Connected Vehicle Pilot Deployment Program Phase 3

Operational Capability Showcase Plan – New York City (NYCDOT)

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Notice

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16. Abstract

This document describes the Operational Capability Showcase Plan (OCSP) for the New York City Department of Transportation (NYCDOT) Connected Vehicle Pilot Deployment (CVPD) Project. As part of USDOT Connected Vehicle (CV) Pilot Deployment program, NYCDOT is required to hold an Operational Capability Showcase (OCS) no later than the first 12 months of Phase 3 which began on January 1, 2021. The OCS is intended as a media event to show the capabilities, intent, and value of the CV deployment. However, due to the COVID-19 pandemic, the OCS for NYC CVPD will occur as a virtual event. The OCSP describes the planned activities and invited speakers for the OCS; this event is scheduled for week of July 20, 2021.

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#	Date	Author(s)	Summary of Changes
D1	5/14/2021	NYCDOT	Initial draft OCSP
D2	6/15/2021	NYCDOT	Revised draft OCSP
F1	6/24/2021	NYCDOT	Final OCSP, Section 508-compliant
F2	8/5/2021	NYCDOT	Revised Chapter 3, 5, and 6 after OCS webinar

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1. Introduction

1.1 Project Scope

NYC is implementing the CV technology as another tool in its quest for Vision Zero. It is anticipated that CV technology will demonstrate its potential in reducing the number of and severity of crashes in the deployment area through this project. New York City will assess the technology's impacts and potential for attaining the Vision Zero goal. Figure 1 in Section 1.2 System Overview provides a conceptual view of the system to be deployed. It also provides insight to whether a component exists or will be newly deployed within the project.

The NYC CVPD project is one of three initial CV deployment projects that establish a base for growing a nation-wide connected vehicle system. As such, its focus is on utilizing standards to build basic infrastructure in a manner that provides a foundation for future deployments of connected vehicle technology.

The NYC CVPD project provides a real demonstration and evaluation of the benefits of the CV technology in a dense urban environment.   NYC has deployed a robust infrastructure with advanced traffic controllers (ATC), an advanced adaptive traffic signal control system which currently uses travel times as part of its operational algorithms, an aggressive maintenance program, and a ubiquitous high speed wireless network (Traffic Safety Network (TSN)). By deploying Aftermarket Safety Devices (ASD) and Roadside Units (RSU), our team can bring the benefits of the CV paradigm to NYC's Vision Zero initiative and provide the opportunity to evaluate the benefits with a significant number of vehicles that are regularly driving in the area.

This project will also provide the Federal Highway Administration (FHWA) the opportunity to showcase the benefits of CV technology without replacing the vehicle fleet – which is likely to be the situation for many years to come. At the same time, the NYC CVPD will be used to demonstrate the benefits to vulnerable road users who suffer the most from roadway fatalities in NYC. Hence, the purpose of the NYC CVP Operational Capability Showcase (OCS) is to highlight the CV technology's benefits.

1.2 System Overview

This project brings New York City (NYC) another step ahead towards reaching the Vision Zero goal of eliminating the injuries and fatalities due to traffic crashes. The project's concept is simple - it introduces CV technology and communications into the NYC travel environment by equipping several large vehicle fleets with the technology and equips several areas with the corresponding connected vehicle infrastructure.

It is important to understand the implications of the connected vehicle technology deployment in New York City. A small portion of NYC roadway network have connected vehicle infrastructure installed (450 Roadside Unit (RSU) locations). Vehicle-to-Infrastructure (V2I) applications such as Red-Light

Violation Warning, Speed Compliance, and Curve Speed Compliance support connected vehicles operating in these areas. However, the geographic reach of the connected vehicle technology is much broader. Vehicles equipped with connected vehicle technology (i.e. ASDs) travel in this infrastructure equipped area *and throughout the City's transportation network*. Thus, the connected vehicle technology that supports Vehicle-to-Vehicle (V2V) applications can function anywhere two (2) equipped vehicles are within range of one another. Equipped vehicle encounters may occur on the surface streets, and bridges crossing the rivers, at the airports, and on the City's higher speed facilities such as the FDR Drive and the Long Island Expressway. The large fleet size means that there will be many opportunities for the connected vehicle technology to perform over a large geographic area and diverse roadway environments.

