



Sixth Annual Richmond Region Transportation Forum

Think Big and Make No Little Plans

Virginia Lingham, P.E.

Connected and Automated Vehicle Program Manager

Office of Strategic Innovation

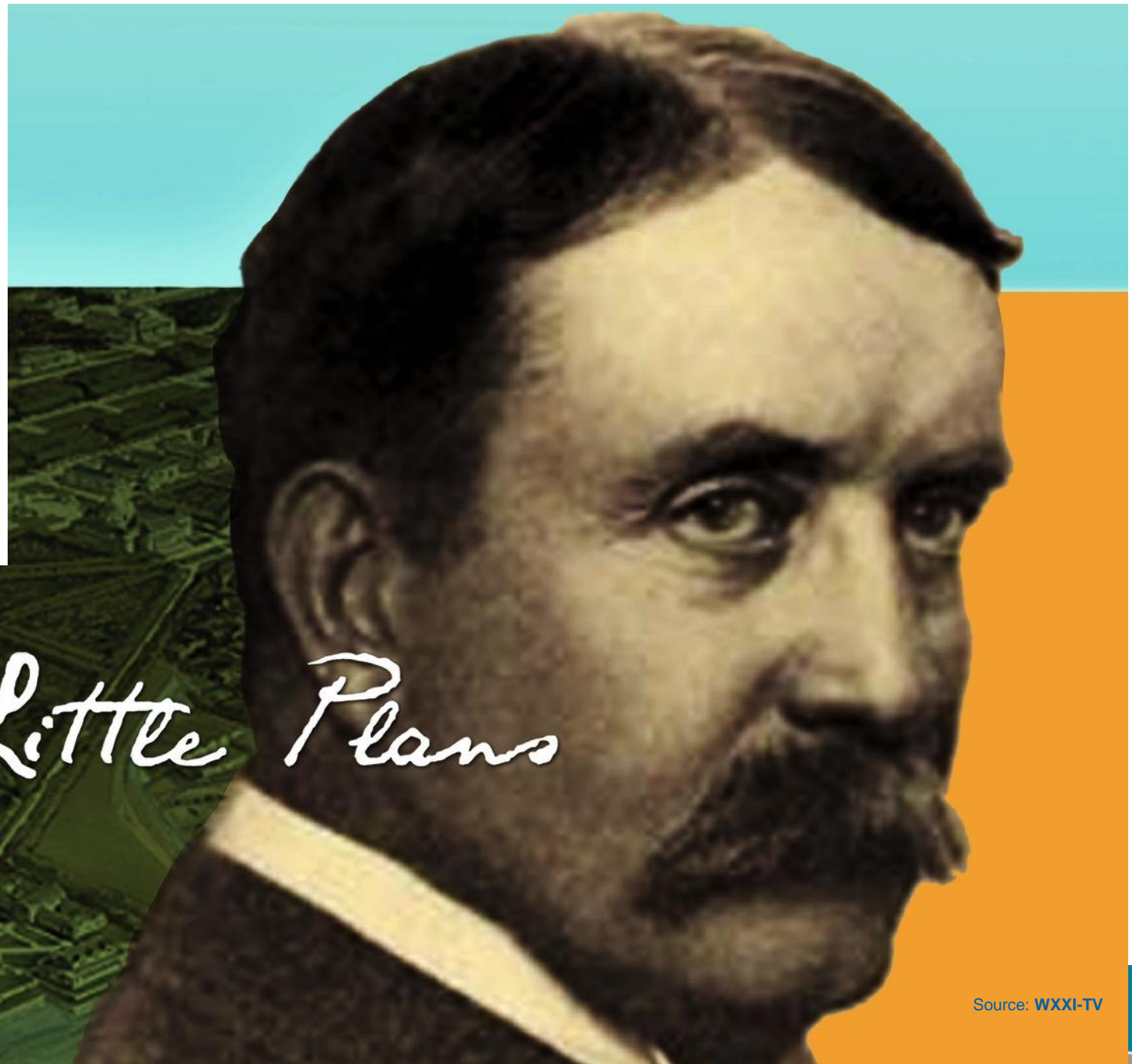
Virginia Department of Transportation

November 29, 2018

Make no little plans; they have no magic to stir men's blood and probably themselves will not be realized. Make big plans; aim high in hope and work, remembering that a noble, logical diagram once recorded will never die, but long after we are gone will be a living thing, asserting itself with ever-growing insistency.

—DANIEL BURNHAM

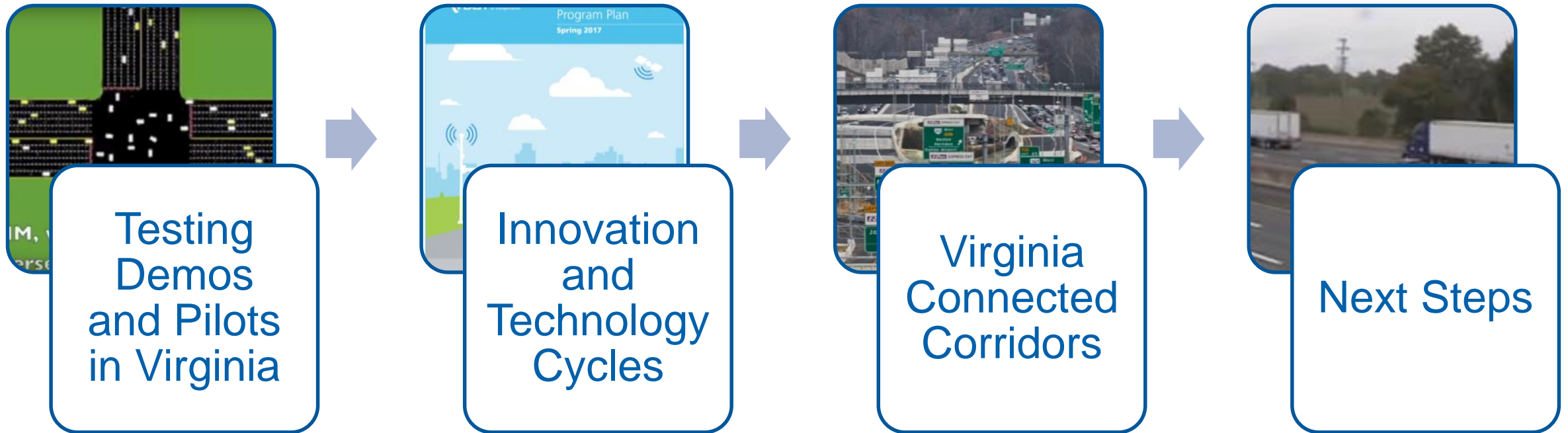
Make No Little Plans



Source: WXXI-TV

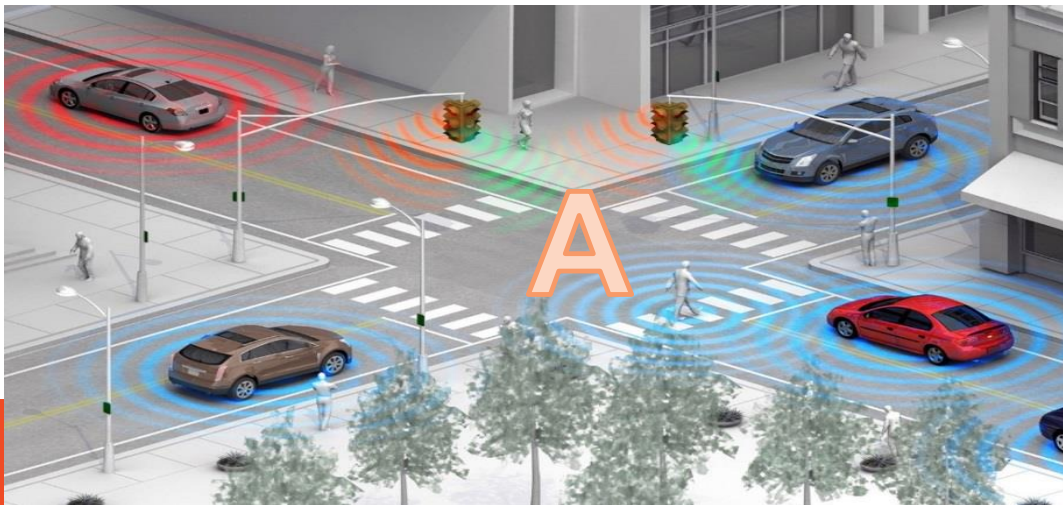
Image Source: <https://www.flickr.com/photos/sg09/8401320130/qohjilqishq>

