



**Title:** VDOT's SmarterRoads Portal

**Category:** Data Management, Analytics & Visualization

**State:** Virginia

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**Project initiation and end dates:** January 17, 2017 – June 30, 2017

## EXECUTIVE SUMMARY

The Virginia Department of Transportation (VDOT) is responsible for building, maintaining and operating roads, bridges and tunnels in the Commonwealth of Virginia. VDOT maintains the nation's third-largest state-maintained highway system in the country, behind Texas and North Carolina.

A simple word search for "data" on VDOT's website ([www.VirginiaDOT.org](http://www.VirginiaDOT.org)) will provide you with more than 27,000 results. (That's a lot of data.)

With public expectations for available data continuing to evolve, and VDOT's own expectations about innovative solutions to transportation challenges, the agency needed to improve the data delivery process.

The result is "SmarterRoads" ([www.SmarterRoads.org](http://www.SmarterRoads.org)), a cloud-based data portal initiative that provides free, widespread access to a wealth of VDOT information to anyone interested in creating value-added applications and products for end users. SmarterRoads provides direct access to roadway and transportation information – beyond widely available traffic operations data – in one portal.

The screenshot displays the VDOT Data Portal interface. At the top, the header includes the VDOT logo and the text "DATA PORTAL" on the left, and a "LEARN MORE" link on the right. The main content area has a blue background with a pattern of transportation icons (car, bus, train, bicycle) and dashed lines. A central text block reads: "Subscribe to VDOT data sets for analysis and reporting". Below this, a smaller text block explains: "The VDOT Data Portal makes VDOT's Transportation Operations data sets available to approved users over the web. Data sets range from real-time sensor data feeds updated every minute to shapefiles of roadway data updated every quarter. Browse available data sets below, then [create an account](#) to get started." To the right of this text is a login form with a text input field containing "tbarkley@iteris.com", a password field with masked characters, and a "Login" button. Below the login form are two links: "Create account" and "Forgot Password".

Below the blue banner is a white section titled "About the Data Portal". It contains a paragraph: "The data sets on this page are all available to approved users through the Data Portal. [Create an account](#) to sign the required Data Sharing Use Agreement; once you are approved you will receive an email with your login information. When you are logged in to the data portal, you can subscribe to data sets to receive credentials and view information for connecting to the data sets."

At the bottom of the page is a flow diagram with three stages connected by arrows:

- VDOT**: Data is collected via a network of sensors and systems.
- DATA PORTAL**: The data portal continuously connects to different data sets and makes the...
- USERS**: Users like you can subscribe to datasets for use in your applications.

## CONCEPT

The project began in January 2017 with a request from the Commonwealth Transportation Board (CTB). Appointed by the governor, the 17-member board oversees transportation projects and initiatives for the Commonwealth of Virginia.

The CTB's ask sounded simple enough: Create a repository for all VDOT data that supports the goal of optimizing opportunities for innovative collaboration and investment in Virginia's transportation system. Through this platform, VDOT would accelerate technology development in Virginia by sharing transportation data with third-party sector business, application developers and university partners.

VDOT's ultimate objectives were to:

- provide all relevant VDOT data in one site
- increase the frequency, quality and accuracy of data shared with the private sector in Virginia
- accelerate Connected and Automated Vehicle (CAV) technology development by exchanging transportation data with businesses, application developers and university partners
- encourage auto manufacturer device, application and business development
- improve safety through innovation
- improve two-way data exchange for VDOT to publish and obtain data for internal use
- maximize the availability and transparency of transportation data
- simplify the process to add new users and manage existing users.
- serve as a national data-sharing model for state transportation agencies

Challenges & Opportunities:

Frankly, VDOT has a lot of data. The agency had multiple portals with varying levels of accessibility for those seeking data (e.g.: [www.VirginiaRoads.org](http://www.VirginiaRoads.org), [www.511Virginia.org](http://www.511Virginia.org) and the VDOT Data Sharing Portal). In order to share and receive data, many different user agreements and memos of understanding had been developed over the decades. Partners include first responders, other transportation agencies, local traffic operations centers, and the news media.

User agreements had to be continuously revised and signed when staff changes occurred (both agency and partners), or software or other infrastructure was modified. This obviously slowed and complicated the process of data delivery.

Cybersecurity continues to be a major concern for VDOT and the SmarterRoads portal. Every day the landscape of digital threats becomes more diverse, with bad actors trying to take advantage. Hackers continue to learn to launch automated and sophisticated attacks. As a result, keeping pace with cybersecurity strategy can be a challenge, particularly in government. Security must be incorporated into the design.

Architecture is not optimal for real-time, query-based data downloads from 1,400 signals. System needs to be optimized in order to broadcast data in industry-standard formats. Back-end technology is not robust enough to handle large volumes of real-time data. Need to implement architecture with load-balanced, dynamic-resource allocation features.

SmarterRoads has many stakeholders. As additional data sets are identified as necessary, the project team must contain increasing costs to manage and operate SmarterRoads.

## Approach:

A cross-functional team made up from representatives from the Operations Division, IT Division and the Office of Transportation Strategic Planning was tasked with developing and deploying a web-based data portal in order to share VDOT data. This would enable data consumers to develop their own transportation applications.