Figure 1-1 depicts the NYC CVPD system and the boundary between the internal system and the external systems and components that interface with the NYC CVPD environment. The ASDs, RSUs, PIDs, data collection/processing system, NYC TSN, and VRU detection system are in the NYC CVPD system. The TCS, ATC, GNSS, TIS, DMS, FM Radio, and other CV support systems including the SCMS are the external systems and components.
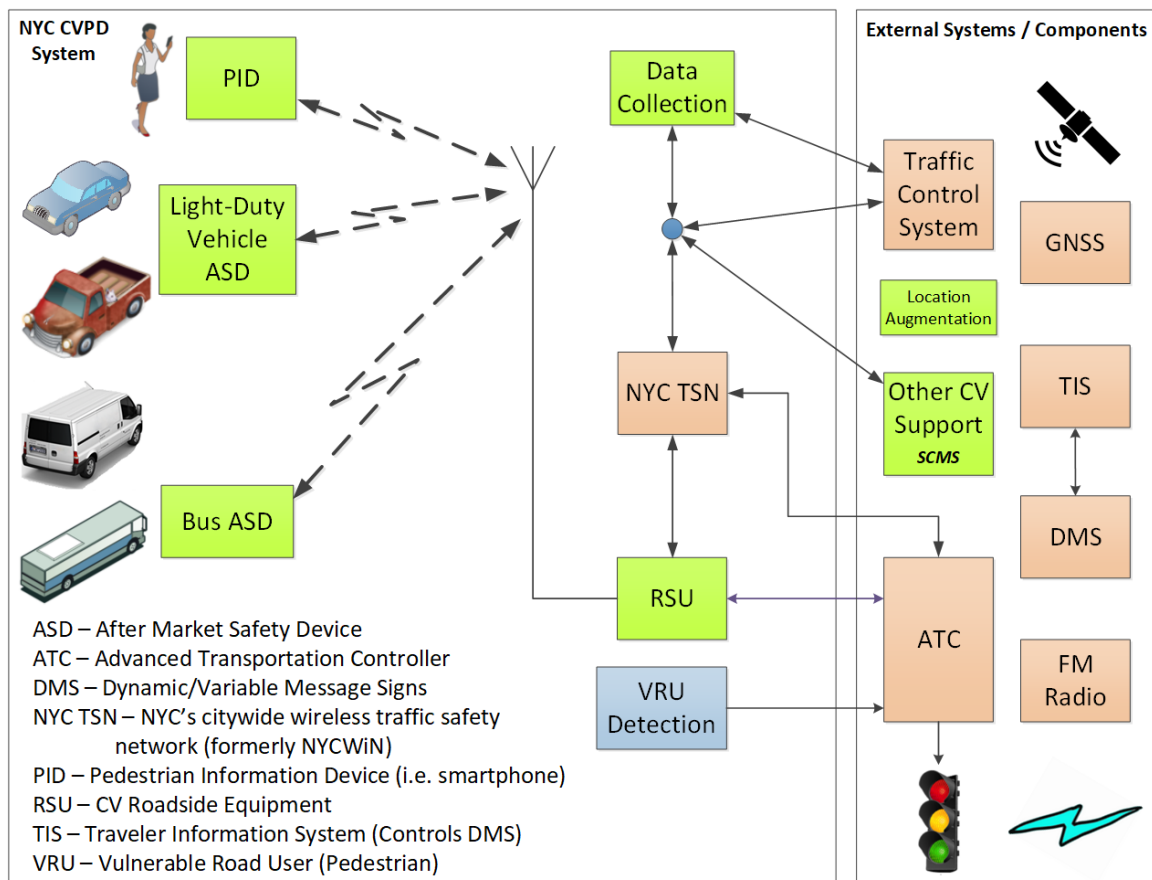
Source: NYCDOT, 2019

Figure 1. NYC CVPD System Concept

The existing system elements, critical to the operation of the pilot system, are illustrated with beige backgrounds. These existing elements include the traffic control system (TCS), traffic controller (ATC),