Overview



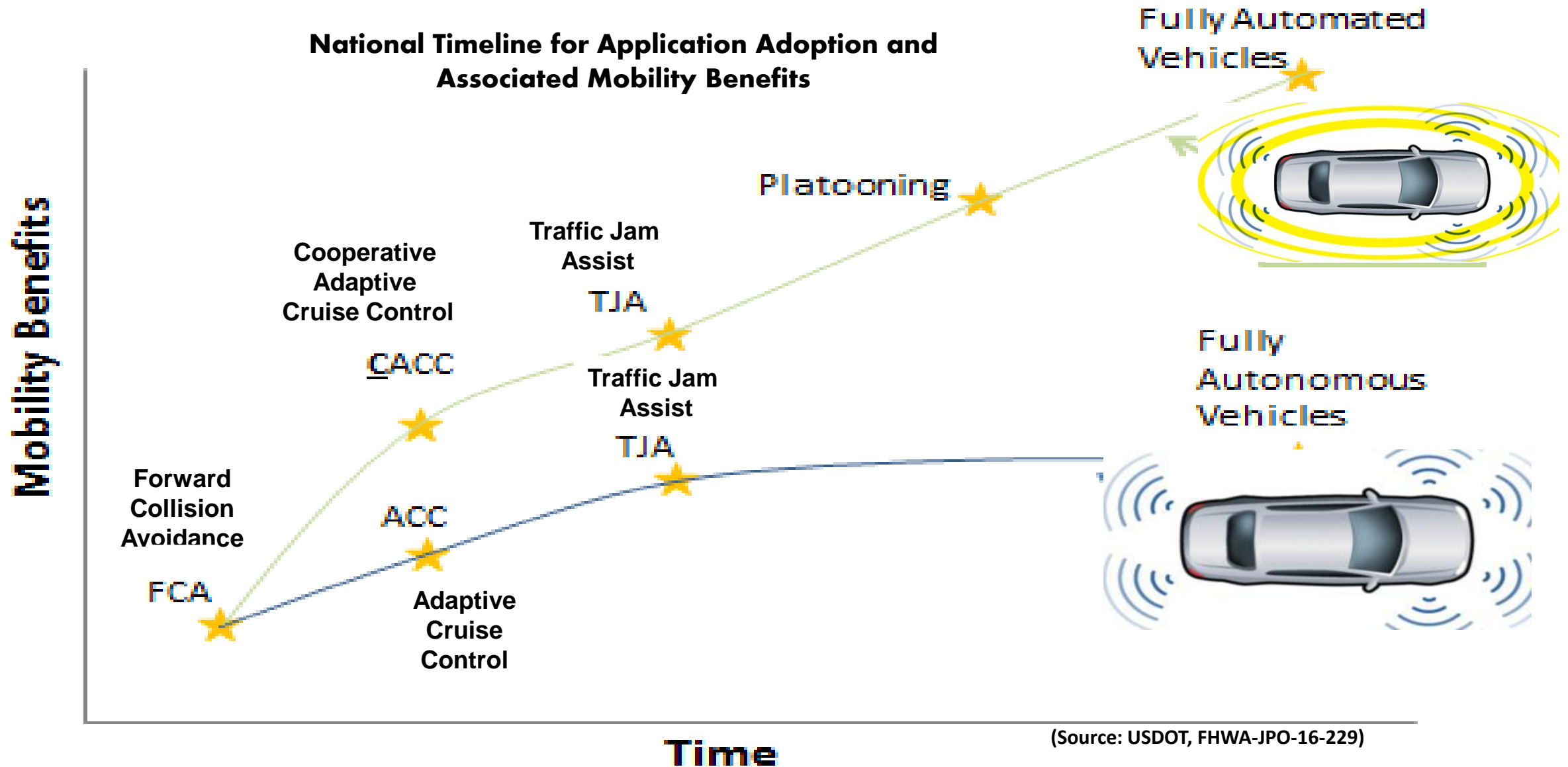
Quiz Time!

- **Connected Vehicle Environment**
- **Autonomous Vehicle (Self-Driving)**
- **Automated Vehicles**


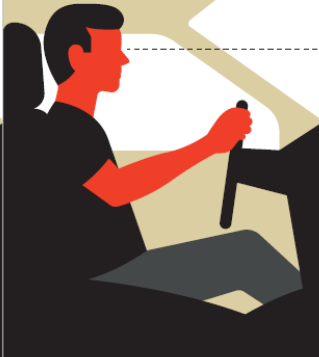
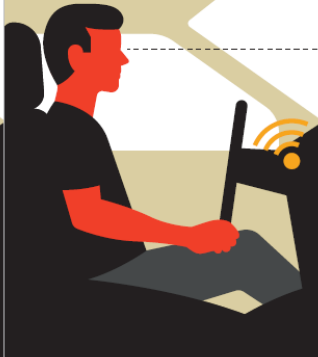

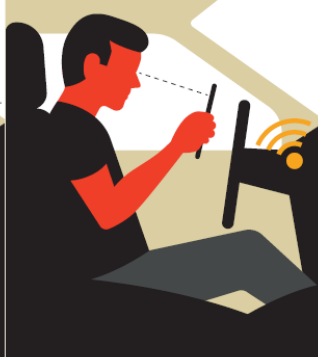



Why Connect?

What Benefits Can We Expect?



Levels of Vehicle Autonomy

				Automated Driving Systems (ADS)		
	Level 0 No Automation	Level 1 Driver assistance	Level 2 Partial automation	Level 3 Limited self-driving (conditional automation)	Level 4 Full self-driving under certain conditions (high automation)	Level 5 Full self-driving under all conditions (full automation)
Vehicle	No automation.	Can assist driver in some situations.	Can take control of speed and lane position in certain conditions.	Can be in full control in certain conditions and will inform the driver to take control.	Can be in full control for the entire trip in these conditions and can operate without a driver.	Can operate without a human driver and need not have human occupants.
Driver						
	In complete control at all times.	Must monitor, engage controls, and be ready to take over control quickly at any moment.	Must monitor and be ready to take over control quickly at any moment.	Must be ready to take control quickly when informed.	Not needed	Not needed

Source: GHSA

Testing, Demos, and Pilots are Active in Virginia

Virginia Tech Transportation Institute Fall 2017



More info at
<https://www.youtube.com/watch?v=EwujR1ARsog>

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FHWA Truck Platooning Demonstration on I-66

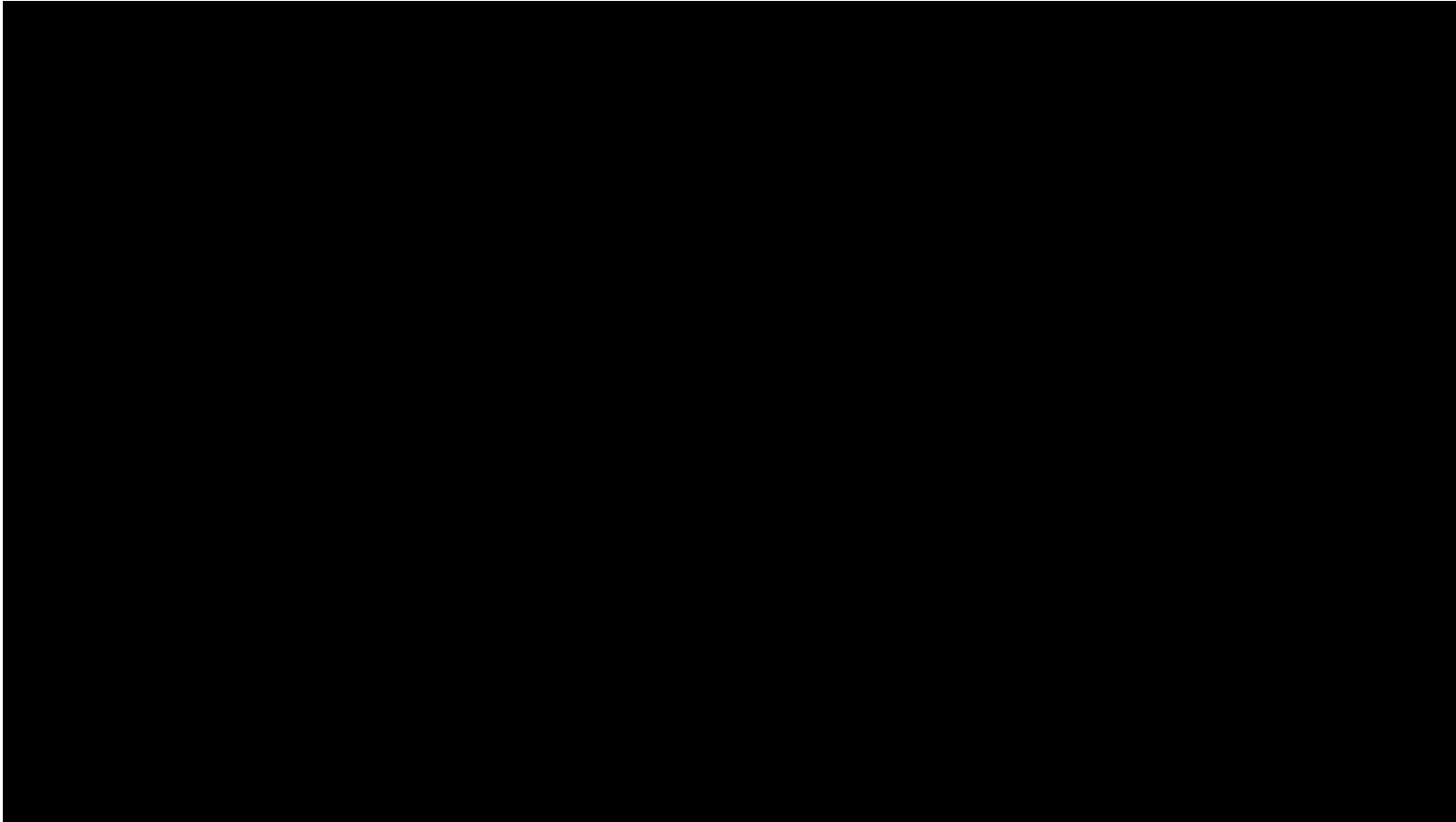
September 13-15, 2017



More info at <https://www.youtube.com/watch?v=iNTKqh7i5jQ>

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Testing, Demos, and Pilots are Active in Virginia (cont.)