This was a multi-phased development effort. The first phase included development and deployment of a comprehensive online portal to enable open access to data consumers to develop transportation applications that benefit travelers through enhancements to Virginia's transportation network.

## Initial capabilities of Phase I:

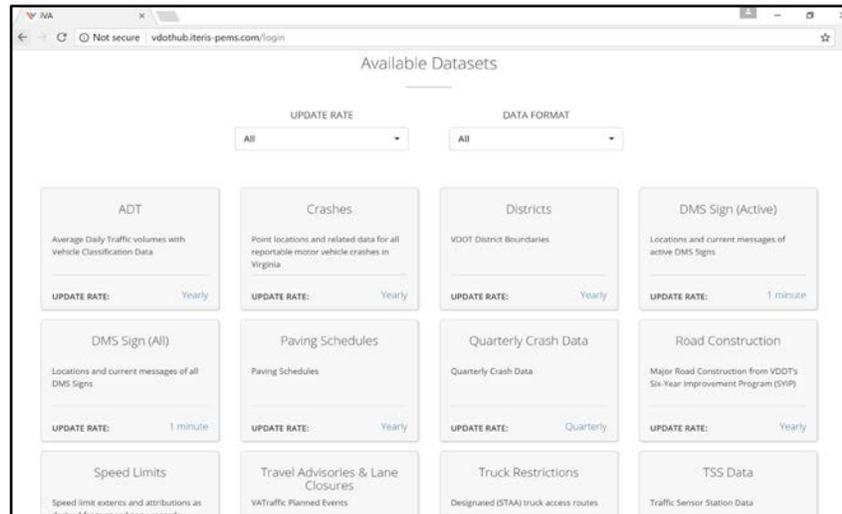
- implement automated user interface
- create account set-up
- establish agreement acceptance process
- leverage existing data services as sources

Anticipated audiences included app and software developers, the connected and automated vehicle industry, the auto industry, Original Equipment Manufacturers (or OEMs), universities and researchers, other departments of transportation and federal, state and local agencies.

Once users accept the SmarterRoads usage agreement, they can create an account and subscribe to as many as 22 different data sets (pictured below). While SmarterRoads will undergo phased enhancement roll outs, initial data sets included traffic volumes, speed limits, travel advisories, lane closures, crashes, truck restrictions, traffic sensors, incidents, sign messages and locations, paving schedules, short- and long-term weather events, Six-Year Improvement Plan major road construction, and Signal Phase and Timing (SPaT) data.



Users may subscribe to more than 20 data sets by setting up a free account at [www.smarterroads.org](http://www.smarterroads.org).



## Data formats:

The portal was designed to provide VDOT data in “raw” (NTCIP 1201) and processed formats. VDOT partnered with the Virginia Tech Transportation Institute (VTTI) along the Virginia Connected Corridor (VCC) to provide SPaT messages to test a DSRC versus a cloud approach in VCC signals.

As VDOT replaces signal controllers with advanced traffic signal controllers with SPaT, MAP, and RTCM messages, SPaT-compliant data will become available in the future. VDOT has begun in Northern Virginia before expanding elsewhere in Virginia. This will be a constantly evolving process.

Evolutionary phases:

- Progressive data source Ingest
- Add remaining existing data sources
- Expand data source ingest
- Accommodate CAV data and ingest when available

SmarterRoads includes a feedback tool so VDOT can continue to make improvements to the portal to meet users' needs. Based on ongoing usage and feedback VDOT receives, user data needs will continue to be evaluated, developed and enhanced.

Feedback can be submitted through the SmarterRoads portal. VDOT will continue to simplify the process to add new users and expand data offerings to meet development needs. An administrator dashboard was created that provides several data points to track usage.

Outreach:

SmarterRoads was soft-launched on June 30, 2017. Without any marketing, promotion, or formal public announcement, the portal quickly received requests from 40 subscribers. A public announcement, through agency news release, was sent out that August.

Several stories were generated from this outreach:

**Mobility Lab: Traffic planners should listen up to solutions offered by Transportation Techies**

<https://mobilitylab.org/2017/08/16/traffic-planners-listen-solutions-offered-transportation-techies/>

**Augusta Free Press: VDOT Launces SmarterRoads** <http://augustafreepress.com/vdot-launches-smarterroads/>

**Equipment World: Virginia DOT launches SmarterRoads data portal for transportation app development**  
[www.equipmentworld.com/virginia-dot-launches-smarterroads-data-portal-for-transportation-app-development/](http://www.equipmentworld.com/virginia-dot-launches-smarterroads-data-portal-for-transportation-app-development/)

**Construction Dive: VA DOT launches cloud-based transit data-sharing platform**  
[www.constructiondive.com/news/va-dot-launches-cloud-based-transit-data-sharing-platform/503112/](http://www.constructiondive.com/news/va-dot-launches-cloud-based-transit-data-sharing-platform/503112/)