Global Navigation Satellite System (GNSS), Traveler Information System (TIS), Dynamic Message Signs (DMS), FM radio, and supporting New York City's wireless network communications infrastructure (TSN). The new system elements which exist and will be reused, modified, or integrated into the NYC CVPD system contain green backgrounds. They comprise of the ASDs in light-duty vehicle, bus, and commercial vehicle, RSUs, PIDs, data collection/processing system, and other CV support systems including the Security Credential Management System (SCMS). The Vulnerable Road User (VRU) detection devices are shown with a blue background. They have been deployed to the system on a very limited basis. The firmware of the traffic controllers was modified by the vendor to provide the SPaT information to the RSU to support the V2I applications, and to the TCS to support the PID applications. In addition, the communications to the ATC have been upgraded to increase the security needed to support the Connected Vehicle applications.

NYC's initial system deployment is anticipated to be the largest CV technology deployment to date. 281 intersections in Manhattan and 28 intersections along Flatbush Avenue in Brooklyn have been instrumented with RSUs to communicate with up to 3,000 vehicles equipped with ASDs. These devices monitor communications with other connected vehicles and the infrastructure and provide alerts to vehicle drivers/operators. Other RSUs have been installed at locations to support system management functions such as providing security credentials, managing application and parameter configurations, and uploading logged information. These locations consist of fleet terminal facilities, airports, and river crossings (bridges and tunnels) where vehicles frequently travel. The City has installed 450 RSUs to support the connected vehicle infrastructure as indicated above.

1.3   Purpose of the Operational Capability Showcase Plan

The NYC CVPD Operational Capability Showcase Plan (OCSP) describes the planned activities and invited speakers for the OCS. It presents a plan to execute the NYC CVPD OCS in Phase 3.

1.4   Organization of the Report

This Operational Capability Showcase Plan (OCSP) consists of the following sections:

- 2 – Operational Capability Showcase
- 3 – Structure of the Operational Capability Showcase
- 4 – Resources Developed for the Operational Capability Showcase
- 5 – Engagement with Media
- 6 – Post-Operational Capability Showcase Activities
- 7 – References
- 8 – Acronyms

2. Operational Capability Showcase

2.1 Objective of the OCS

The purpose of the Operational Capability Showcase (OCS) is to provide a media event that shows the capabilities, intent, and value of CV technology deployment. For NYC, the intent is to showcase the CV technology being deployed and operating in an urban environment and avoid being a structured demonstration such as the Operational Readiness Demonstration (ORD) in Phase 2.

However, the COVID-19 pandemic has been ongoing since early part of 2020 through 2021. Nonetheless, the project requirement is to hold the OCS no later than the first 12 months of Phase 3 which began on January 1, 2021. Hence, USDOT agreed to allow NYCDOT to hold a virtual OCS through the web in place of a face-to-face media gathering.

2.2 Core Operational Capability Elements

The NYC Operational Capability Showcase (OCS) will present the accomplishments of the NYC CV pilot deployment project and show how to NYC CV pilot system performs. The attendees will be able to see how the deployed V2V and V2I applications operate in NYC's urban environment. They will also learn more about how the ASDs communicate with each other and communicate with other RSUs deployed in the field. The USDOT CV interoperability video and the NYC CV safety application video will show how the applications will be triggered and how drivers will be alerted by the ASDs in the vehicles.

2.3 Anticipated Outcomes of the OCS

At the end of the virtual Operational Capability Showcase (OCS), the audience will be provided time for questions and answers to learn more about the NYC CV pilot deployment. They will be able to see the impact of NYC CV pilot deployment's emphasis and focus on safety goals and benefits. Also, they will be able to understand how the NYC CV pilot deployment could evolve into a sustainable infrastructure to support USDOT's goals for CV interoperability and standardization. The lessons learned presented during the virtual NYC OCS could be shared with the general public to help and encourage current and future CV deployers in other parts of the country and the world.
The audience will learn where to find additional resources describing the project, its performance, and continued operations.