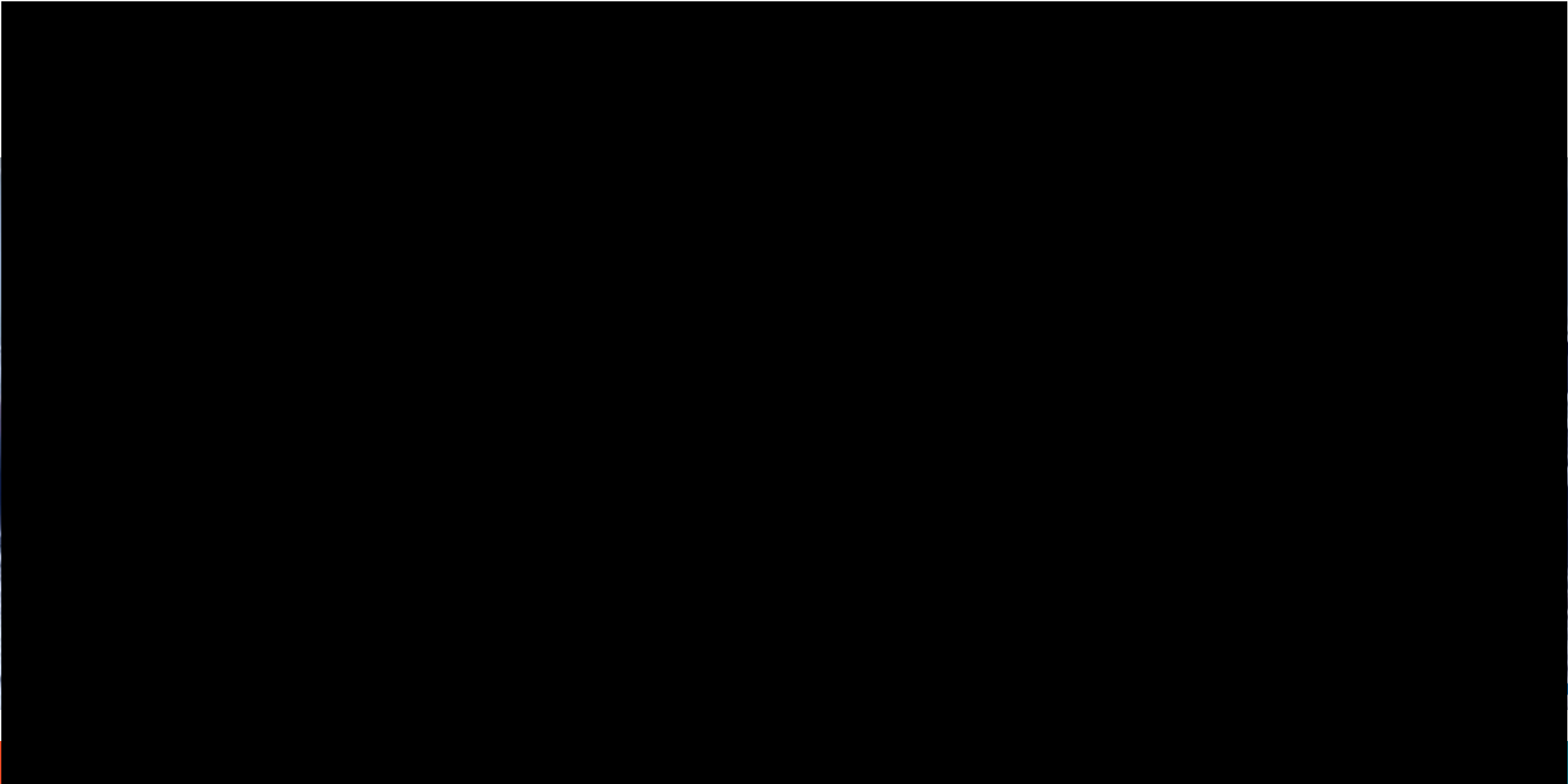
FHWA Connected Vehicle Testing on I-95 Express Lanes June 2018



Source: USDOT

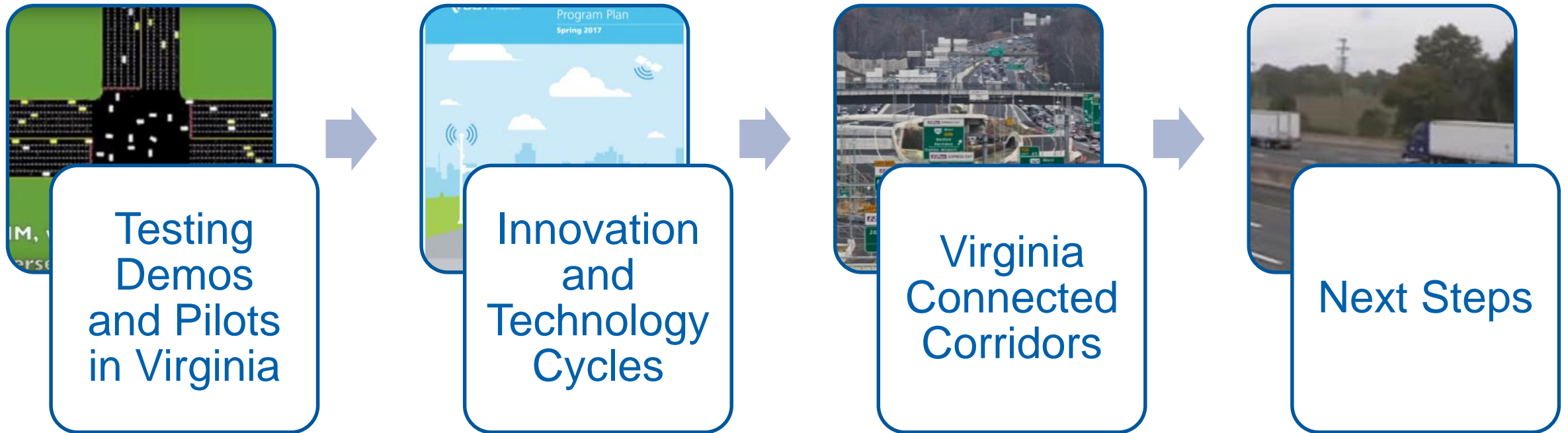
More info at <https://www.youtube.com/watch?v=EwujR1ARsog>

Testing, Demos, and Pilots are Active in Virginia (cont.)



OT

Overview



expectations

On the Rise

At the Peak

Sliding Into the Trough

Climbing the Slope

Entering the Plateau

Supplier proliferation

Activity beyond early adopters

Negative press begins

Mass media hype begins

Early adopters investigate

Supplier consolidation and failures

First-generation products, high price, lots of customization needed

Second/third rounds of venture capital funding

Startup companies first round of venture capital funding

Less than 5 percent of the potential audience has adopted fully

Methodologies and best practices developing

High-growth adoption phase starts: 20% to 30% of the potential audience has adopted the innovation

Third-generation products, out of the box, product suites

Second-generation products, some services

R&D

Technology Trigger

Peak of Inflated Expectations

Trough of Disillusionment

Slope of Enlightenment

Plateau of Productivity

time

Gartner's Technology Hype Curve
(gartner.com)

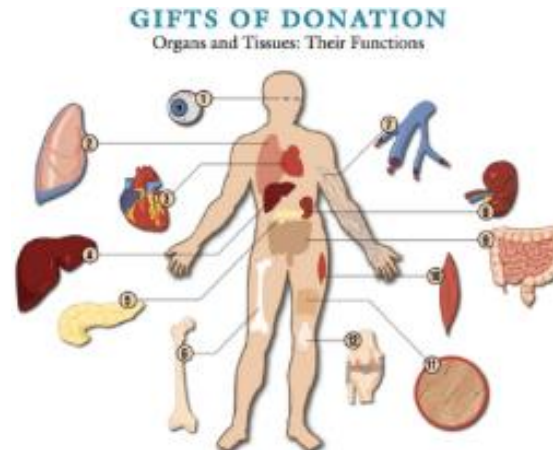
Soooo, what's really happening out there?

