Virginia Connected Corridors

Active V2V, V2I, and V2X development and deployment providing real solutions for safety, mobility, and sustainability

More than 15 years ago, the Virginia Department of Transportation (VDOT) and the Virginia Tech Transportation Institute (VTTI) partnered to create one of the first active and integrated roadways featuring intelligent transportation systems: the Virginia Smart Road. Today, VDOT—along with its research arm, the Virginia Transportation Research Council (VTRC)—and VTTI have teamed once again to enhance and complement the development and deployment of the next generation of vehicular technology with the Virginia Connected Corridors (VCC).

Encompassing the Smart Road and the Northern Virginia Connected-Vehicle Test Bed—located along Interstate 66, Interstate 495, U.S. 29, and U.S. 50, one of the nation's most congested corridors—the VCC is facilitating the real-world deployment of connected-vehicle technology via dedicated short-range communications and cellular technology.

Using more than 60 roadside equipment units (RSEs) located along the corridors, VDOT, VTRC, and researchers from multiple institutes across Virginia are implementing connected applications that include traveler information, lane closure alerts, and work-zone and incident management.

The VCC is an initiative that will help fulfill the ultimate goals of integrating connectivity within the transportation system: to improve mobility, enhance sustainability, and save lives.

VCC Development/Deployment Capabilities

The VCC is promoting the implementation of connected-vehicle applications using a real-world roadway environment that features multiple transportation challenges. The VCC application deployment infrastructure includes:

- A developer-friendly environment that supports third-party application development and deployment

- Data exchange services, including data warehouse and clearinghouse implementations

- Free application program interfaces (APIs) and reference applications to simplify the development of connected-vehicle applications

- Access to more than 60 RSEs installed on a mix of freeways and arterials, which are connected to a low-latency backhaul network

- A phased test and deployment process that supports the migration of safety-critical applications from test tracks to live public roadways

- A corridor visualization application that supports situational awareness for deployed application functions

- An integrated vehicle instrumentation and data acquisition system to support post-deployment safety assessments of applications

Created through a partnership between

VDOT — Virginia Department of Transportation

VTRC — Virginia Transportation Research Council

VirginiaTech — Transportation Institute

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VCC Research Projects

The VCC is active and connected, with VTTI, the University of Virginia, and Morgan State University having conducted more than 20 V2V, V2I, and V2X projects under the umbrella of the Tier 1 U.S. Department of Transportation Connected Vehicle/Infrastructure University Transportation Center (http://cvi-utc.org/). Projects included:

- Emergency vehicle-to-vehicle communication
- Connected-vehicle-enabled freeway merge management field test
- Connected motorcycle crash warning systems
- Connected-vehicle applications for adaptive lighting
- Safety and human factors of adaptive stop/yield signs using connected-vehicle infrastructure
- Field testing of eco-speed control using vehicle-to-infrastructure communication
- Infrastructure pavement assessment and management applications enabled by the connected-vehicles environment research program - Phase 1: Proof of concept
- Intersection management using in-vehicle speed advisory/adaptation
- Prototyping and evaluating a smartphone dynamic message sign (DMS) application in the Connected Vehicle/Infrastructure University Transportation Center test bed
- An innovative "intelligent" awareness system for roadway workers using dedicated short-range communications
- A connected-vehicle-enabled virtual dynamic message sign system

- Developing connected-vehicle freeway speed harmonization algorithms
- Next-generation transit signal priority with connected-vehicle technology

Research conducted using the VCC is already providing important insights into the benefits of connected-vehicle technology. For example:

- Studies conducted to date show that participant acceptance of connected-vehicle technology is extremely positive.
- With increased market penetration rates of connected vehicles, the application of a speed harmonization algorithm results in a greater discharge flow rate of bottlenecks, reduced traffic stream delays, and reduced vehicle emissions and fuel consumption levels.
- An infrastructure pavement assessment and management application facilitated by connected-vehicle technology can correctly identify 80 percent to 93 percent of deficient pavement sections.
- Connected-vehicle technology is 91 percent accurate in alerting a worker on foot and an approaching vehicle of crash and near-crash risks in a work zone.
- An intersection equipped with a connected-vehicle-enabled adaptive stop sign had a full-stop compliance level of 62 percent, compared to only 12 percent compliance at a traditional stop-controlled intersection.
- Researchers using the VCC have presented, or are in the process of presenting, their connected-vehicle work globally, from major U.S. cities to Japan, the Netherlands, Austria, and France.