3. Structure of the Operational Capability Showcase

3.1 OCS Location Details

The NYC Operational Capability Showcase (OCS) will be held virtually on July 20, 2021 from 1:30 to 2:30pm Eastern Time (ET). NYCDOT will coordinate with Intelligent Transportation Society of America (ITS America) and Institute of Transportation Engieners (ITE) to host the virtual NYC OCS and provide an external link (i.e. Adobe Connect) for attendees to join. Ahead of the virtual OCS, the NYCDOT team had planned on pre-recording most of the presentation for all speakers except for those speaking in the welcome and introduction section and questions and answers. However, the decision was made to conduct the entire webinar live.

3.2 Demonstration Elements

Because the NYC Operational Capability Showcase (OCS) will not be an in-person event, no demonstration will occur during the OCS. Instead, videos of the operation of the various safety applications in selected City vehicles will be used to provide the viewer with an understanding of the driver experience.

3.3 Roles and Responsibilities

NYCDOT will be responsible for organizing and executing the Operational Capability Showcase (OCS). Multiple speakers will be invited to participate in the virtual NYC OCS event. The NYCDOT team will prepare OCS presentation slides and prepare scripts for the USDOT speakers. This section describes the speakers' roles and responsibilities as well as the themes each speaker will address.

3.3.1 USDOT Speakers

The following USDOT members will be speaking during the OCS:

- Ken Leonard, Director of ITS Joint Program Office (JPO)
    - Opening remarks for the virtual NYC CVP OCS
- Jonathan Walker, Chief of Policy, Architecture, and Knowledge Transfer
    - Transition remarks from welcome and introduction to project overview and accomplishments
    - NYC CV Pilot's focus on interoperability

- Arthur O'Connor, Sr. ITS/Operations Engineer, Office of Program Management
  - o Final remarks on program success, deployment experience in an urban environment, and next steps on NYC CV pilot.

3.3.2 NYCDOT CV Pilot Team Speakers

3.3.2.1 NYCDOT Speakers

The following NYCDOT members will be speaking during the OCS:

- Margaret Forgione, NYCDOT First Deputy Commissioner
  - o Connected vehicle technology contributing to Vision Zero
  - o Lessons learned applying CV technology in the urban environment

- Mohamad Talas, Director of ITS Management and System Engineering
  - o Vision zero goals

3.3.2.2 DCAS Speakers

The following NYC Department of Citywide Administrative Services (DCAS) member will be speaking during the OCS:

- Keith Kerman, Chief Fleet Officer and Deputy Commissioner
  - o Partnership between USDOT and NYCDOT
  - o DCAS' Safe Fleet Transition Plan
- Eric Richardson, Deputy Chief Fleet Management Officer
  - o Stakeholder contributions
  - o Connected vehicle safety, augmenting the operational data provided by Geotab (i.e. driver driving without a seatbelt, speeding, idling too long)

3.3.2.3 Additional Speakers

The following additional speakers from the NYC CV Pilot consulting team will be speaking during the OCS:

- David Benevelli, JHK
  - o Discussion of the traffic operational needs from the ConOps
    - ▪ Reduce vehicle crashes
    - ▪ Manage vehicle speed
    - ▪ Evaluate CV technology for other uses (i.e. EVACINFO, PEDINXWALK, PED-SIG for visually-impaired pedestrians)

- Kaan Ozbay, NYU
  - o Pedestrian information device (PID) and PED application for the visually-impaired pedestrians

- Keir Opie, Cambridge Systematics
  - Safety as the primary benefit (reduce crashes) and performance metric for evaluation, with mobility being a side benefit
  - Additional NYC CV Pilot resources: NYC CV Pilot web site, publicly available data via ITS Public Data Hub (PDH) and data dashboard

- Bob Rausch, JHK
  - Goal of trying to deploy CV technology in the challenging urban environment
  - Data collection
  - Transition from DSRC to C-V2X
  - Lessons learned: three (3) most important ones from NYC CVP
    - Direct them to RSU and ASD lessons learned
    - Tools for deploying (i.e. SET-IT/ARC-IT, standards)
    - Operational contributions
      - Dealing with first and last radio frequency (RF) sighting for verifying equipment
      - Integrating capabilities of the SCMS to NYC CVP operations
      - Safety application and CV system performance, trying to measure performance in a diverse, urban ecosystem/landscape with various means of location determination application and configuration

3.4 Final Agenda

The final agenda for the virtual OCS is shown in Table 1 below. The total duration will be 1 hour that includes 45 min for the presentation and 15 minutes for questions and answers.