Tesla Driver Gets Auto-Pilot Ticket Dismissed After 'Driving' With Feet Out Window

Published March 7, 2018 at 12:10 am PDT
By Jeff Mazzeo, Gary Trock, Ryan Naumann, Mike Walters



SHARE
A DJ who got busted for driving while on his cellphone, and with his FEET HANGING OUT THE WINDOW, just got off the hook because his car was self-driving and he was merely along for the ride.



Uber

Self-driving Uber kills Arizona woman in first fatal crash involving pedestrian

Tempe police said car was in autonomous mode at the time of the crash and that the vehicle hit a woman who later died at a hospital



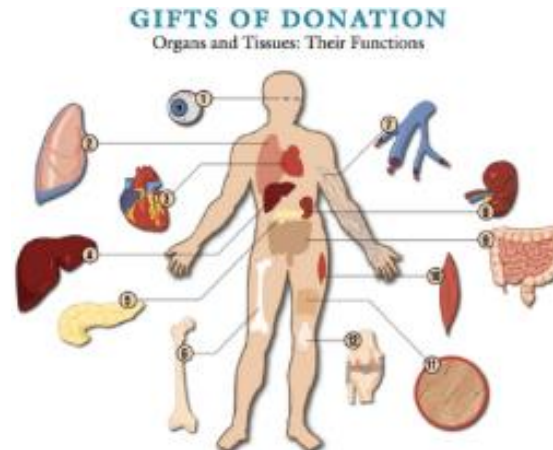
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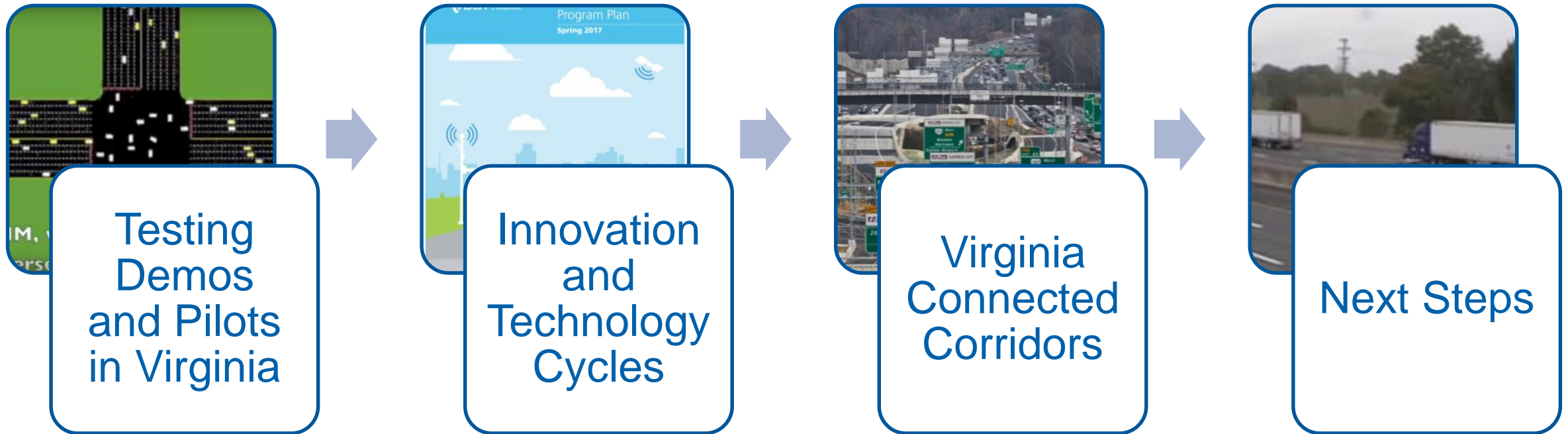
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Overview



VDOT's Vision for Connected and Automated Vehicles

VDOT envisions a future environment where Connected and Automated Vehicle applications provide connectivity between vehicles, roadside infrastructure and wireless devices.

This interconnected environment is expected to meet the following objectives:

- **Increased Safety**
- **Improved Mobility**
- **Reduced Infrastructure Investments**
- **Enhanced Traveler Information**



Virginia's Unique Strengths



Diverse highway system with a good state of repair



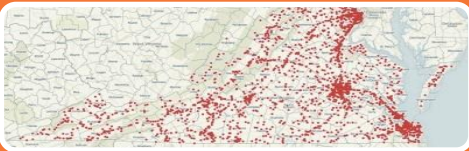
An “Open-for-business” regulatory environment for innovative transportation solutions



Data driven commitment to innovation



Trusted world-class research and testing capabilities



Capable knowledge based work force, including a strong military presence.

Focus Areas of the Connected and Automated Vehicle Program



**Outreach
and
Coordination**



Leadership



Deployments



Planning



Policy



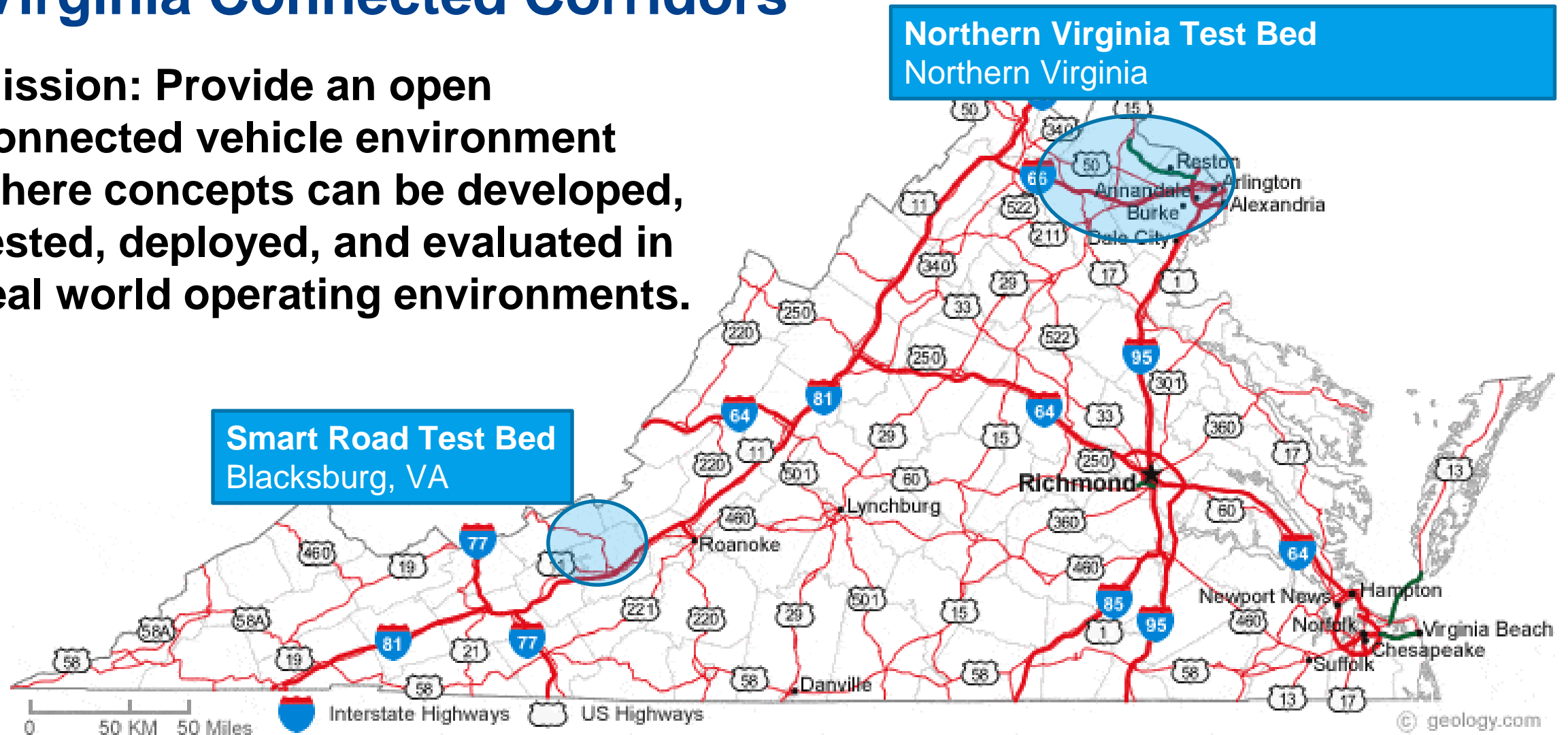
Virginia Connected Corridors Partnership

To facilitate the understanding of CV deployment, the Virginia Department of Transportation has partnered with the Virginia Tech Transportation Institute to create the Virginia Connected Corridors.



