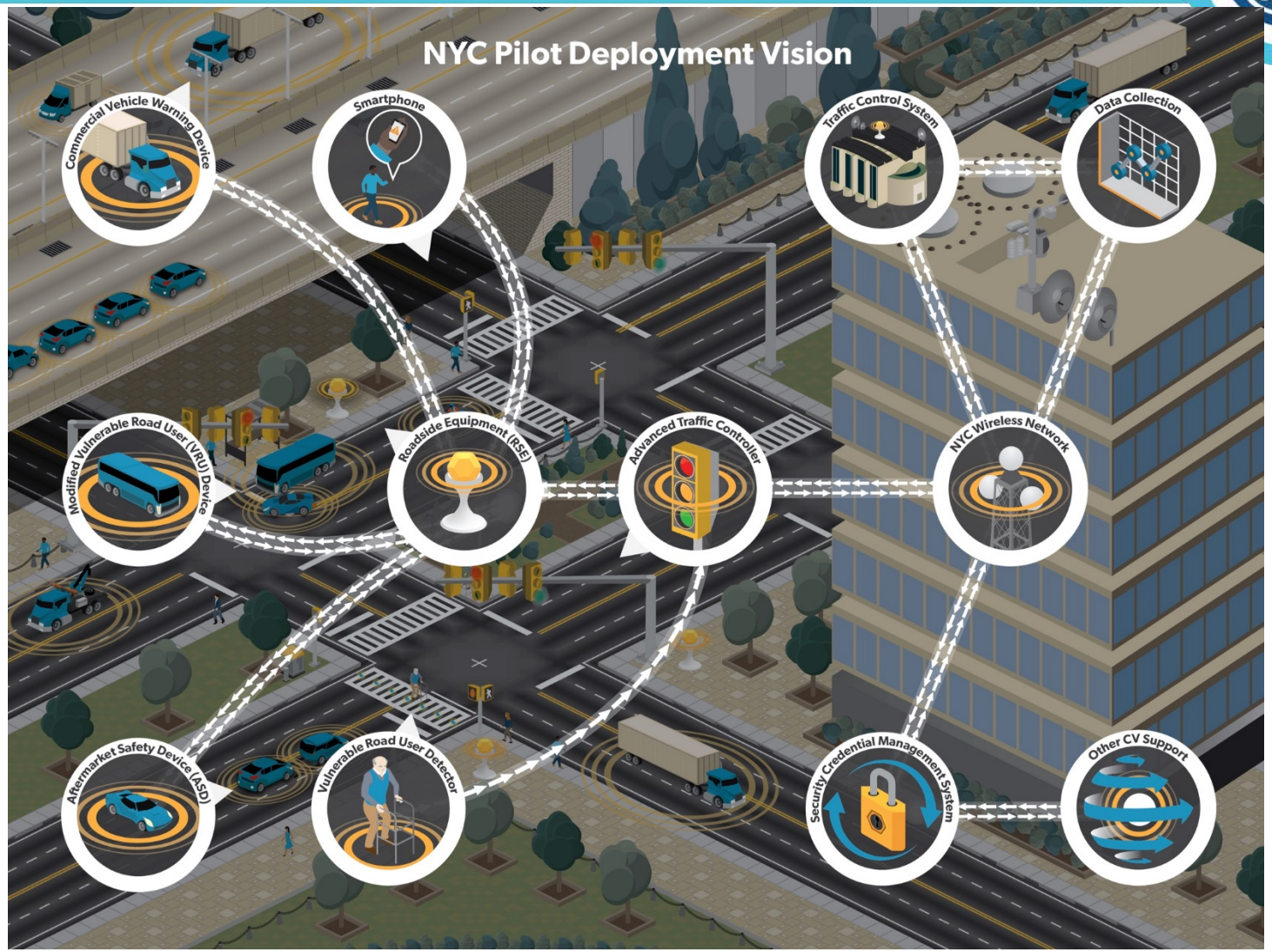
- Eco-Speed Harmonization

Deployment of applications is dependent upon Final ConOps and funding

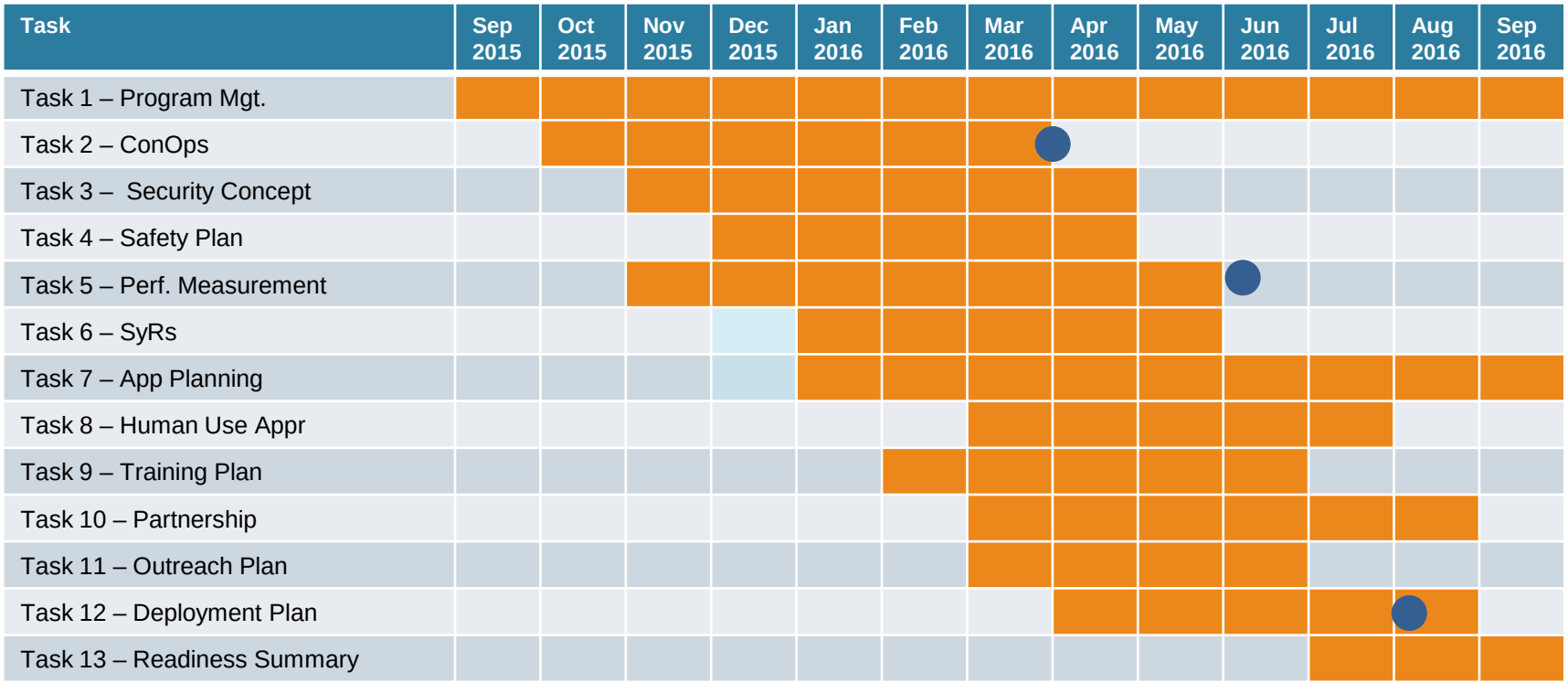
NYC Pilot Deployment Proposed CV Application-Fleet Distribution

CV Application	Taxi & Limousine	NYC DOT/ Sanitation	MTA/ NYCTA Buses	Commercial Vehicles	Pedestrian
	7500	500	1500	500	TBD
1. Mod. Eco-Speed Harmonization	✓	✓	✓	✓	
2. Red Light Violation Warning	✓	✓	✓	✓	
3. Ped. in Signalized Crosswalk Warn.	✓	✓	✓	✓	✓
4. RT Vehicle in Front of Bus Warning			✓		
5. Mobile Accessible Ped Signal Sys.					✓
6. Curve Speed Warning	✓	✓	✓	✓	
7. Freight Dynamic Travel Planning		✓	✓	✓	
8. Reduced Speed/Work Zone Warn.	✓	✓	✓	✓	
9. I-SIG	✓	✓	✓	✓	
10-15. V2V Applications (6)	✓	✓	✓	✓	
16. EVAC In-Vehicle Information	✓	✓	✓	✓	

NYC Pilot Deployment Vision



TIMELINE



Task	Sep 2015	Oct 2015	Nov 2015	Dec 2015	Jan 2016	Feb 2016	Mar 2016	Apr 2016	May 2016	Jun 2016	Jul 2016	Aug 2016	Sep 2016
Task 1 – Program Mgt.													
Task 2 – ConOps													
Task 3 – Security Concept													
Task 4 – Safety Plan													
Task 5 – Perf. Measurement													
Task 6 – SyRs													
Task 7 – App Planning													
Task 8 – Human Use Appr													
Task 9 – Training Plan													
Task 10 – Partnership													
Task 11 – Outreach Plan													
Task 12 – Deployment Plan													
Task 13 – Readiness Summary													

● Public Webinar

CV Pilots Phase 1 Deliverable Schedule

Task Name	Deliverables	Due Date