Table 1. NYC Operational Capability Showcase Agenda (Final)

#	Subject	Duration	Description	Speaker
1	Welcome and Introduction	7 min	Master of Ceremonies: Mohamad Talas introduces the speakers	• Ken Leonard – USDOT Director of ITS Joint Program Office (JPO) • Margaret Forgione – NYCDOT First Deputy Commissioner • Keith Kerman – NYC DCAS Chief Fleet Officer and Deputy Commissioner
2	Interoperability	7 min	• USDOT CV interoperability video • CVP Project Coordination Goals (Documentation	Jonathan Walker – Chief of Policy, Architecture, and Knowledge Transfer, USDOT ITS JPO

			consistency, common system engineering approaches, etc.)	
3	Project Overview and Accomplishments	14 min	• Goals • Safety applications ○ V2V, V2I, PED App • NYC CV safety application / driver training video • PED-SIG application challenges	• Mohamad Talas – Director of ITS Management and System Engineering, NYCDOT Traffic Operation • David Benevelli – Associate Vice President, JHK • Kaan Ozbay – Professor at the Department of Civil and Urban Engineering (CUE) and Director of the C2SMART Center, NYU Tandon School of Engineering
4	Stakeholder Outreach	3 min	Stakeholder outreach coordination	Eric Richardson – Deputy Chief Fleet Management Officer, NYC DCAS
5	Performance Measurement to Date	4 min	• Safety • Mobility	Keir Opie – Director of Simulation and Traffic Analysis | Principal, Cambridge Systematics

6	Additional Resources	3 min	• NYC CV Pilot web site
			• Publicly available data:
			   ○ ITS Public Data Hub
			   ○ Data Dashboard
				Keir Opie – Director of Simulation and Traffic Analysis | Principal, Cambridge Systematics

7	Conclusion and Next Steps	5 min	• Lessons Learned • Urban Environment • Scale • Operations/Maintenance • Fleet Management • Security Scaling • Safety Application Performance	Bob Rausch – Vice President, JHK
8	Next Steps	2 min	• Program Success • Urban Environment Model experience • Next Steps	Arthur O'Connor – Sr. ITS/Operations Engineer, USDOT/FHWA Office of Program Management
	Q&A	15 min		

3.5   Invited Non-Media Attendees

In addition to the speakers described in the previous sections, additional non-media attendees will be invited to attend the NYC CVP Operational Capability Showcase (OCS). They are as follows:

- Joshua Benson – Deputy Commissioner for Traffic Operations, NYCDOT
- John Tipaldo – Associate Deputy Commissioner, NYCDOT
- Cordel Schachter – Chief Technology Officer, NYCDOT
- Sunil Nair – Chief Officer of Bus Technology, MTA

As the OCS will be held virtually, additional attendees may be invited per instructions by USDOT and NYCDOT.

4. Resources Developed for the Operational Capability Showcase

4.1 Presentation

The final slides for the virtual NYC Operational Capability Showcase (OCS) presentation will be provided in the OCS Summary (OCSS) deliverable. This is described further in Section 6 of this OCSP document.

4.2 Videos

The following videos will be shown during the virtual NYC Operational Capability Showcase (OCS) event:

- NYC CV safety application / driver training video
- USDOT CV interoperability video

4.3 Press Release and Project Fact Sheet

NYCDOT will develop and provide a press release and an updated project fact sheet for advertising the virtual OCS event. This will summarize the project goals, applications, infrastructure, and some of the observations and data collected to date. The NYCDOT team will consider making these available for download during the virtual OCS event. This is described further in Sections 5 and 6.

5. Engagement with Media

5.1 Invitations

As the organizer of the NYC Operational Capability Showcase (OCS), NYCDOT will coordinate with ITS America and ITE to send the official invitation electronically. Should this be available, a copy will be provided in the OCS Summary (OCSS). This is described further in Section 6.