Virginia Connected Corridors

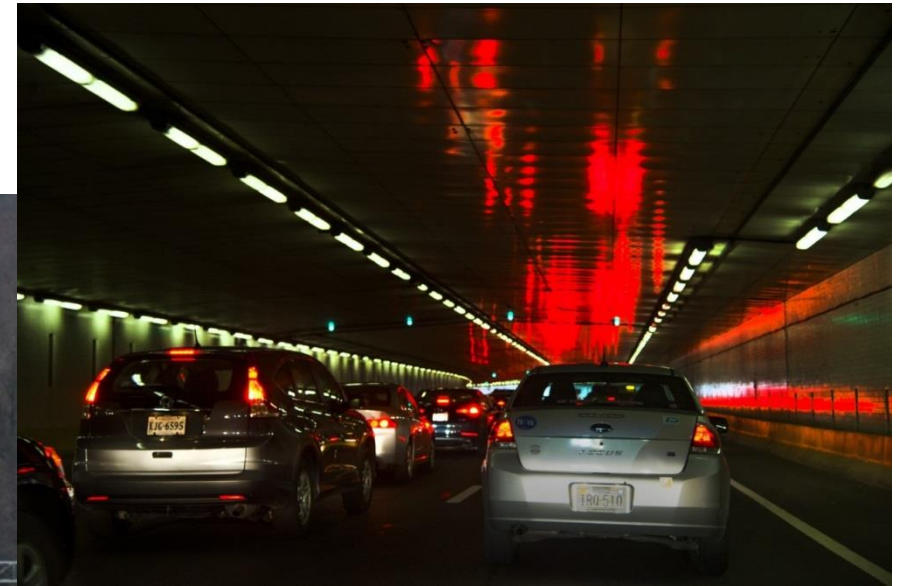
Mission: Provide an open connected vehicle environment where concepts can be developed, tested, deployed, and evaluated in real world operating environments.



Smart Roads at Virginia Tech Transportation Institute



Northern Virginia Challenges



Legend:

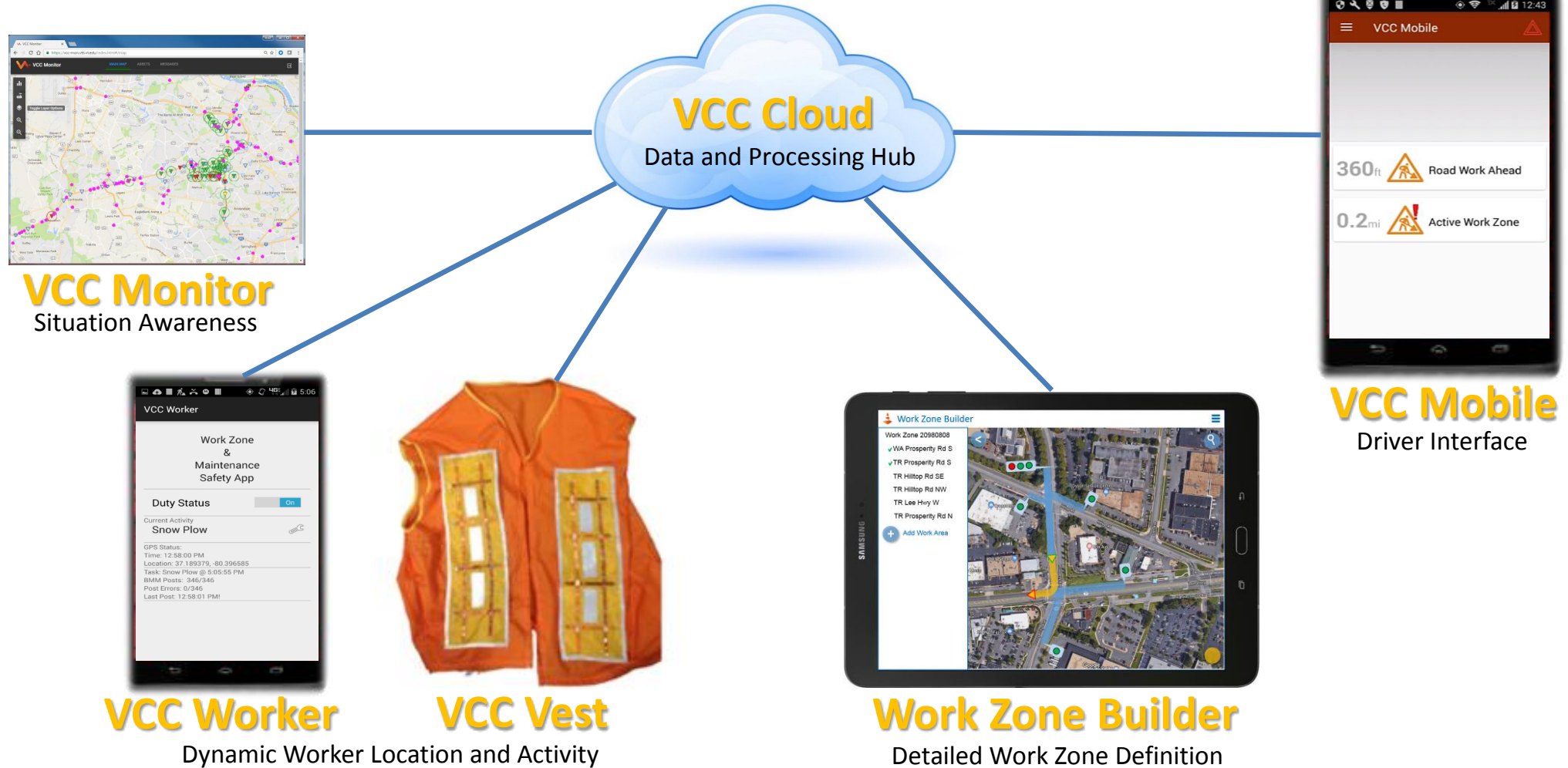
- Arterial/Intersection RSUs (30)
- Freeway RSUs (19)

RSU: Cohda MK5

The test beds include cellular communications to support cellular-based applications

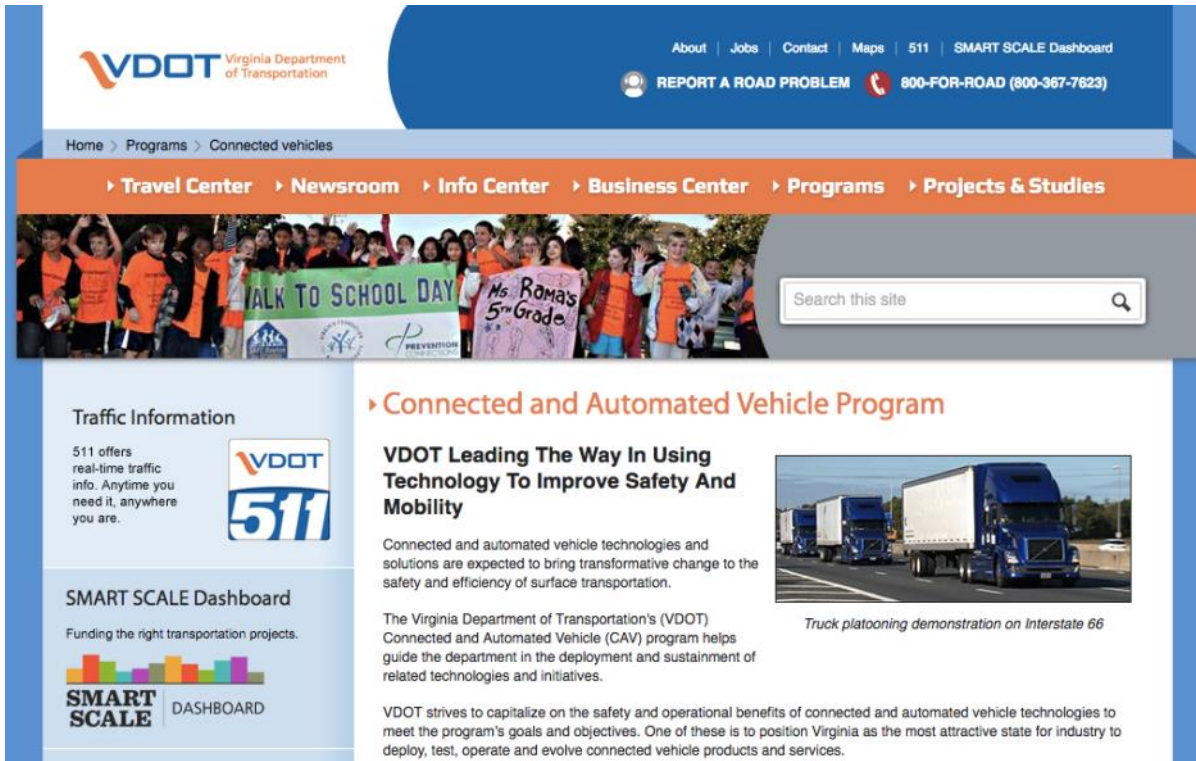
The test beds include cellular communications to support cellular-based applications

VCC Work Zone Components



Contact us for more information!