**State Smart Transportation Initiative: SmarterRoads: Virginia's public-private data sharing strategy**  
[www.ssti.us/2017/09/smarterroads-virginias-public-private-transportation-data-sharing-strategy/](http://www.ssti.us/2017/09/smarterroads-virginias-public-private-transportation-data-sharing-strategy/)

SmarterRoads was awarded a Governor's Technology Award in the category of Innovative Use of Open Data at the 2017 Commonwealth of Virginia Innovative Technology Symposium (COVITS):

**Governor McAuliffe Presents Technology Awards at COVITS 2017**  
[http://covits.virginia.gov/2017\\_winners.html](http://covits.virginia.gov/2017_winners.html)

**StateScoop**  
**Governor's Technology Awards showcases 17 'creative' technologies in Virginia**  
<http://statescoop.com/governors-technology-awards-showcases-17-creative-technologies-in-virginia>

**Governor McAuliffe Announces Governor's Technology Award Winners**  
<http://governor.virginia.gov/newsroom/newsarticle?articleId=21140>

## **SIGNIFICANCE**

By encouraging auto and equipment manufacturers, application and business development, VDOT is unleashing information for the private sector to provide new and enhanced services. This innovative use of transportation information will improve safety, enhance our transportation network, enhance customer service and improve our quality of life in Virginia.

SmarterRoads is another example of the agency's commitment to innovation, sound stewardship of public dollars and providing taxpayers with the highest quality of customer service.

SmarterRoads allows VDOT to:

- accelerate Connected and Automated Vehicle (CAV) technology development by making it possible to exchange transportation data and video with private sector CAV business, application developers, and university partners.
- provide all relevant VDOT data beyond current traffic data in one portal site.
- encourage auto manufacturer device, application and business development to increase the frequency, quality and accuracy of data shared with private sector in Virginia.
- significantly improve the capability for two-way data exchange to publish and obtain data for internal use.
- address future public expectations for data.
  - ✓ immediate static and dynamic data without latency
  - ✓ CAV growth
  - ✓ Multimodal Integrated Corridor Management (ICM) strategies
- grow to become one of the leading transportation agencies in the country to offer open data.

SmarterRoads 2.0 additional data feeds:

- I-66 and I-64 tolling data
- Truck parking data
- 3,300 traffic signal location data
- 24 additional SPaT signalized intersection research data
- Evaluating request for RWIS data in its raw format
- SmarterRoads 2.0 User agreement update to:
- Distinguish between commercial data and research data
- Identify VDOT source data and private source data

Future architecture highlights include:

- Secured cloud based real-time data processing system
- Compliant with Commonwealth of Virginia Security Requirements
- Ability to broadcast data in various industry-standard formats (BIM, CAMP, etc.)
- Reduce real-time data handling latency issues
- No more than three-second delay from source to destination
- Provide access to VDOT's traffic camera feeds (1,400 cameras from VDOT's TVD program)
- Incorporate SPaT data for all 3,300 signals once upgraded with new controllers and firmware
- Implement new security driven geo-spatially enabled cloud architecture
- VDOT will now turn attention to how SmarterRoads can be developed further to sunset, or redirect, other portals and programs.

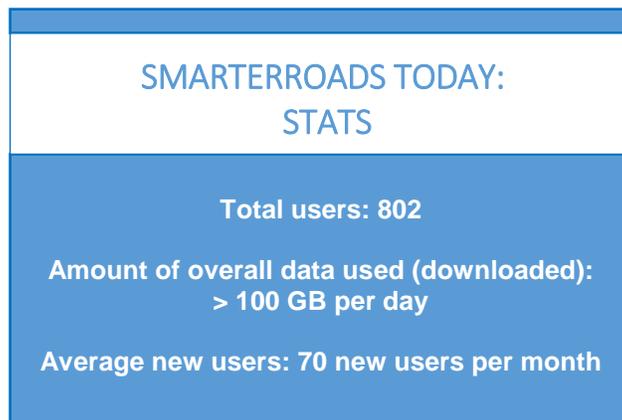
## IMPACT

As stated above, SmarterRoads encourages public-sector technology business development and innovation, helps VDOT improve its transportation network and capabilities, and provides Virginia taxpayers with a higher quality of customer service.

SmarterRoads allows interested parties access to raw data streams to create value-added transportation applications and products for end users.

Having an open data portal may also enhance vital safety improvements. In 2017, work zone incidents were up significantly: incidents rose 15 percent, injuries were up 17 percent and fatalities skyrocketed 43 percent (*Source: VDOT Traffic Engineering Division, VDOT/VAA Asphalt Co-Op, Dec. 16, 2017*).

The SmarterRoads portal opens VDOT's data up to app developers and others who may be able to assist the agency in reaching its long-term goals of zero fatalities on Virginia's roads, improving day-to-day operations, reducing congestion, improving efficiency of moving goods and services, and minimizing the agency's future footprint.



SmarterRoads sets the stage for VDOT's data management future. VDOT has already heard from several third-party technology and software development firms interested in working with the agency further to realize innovative solutions to tomorrow's transportation challenges.

The SmarterRoads data portal is another example of VDOT's commitment to innovation, sound stewardship of public dollars and providing taxpayers with the highest quality of customer service.