5.2 Engagement Activities

As the organizer of the NYC Operational Capability Showcase (OCS), NYCDOT will send out a press release and project fact sheet for this event, if requested. If available, a copy of the press release will be provided in the OCS Summary (OCSS). This is described further in Section 6.

5.3 Invited Media

The list of invited media has not been determined at this time. Should this information become available, the OCSP will be updated accordingly.

6. Post-Operational Capability Showcase Activities

6.1 OCS Summary

Following the NYC Operational Capability Showcase (OCS), the results and observations of the OCS will be recorded and documented in the OCS Summary (OCSS). The OCSS will include the following elements:

- Final documents and material from the OCS
- Copy of press release and project fact sheet (if requested)
- List of OCS attendees
- Questions and answers, comments, and action items raised during the OCS
- List of any media articles produced after the OCS
- Copy of media invitations (if available)

The OCSS will provide lessons learned about interfacing with the general audience during the virtual OCS and the stakeholder engagement process. In addition, a separate webinar on highlights of the virtual OCS event may be held in the later part of 2021 per USDOT instruction.

6.2 Continued Engagement

The NYC Operational Capability Showcase (OCS) presentation will be transmitted to USDOT. After the virtual OCS event, the presentation will be shared with the public, in particular those who have demonstrated keen interest in the NYC CV Pilot. NYCDOT will submit the CV application video shown during the virtual OCS event and post it on its CVP website (https://www.cvp.nyc). In addition, the final 508-compliant version of this Operational Capability Showcase Plan (OCSP) will be posted on the USDOT's CV Pilots website (https://www.its.dot.gov/pilots/index.htm).

7. References

Table 2 below lists the references used for this Operational Capability Showcase Plan (OCSP) document.

Table 2. References

#	Document (Title, source, version, date, location)
1	Galgano, S., Talas, M., Benevelli, D., Rausch, R., Sim, S., Opie, K., Jensen, M., Stanley, C., Connected Vehicle Pilot Deployment Program Phase 1, Concept of Operations (ConOps) - New York City, April 8, 2016 FHWA-JPO-16-299.
2	Connected Vehicle technology is coming to the streets of New York City! This technology holds the potential to make our streets safer and smarter. https://www.cvp.nyc

8. Acronyms

Table 3 below provides a list of the acronyms used in this Operational Capability Showcase Plan (OCSP) document.

Table 3. Acronym List

Acronym / Abbreviation	Definition
AO	AOR
AOR	Agreement Officer Representative
ASD	Aftermarket Safety Devices
ASTC	Advanced Solid-state Traffic Controller
ATC	Advanced Traffic Controller
BSM	Basic Safety Message
ConOps	Concept of Operations
C-V2X	Cellular vehicle to everything
CV	Connected Vehicle
CVPD	Connected Vehicle Pilot Deployment
DSRC	Dedicated Short Range Communications
FHWA	Federal Highway Administration
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
I2V	Infrastructure-to-Vehicle
IE	Independent Evaluator
ITE	Institute of Transportation Engineers
ITS	Intelligent Transportation System
ITS PDH	ITS Public Data Hub
ITSA	Intelligent Transportation Society of America
MAP	Map Data Message
MTA	Metropolitan Transportation Authority
NYC	New York City
NYCDOT	New York City Department of Transportation

OBU	Onboard Unit
OCS	Operational Capability Showcase
OCSP	Operational Capability Showcase Plan
OCSS	Operational Capability Showcase Summary
ORD	Operational Readiness Demonstration
OTA	Over-the-Air
PASS	Pedestrians for Accessible and Safe Streets
PED	Pedestrian
PID	Pedestrian Information Device
RF	Radio Frequency
RSU	Roadside Unit
SCMS	Security Credential Management System
SDC	Secure Data Commons
SPaT	Signal Phase and Timing
TCS	Traffic Control System
TIM	Traveler Information Message
TIS	Traveler Information System
TSN	Traffic Safety Network
V2I	Vehicle-to-Infrastructure
V2V	Vehicle-to-Vehicle
VRU	Vulnerable Road User
USDOT	United States Department of Transportation

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