Please visit <http://virginiadot.org/automated>



The screenshot shows the VDOT website with a blue header containing navigation links: About, Jobs, Contact, Maps, 511, and SMART SCALE Dashboard. Below the header is a search bar and a navigation menu with links to Travel Center, Newsroom, Info Center, Business Center, Programs, and Projects & Studies. The main content area features a large image of a group of children holding a banner that says "WALK TO SCHOOL DAY". Below this image is a section titled "Connected and Automated Vehicle Program" with the subheading "VDOT Leading The Way In Using Technology To Improve Safety And Mobility". The text describes the program's goals and objectives, mentioning the deployment and sustainment of related technologies and initiatives. A small image of a truck platooning demonstration on Interstate 66 is also shown.

VDOT Virginia Department of Transportation

About | Jobs | Contact | Maps | 511 | SMART SCALE Dashboard

REPORT A ROAD PROBLEM 800-FOR-ROAD (800-367-7623)

Home > Programs > Connected vehicles

Travel Center | Newsroom | Info Center | Business Center | Programs | Projects & Studies

Search this site

Connected and Automated Vehicle Program

VDOT Leading The Way In Using Technology To Improve Safety And Mobility

Connected and automated vehicle technologies and solutions are expected to bring transformative change to the safety and efficiency of surface transportation.

The Virginia Department of Transportation's (VDOT) Connected and Automated Vehicle (CAV) program helps guide the department in the deployment and sustainment of related technologies and initiatives.

VDOT strives to capitalize on the safety and operational benefits of connected and automated vehicle technologies to meet the program's goals and objectives. One of these is to position Virginia as the most attractive state for industry to deploy, test, operate and evolve connected vehicle products and services.

Truck platooning demonstration on Interstate 66



The screenshot shows the Virginia Connected Corridors website with a dark purple header containing navigation links: Home, About, CV Environment, Get Involved, News, and Contact. The main content area features a large white logo of a stylized 'V' with a horizontal line through it. Below the logo is the title "Virginia Connected Corridors". There are two main sections: "Get Involved" and "Access Data". The "Get Involved" section states that VDOT and VTTI are actively seeking third party application developers who are interested in developing and testing in a real-world connected vehicle environment. The "Access Data" section states that users can gain access to the VCC dataset using APIs and other standardized data access methods. Both sections have a "More Information" button.

Home | About | CV Environment | Get Involved | News | Contact

Virginia Connected Corridors

Get Involved

VDOT and VTTI are actively seeking third party application developers who are interested in developing and testing in a real-world connected vehicle environment.

More Information

Access Data

Gain access to the VCC dataset using APIs and other standardized data access methods.

More Information

National SPaT Challenge

What is the Challenge?

To challenge state and local public sector transportation IOOs to cooperate together to achieve deployment of DSRC infrastructure with SPaT broadcasts in at least one corridor or network (approximately 20 signalized intersections) in each state by January 2020.

What is SPaT?

A Signal Phase and Timing (SPaT) message defines the current intersection signal light phases. The current state of all lanes at intersection are provided, as well as any active pre-emption or priority. SPaT message defined by the SAE J2735 standard.