Task 1: Project Management	Kickoff Briefing to USDOT	10/1/2015
	Program Management Plan (Final)	10/30/2015
Task 2: Concept of Operations	Stakeholder ConOps Review Panel Roster (Final)	11/6/2015
	ConOps (Final)	3/11/2016
	ConOps Webinar (Public)	4/12016
Task 3: Security Management Concept	Security Management Operating Concept (Final)	4/15/2016
Task 4: Safety Plan	Safety Management Plan (Final)	4/22/2016
Task 5: Performance Measurement	Performance Measurement Plan (Final)	5/16/2016
	Performance Plan Measurement Webinar(Public)	6/6/2016
Task 6: System Requirements	Stakeholder SyRS Review Panel Roster (Final)	3/21/2016
	SyRS (Final)	5/16/2016
Task 7: Application Planning	Application Deployment Plan (Final)	6/6/2016
Task 8: Human Use Approval	Human Use Approval Summary (Final)	7/18/2016
Task 9: Training Plan	Training and Education Plan (Final)	6/13/2016
Task 10: Partnership	Partnership Status Summary (Final)	8/1/2016
Task 11:Outreach Plan	Outreach Plan (Final)	6/6/2016
Task 12: Deployment Plan	Comprehensive Deployment Plan (Final)	8/1/2016
	Deployment Plan Webinar (Public)	8/2/2016
Task 13: Readiness Summary	Deployment Readiness Briefing to USDOT	8/22/2016
	Deployment Readiness Summary (Final)	9/12/2016

STAY CONNECTED

- **Join us for the *Getting Ready for Deployment* Series (link to webinars)**
  - Discover more about the Wave 1 CV Pilot Sites
  - Learn the Essential Steps to CV Deployment
  - Engage in Technical Discussion

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