National SPaT Challenge Deployment Map



National SPaT Challenge Deployment Map



Source: NOCoE
Updated 5-12-17

National SPaT Challenge Deployment Map



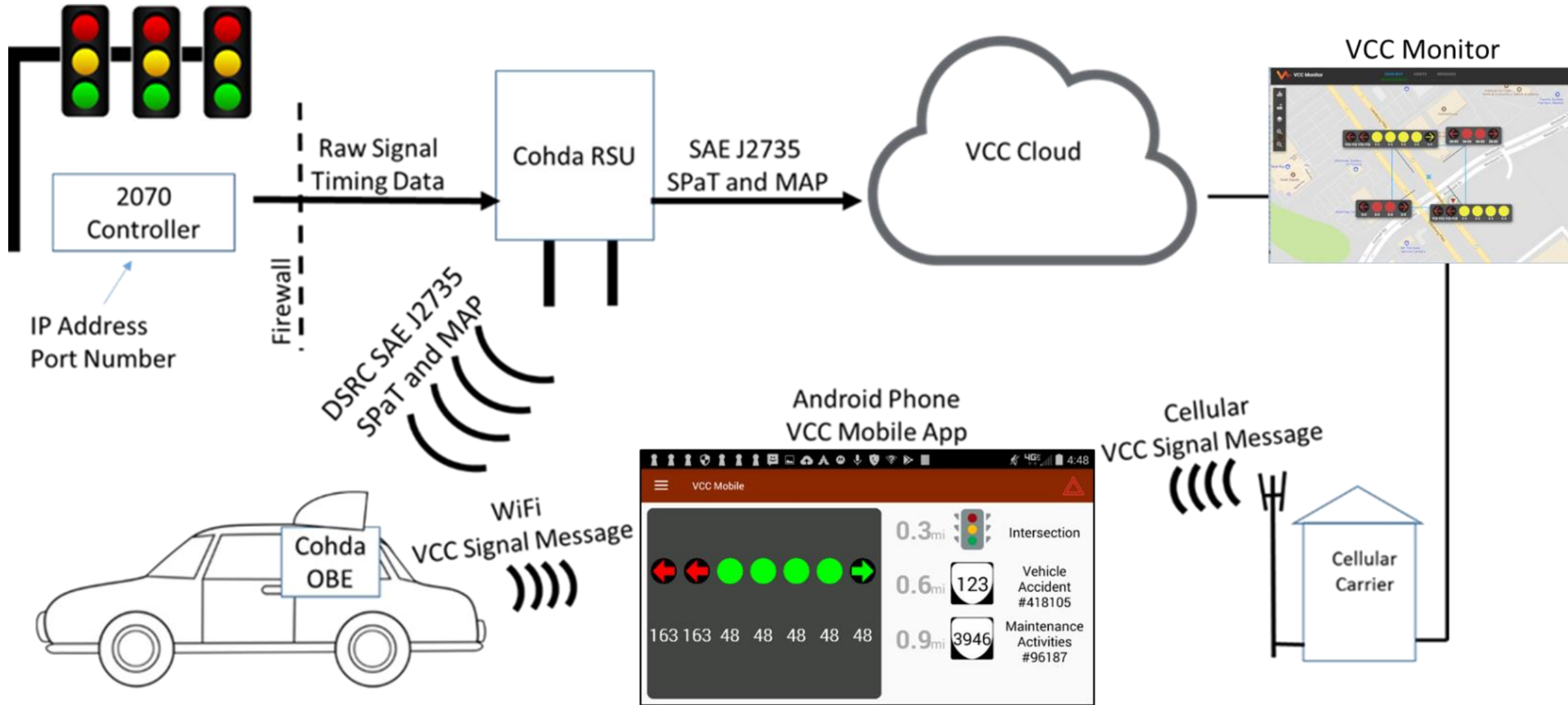
Source: NOCoE
Updated 11-17-17

National SPaT Challenge Deployment Map

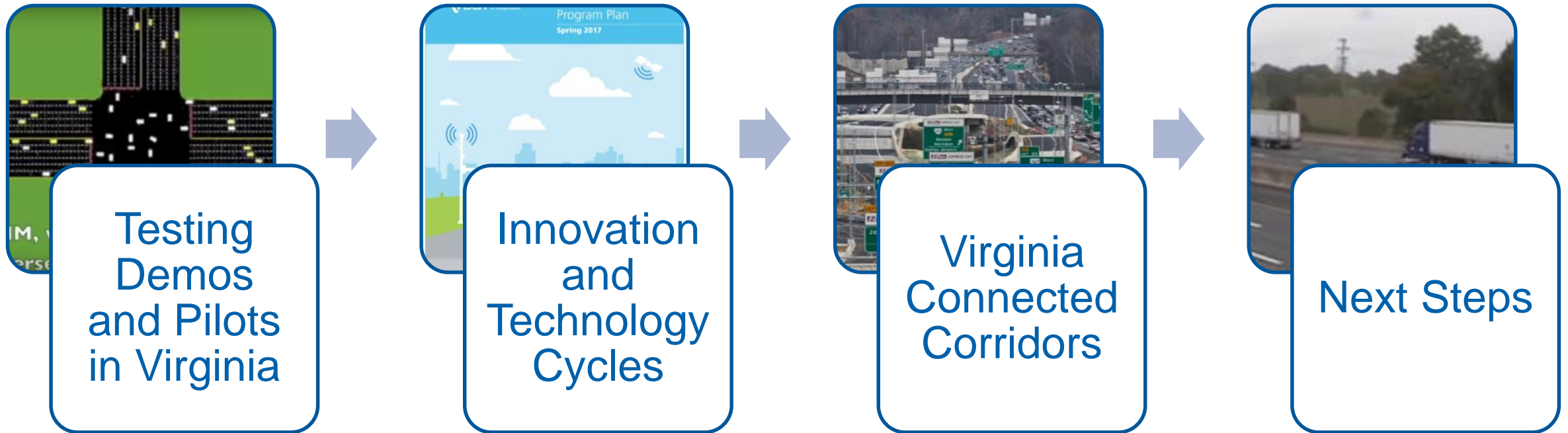


Source: NOCoE
Updated 9/10/18

Virginia Connected Corridor's SPaT Challenge Architecture



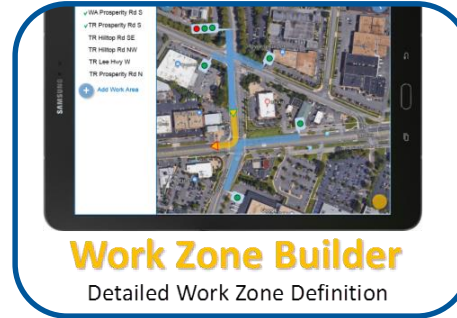
Overview



Next Steps



**Automated
Maintenance
Vehicles**



**Work Zone
Information**



**First and Last Mile
Solutions**



**Work Force
Development**



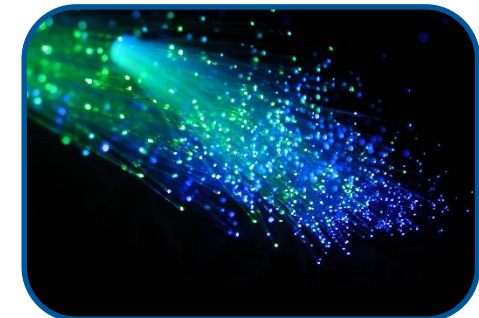
Fleet Challenge



**Industry
Coordination**



**Data Management
and Security**



**Leveraging
Broadband**

Get Involved!



ROADS&BRIDGES

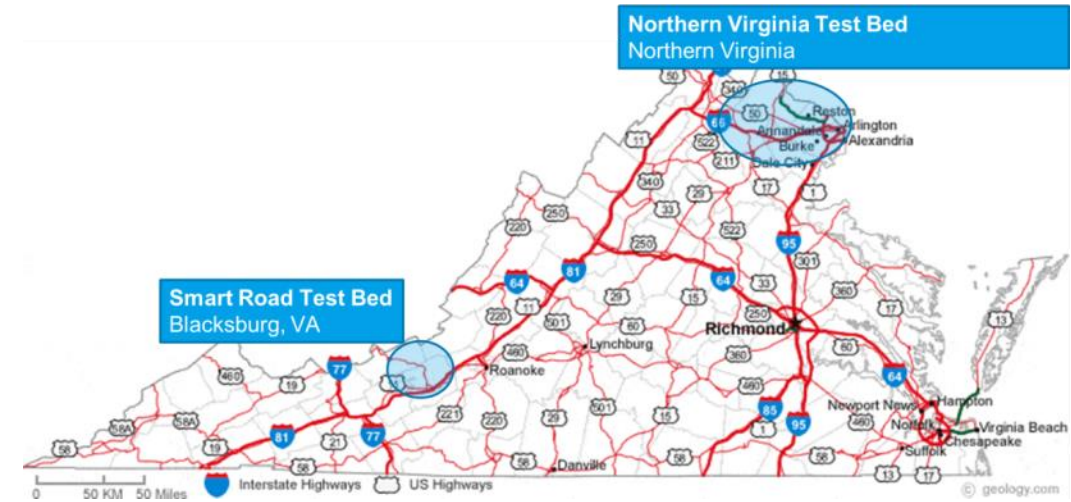


American Planning Association

Making Great Communities Happen

1

Thank you!



Virginia R. Lingham, P.E.

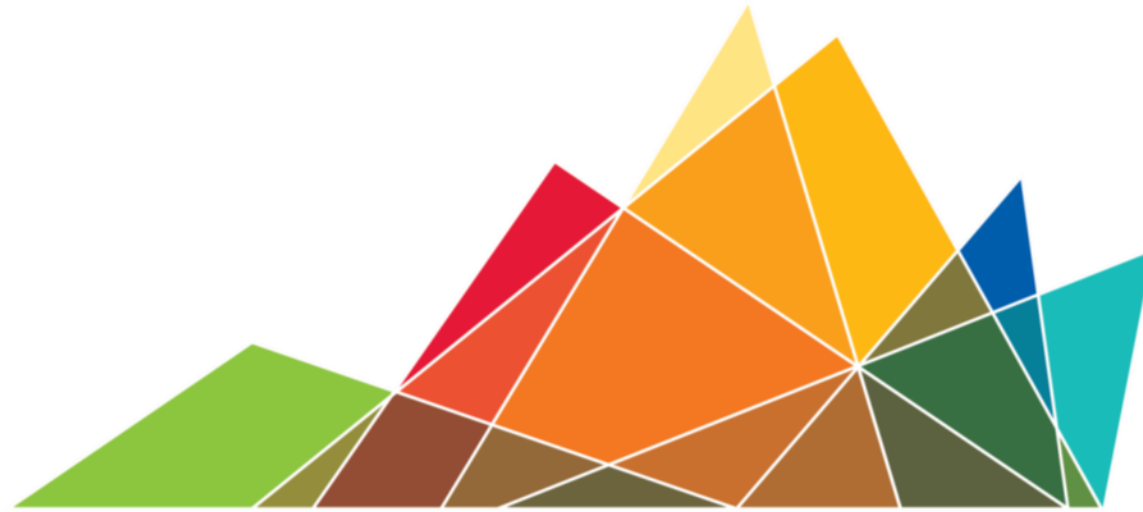
Connected and Automated Vehicle Program Manager

Office of Strategic Innovation

Virginia Department of Transportation

virginia.ingham@vdot.virginia.gov

(804) 692-0455 #SmarterRoadsVA @VaDOT



VDOT | SMARTER**ROADS**



SmarterRoads Hackathon Series



VDOT | SMARTERROADS

Hackathon

ROANOKE

[Home](#) [Participants](#) [Rules](#) [Submissions](#) [Updates](#) [Discussions](#) [Manage](#)

Use Open Data Sources To Find Transportation Solutions!

IMPORTANT: Register first at <https://nvite.com/SmarterRoadsVA/xs2m22>

The Virginia Department of Transportation presents its third installment of the SmarterRoads Hackathon and Idea Jam series.

The two-day event will be held on Friday, August 17, through Saturday, August 18, 2018, at CoLab in the heart of Gandin Villiage. CoLab is Roanoke's premier co-working space that provides an infrastructure for Roanoke's entrepreneurial ecosystem through programs, education, networking, mentorship and shared workspace.

We are seeking to attract a diverse group of developers, planners, futurists, big data lovers and problem solvers to help address Virginia's greatest transportation issues through the use of open data sets, including VDOT's SmarterRoads data portal. Your expertise is the key.

WEDNESDAY AUGUST 15

Look for teammates

You're registered for this hackathon.
[Unregister](#)

Submissions open soon

Aug 17 – 18, 2018
[view all dates](#)

CoLab

1327 Grandin Rd SW, Roanoke, VA 24015, USA

Invite others to compete

[Twitter](#) [Facebook](#) [Reddit](#)

Questions? [Email the hackathon manager](#)

#SmarterRoadsVA

SmarterRoads Hackathon & Idea Jam Objectives



Accelerate Technology Development and Implementation



Promote Existing Open Data Products

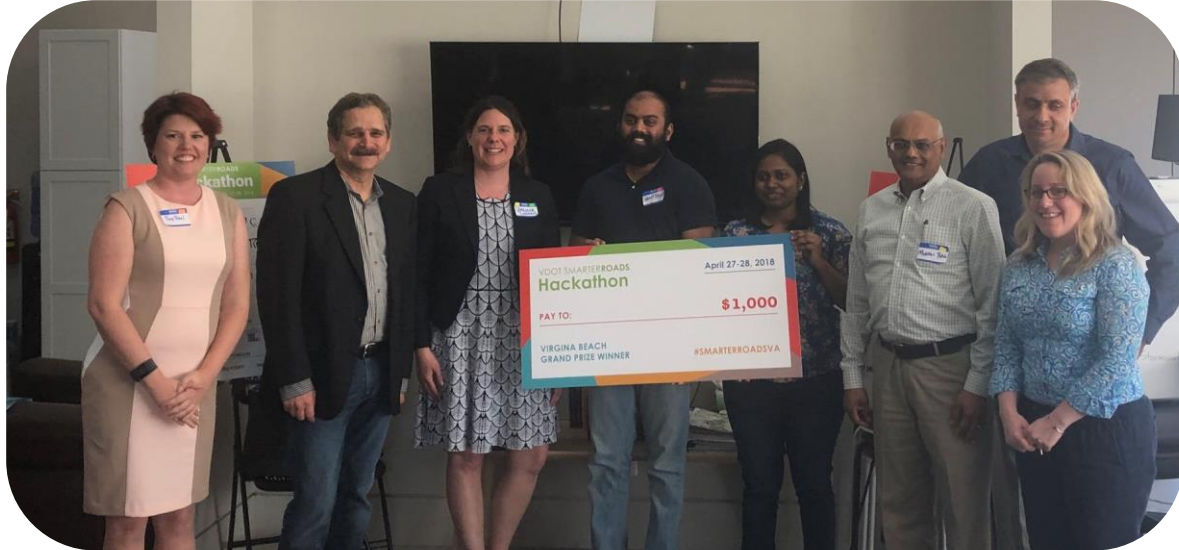


Develop and Strengthen Relationships

GOAL: Create and share a model to follow for future events

VDOT | SMARTERROADS Hackathon

VIRGINIA BEACH

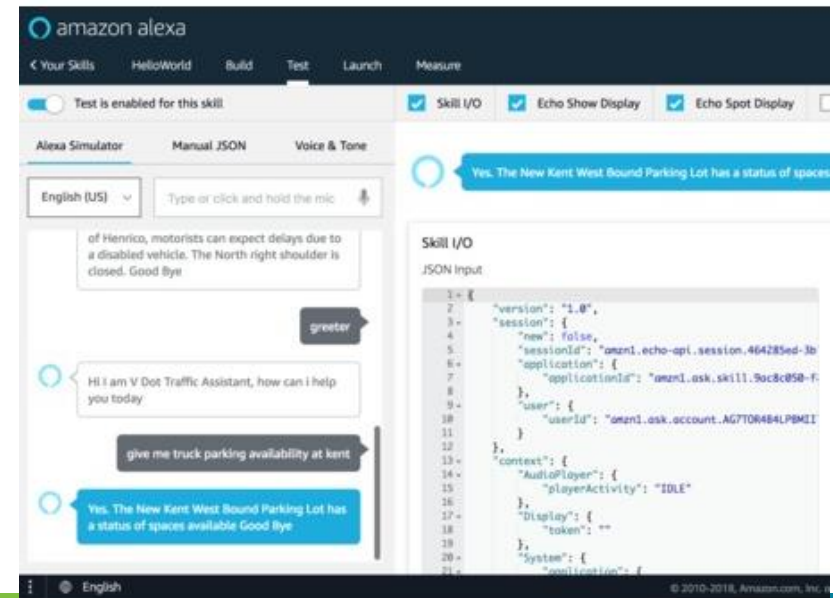


Inspiration

Availability of data sources in various places and different formats waiting to be consumed by users in an easy manner

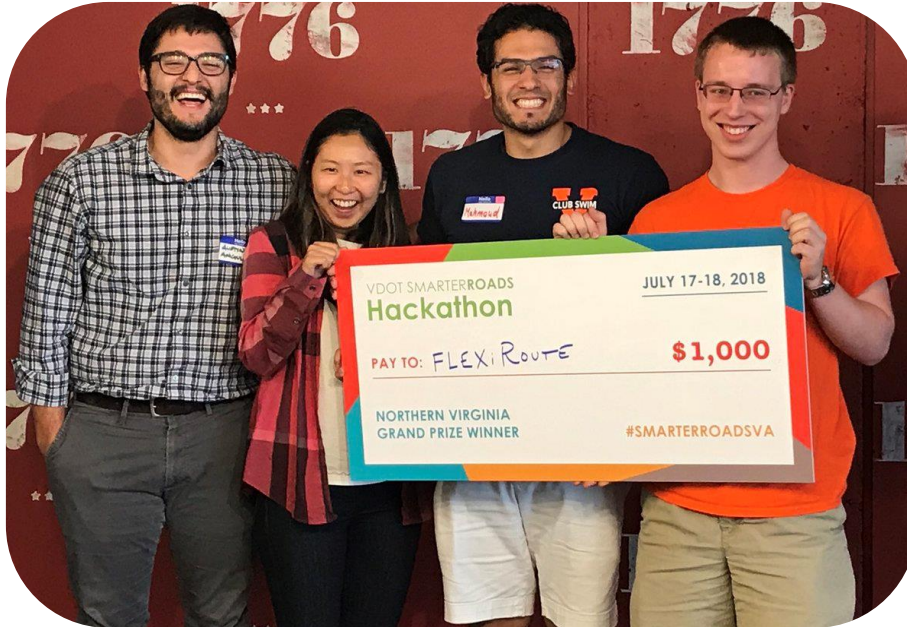
Talk DOT

This project enables users to consume traffic data and get insights through artificial intelligence and neuro-linguistic programming.



VDOT | SMARTERROADS Hackathon

NORTHERN VIRGINIA



FlexiRoute

A user oriented
customizable route
optimizer.

Suggestions

README.txt files or code snippets of APIs consuming the data would prove really useful in understanding how the data is intended to be understood.

A screenshot of a mobile application interface for 'FLEXiROUTE'. At the top, there's a status bar with various icons and the time '11:12 AM'. Below that, the app shows two address inputs: '11909 Market St, Reston, VA, 20190' and '2231 Crystal Dr, Arlington, VA, 22202'. There are four sliders for customization: 'Feeling Lucky' (set to the left), 'Duration' (set to the middle), 'Cost' (set to the left), and 'Calories Burned' (set to the right). At the bottom, the app name 'FLEXiROUTE' is displayed above a 'SEARCH' button.

VDOT | SMARTERROADS Hackathon

ROANOKE



What We learned

We learned how to develop an Android app using Android Studio. We also both improved our skills in java and learned the basics of xml.

EZ Speed

Android app designed to audibly tell the user the speed limit of the road they are on.

```
// again++;
SmartLocation.with(getBaseContext()).location().start(new OnLocationUpdatedListener() {
    //Override
    public void onLocationUpdated(Location location) {
        String lat = String.valueOf(location.getLatitude());
        String lon = String.valueOf(location.getLongitude());
        String latlon = lat + " , " + lon;
        //ToastLong(latlon);

        SmartLocation.with(getBaseContext()).geocoding().reverse(location, new OnReverseGeocoding
        //Override
        public void onAddressResolved(Location location, List<Address> addresses ) {
            if (addresses != null && addresses.size() > 0) {
                Address address = addresses.get(0);
                // Thoroughfare seems to be the street name without numbers
                String street = address.getThoroughfare();

                if (Example.prev_street.equals(street)) {

                    System.out.println("F");

                }

            }
            else{
                ToastLong(street);
                readSpeedData(street);
            }
        }
    }
});
```

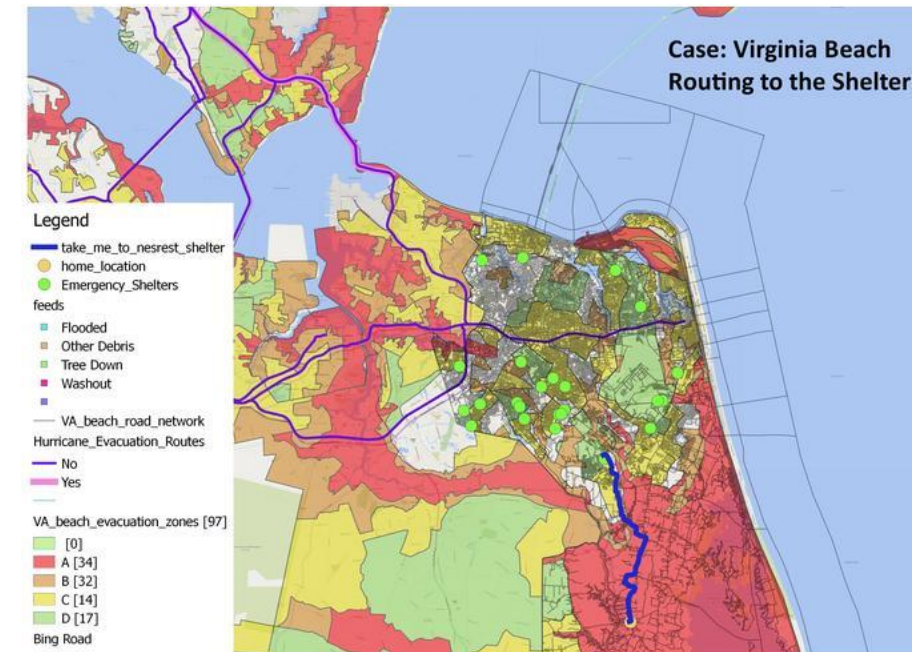
VDOT | SMARTERROADS Hackathon

FREDERICKSBURG



EEvacPlan

All-in-one dashboard/app for emergency evacuation.



Challenges we ran into

Summarizing the problem and solution in 5 minutes.

Accomplishments that we're proud of

Illustrate our ideas through conceptual maps and dashboard.